WORKING ON THE WORK FRAMEWORK FOR ENGAGEMENT:
IMPACTING STUDENTS’ PERCEIVED LEARNING, ATTITUDES TOWARD SCHOOL,
AND ACHIEVEMENT

by

Michael Joshua Forehand

Liberty University

A Dissertation Presented in Partial Fulfillment
of the Requirements for the Degree
Doctor of Education

Liberty University
May, 2014
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ABSTRACT
A quasi-experimental, pre-test post-test nonequivalent control group study was utilized to
determine the difference in students’ perceived learning, attitudes toward school, and
achievement when participating in classes utilizing engagement design qualities as compared to
students in classes not utilizing engagement design qualities. To inform the relationship between
student engagement, perceived learning, attitudes toward school, and achievement,
Csikszentmihalyi’s Theory of Flow was utilized as a theoretical framework along with the
implementation of Schelchty’s Working on the Work (WOW) Framework with 178 third grade
students in a Metro-Atlanta school system. A perceived learning questionnaire, the Elementary
Form of the Battle Student Attitude Scale, and an expert validated mathematics assessment were
analyzed to determine the differences in students that participated in traditional instruction and
WOW instruction. Perceived learning and achievement scores were analyzed utilizing an
independent samples t test. Student attitudes were analyzed through ANCOVA to control for
covariance on the Battle Student Attitude Scale Elementary Form.

Keywords: engagement, Working on the Work Framework, perceived learning, attitudes,
achievement
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CHAPTER ONE: INTRODUCTION

The twenty-first century learner is unique. Growing up in a world infused with technology, revolutionary changes to the job market, and an unstable economy is a challenging experience. These new learners want to know the purpose and relevance of their own lives. The engagement of students has become less innate and must now be earned. In years past, motivation to learn was prompted by a respect for teachers and parents and an eagerness to succeed. Over the last five decades, the number of young people growing up in single parent families where both parents were not present to share the responsibilities of rearing a family has risen (Csikszentmihalyi, 1990). Whereas family structures and the workforce have changed dramatically over the past 30 years, the school environment has not completely kept up with this trend. Prensky (2012) posited “observing what goes on in our classrooms and hearing kids talk about their experiences led me to the conclusion that there are huge problems with how we teach, which is still, primarily, through an outdated ‘lecture’ or ‘telling’ style very much at odds with how today’s students learn (p. 9). Schlechty’s (2001) research echoed this belief: “In spite of numerous waves of reform US schools are not much different—either for good or ill—than they were fifty years ago” (p. xi).

The trend of significant change began with the family. Family structures can no longer be characterized by a mother and father duo. Single mothers and fathers, mothers and stepfathers, and vice-versa, grandparents, aunts and uncles, are all at the helm of many family households. In the workforce, adults no longer only make their way to the farms, factories, and manufacturing plants, allowing them to arrive home by dinnertime. Due to the economy and the variety of new professions, many adults drive into the city or long distances to their jobs. In stark comparison, many of our schools are still designed and managed in the traditional style of the one-room schoolhouse, emphasizing reading, writing, and mathematics. In some cases,
digital immigrants, otherwise known as people born before 1980, have encountered students who are digital natives (Trilling & Fadel, 2009).

These digital natives are immersed in video games, hand held electronic devices, and other electronic media for a majority of their day. However, they come to school and are subjected to an environment not quite as engaging as their electronic media. Prensky (2009), who coined the terms ‘digital immigrants’ and ‘digital natives,’ deemed the idea of digital immigrants as less irrelevant as society moves further into the twenty-first century where many educators have grown up in the digital age. Parsons and Traylor (2011) emphasized the need for further research aimed at “the so-called ‘new students’ and the world we are launching them into,” and indicated that the literature continuously calls for “reexamining our assumptions about learning and about the learners” (p. 5). In considering the twenty-first century learner, the amount of time students spend on any task is directly related to their engagement with their interest in the task. As a result of the new technologies and types of jobs that have evolved, for educators to know everything is impossible. Therefore, educators must strive to teach students how to learn on their own.

Csikszentmihalyi (1990) discussed forces outside of human control that have a direct effect on how people feel and what people do. Forces outside of human control include looks, temperament, time and date of birth, time period in which a person is born, as well as the surrounding political climate. Furthermore, educators are unable to control much of their student’s lives outside of the schoolhouse—which students they have in their classroom, the parents who send the child to school, the number of students who enroll or withdraw during the year, or funds allocated to them. However, the one thing educators can control is the work they give their students.
These new learners are learning how to learn. No longer are teachers the one source of information. In order for students to want to come to school, feel like they are learning, and to achieve at high levels, engagement strategies that appeal to the twenty-first century learner are necessary. This investigation focused on the implementation of the 10 design qualities described in the Working on the Work (WOW) Framework and how teachers used these design qualities to design engaging lessons to influence the perceived learning, attitudes toward school, and achievement of third grade students in a Metro-Atlanta school system. The WOW Framework has guided learners toward profound learning. Lessons designed using the WOW Framework allowed students to see the purpose and relevance of their work. Additionally, students had a choice in how they showed their learning. Students eagerly shared their knowledge with colleagues, parents, and digitally with the world. Students engaged in WOW lessons typically took their own time to learn more about topics that were of interest to them. This chapter will delve further into the problem of interest and introduce the purpose of the investigation. Next the research questions and hypotheses are stated. Following the research questions and hypotheses, each variable was identified and defined for clarification purposes. Assumptions and limitations are discussed prior to an explanation of the chosen research design.

**Background**

Student engagement, especially at the middle school and secondary levels, was studied extensively over the past 10 years. Considering the amount of research in the field, the importance of student engagement to stakeholders interested in student growth and achievement is evident. In today’s classrooms, teachers are faced with the task of preparing students for jobs that do not yet exist. In order for educators to see increases in student achievement, educators must engage students in their work as much as the students are engaged when playing video
games. Trilling and Fadel (2009) emphasized the importance of engagement in their text, *21st Century Skills: Learning for Life in our Times*. The authors discussed a new set of skills that required the use of student creativity and innovation to help students brainstorm and attempt to solve both local and widespread problems. The development of the Common Core Standards in the United States of America has caused educators to take a look at their instructional practices.

To be successful with the Common Core Curriculum, public school students must be engaged in their work to circumvent avoidance behaviors. Rather than teaching at the knowledge level of Bloom’s Taxonomy, in the Common Core Georgia Performance Standards educators are required to delve deeper into a fewer amount of standards. Introduction of such rigor into instruction can be overwhelming for students. Students are no longer charged with only working through algorithms, rather they are given tasks or scenarios to decide how to solve the problem before they can even attempt to use an algorithm to find an answer. Such tasks can cause students to give up due to their lack of success with the task. Many times students lack the background knowledge to understand the task at all. Additionally, the Common Core Standards have emphasized teaching students a variety of methods to solve problems.

Relevance and relationships have become keys to unlocking student engagement. When a task has meaning for a student and the student is genuinely interested in the experience, the student will persevere, even when frustrated. Students will spend hours playing on computers and video games in pursuit of winning or mastering a challenge. Athletes and artists spend countless hours practicing their craft to become the best. Why? The task at hand is relevant and important to them. Csikszentmihalyi (1990) discussed such experiences as the voluntary stretching of a person’s mind or body, often unpleasant, to accomplish a goal or task that has been deemed worthwhile. Csikszentmihalyi labeled these occurrences as optimal.
experiences. Furthermore, authentic student-teacher relationships are based on trust. Students become authentically engaged in a supportive and relevant climate, thus allowing for student success. The WOW Framework builds trust between the teacher and student because a fear of failure is void. Bodovski and Farkas (2007) attempted to show a relationship between engaged students and higher achievement, while correlating graduation rates with higher engagement. The authors found that students who were engaged achieved higher scores, enjoyed school, and went on to graduate, as compared to their non-engaged counterparts. Equally disturbing was the finding that less engaged peers were alienated in school and manifested behavior problems. Thus, research has shown that increased student engagement yields higher achievement.

Educators identified engaging disengaged students as one of the most difficult challenges they faced in the twenty-first century (Gilbert, 2007; Harris, 2008; Prensky, 2005; Willms, 2003). Allowing students to graduate from public schools without the critical thinking skills and the background knowledge necessary to be productive in a global world would surely create an illiterate population that endangers the future of society.

Although some researchers (Bennett, Maton, & Kervin, 2007; Carlson, 2005; Young, 2006) posited that the students of today are no different from previous generations, there is a line of research that has supported that students in public schools today are different than the students who sat in public schools in the 1970s and 1980s. Gilbert (2007) yielded, “Students of today are different—they are both active seekers and co-creators of knowledge. Linear and didactic pedagogy will no longer work for them” (p. 16). The global marketplace has forced society to introduce and implement technological advances. Additionally, businesses have outsourced many production type jobs to less developed countries around the world.

Companies in the twenty-first century have used Facebook, Twitter, eBay, and other
online platforms to market their products. Trilling & Fadel (2009) emphasized, “What is certain is that two essential skill sets will remain at the top of the list of job requirements for twenty-first century work: the ability to quickly acquire and apply new knowledge, and the know-how to apply essential twenty-first century skills—problem solving, communication, teamwork, technology use, and innovation” (p. 36). Thus, students today have innately different needs from schooling. Through fostering active engagement teachers can increase achievement through equipping students with twenty-first century skills. Educators and parents alike have encouraged students to participate in work study programs, simulations, and technical and career academies, and students have benefited from these settings which have taught them to integrate theory and practice.

To see dramatic increases in student achievement, educators must connect key concepts identified in engagement research and integrate these strategies through relevant and meaningful practice. Athletes come to practice ready to engage in drills. They do not sit the whole time and listen to their coaches review plays and theories of the game. This can be applied to the classroom. Students learn by doing. Through designing relevant, thought-provoking, and engaging student work, educators can improve student attitudes toward school, thus improving their perceived learning and achievement. Research on student engagement is void of studies that consider specific designs of student work. However, many studies have focused on student behavior rather than student learning (Harris, 2008).

Research by Ramaley and Zia (2005) suggested that successful classrooms combined aspects of student engagement to engage “the Net Generation and the adult learner” (p. 8). Furthermore, Dunleavy and Milton’s (2009) research was echoed by Willms, Friesen, and Milton (2009) when they stated, “Engaging teachers in school improvement, as a collaborative
knowledge building process is also key to understanding the types of practices educators might start to cultivate to improve the educational experiences and learning outcomes for all students” (p. 33). Moreover, these researchers identified the student voice and self-perspective on engagement as valuable information for teacher consideration in lesson design. Claxton (2007) posited, “The goal of expanding students’ learning capacity seems more likely to take root in a school culture if students understand what is going on, and are given some significant role in helping to design and bring about the desired culture change” (p. 12). Therefore, considering the significance of The Working on the Work Framework that has combined key aspects of engagement research and guided teachers in working collaboratively with other faculty and their students in designing engaging and relevant student work was important.

The key word here is ‘designing.’ Teachers have shifted from the role of a holder of knowledge to a facilitator of learning. Designing work that created authentic experiences which challenged students, yet engaged them enough to keep them trying even after they failed, was a complex task. However, it has become necessary. Consider a child building a bulldozer with legos™. He will spend hours perfecting the task because it is interesting and important to him. Think about an Olympic gymnast perfecting her dismount from the parallel bars. She will not give up until she achieves perfection. In each of these instances, the human has reached a state of optimal experience. They are happy to continue working towards something that is important and relevant to their life. This state of optimal experience was studied extensively by Csikszentmihalyi (1990), who introduced the Theory of Flow, also known as the psychology of optimal experience, rooted in Aristotle’s theory that humans are on a constant quest for happiness. Csikszentmihalyi spent a quarter of a century studying how humans achieved optimal experiences. Csikszentmihalyi found that these moments were not always enjoyable; however,
they occurred when “a person’s body or mind is stretched to its limits in a voluntary effort to accomplish something difficult and worthwhile” (p. 3). As applied to this study, this theory holds that the independent variable, implementation of the engagement strategies for designing student work, will influence student attitudes toward school, perceived learning, and achievement because engaging students in interesting, relevant, and challenging work leads to happiness and fulfillment, thus creating an optimal learning experience. Csikszentmihalyi stated:

What makes these activities conducive to flow is that they were designed to make optimal experiences easier to achieve. They have rules that require the learning of skills, they set up the goals, they provide feedback, they make control possible. Such flow activities have as their primary function the provision of enjoyable experiences. Play, art, pageantry, ritual, and sports are some examples. Because of the way they are constructed, they help participants and spectators achieve an ordered state of mind that is highly enjoyable. (p. 72)

The Working on the Work Framework (WOW) has provided a platform for teachers to design enjoyable and relevant, yet rigorous and challenging experiences. Csikszentmihalyi (1975) found that flow activities provided a “sense of discovery, a creative feeling of transporting the person into a new reality. It pushed the person to higher levels of performance, and led to previously undreamed of states of consciousness” (p. 74).
Table 1

*Connection between Working on the Work Framework and the Theory of Flow*

<table>
<thead>
<tr>
<th>Working on the Work Design Qualities</th>
<th>Theory of Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content &amp; Substance</td>
<td>We confront tasks we have a chance of completing. We must be able to concentrate on what we are doing. The concentration is possible because the task undertaken has clear goals and provides immediate feedback.</td>
</tr>
<tr>
<td>Organization of Knowledge</td>
<td></td>
</tr>
<tr>
<td>Clear and Compelling Product Standards</td>
<td></td>
</tr>
<tr>
<td>Product Focus</td>
<td></td>
</tr>
<tr>
<td>Safe Environment</td>
<td>One acts with a deep but effortless involvement that removes from awareness the worries and frustrations of everyday life.</td>
</tr>
<tr>
<td>Novelty &amp; Variety</td>
<td>The sense of the duration of time is altered; hours pass by in minutes, and minutes can stretch out to seem like hours. Differentiation implies a movement toward uniqueness, toward separating oneself from others.</td>
</tr>
<tr>
<td>Affiliation</td>
<td></td>
</tr>
<tr>
<td>Affirmation of Performance</td>
<td>Enjoyable experiences allow people to exercise a sense of control over their actions. It is important to have a union with other people, with ideas and entities beyond the self.</td>
</tr>
<tr>
<td>Choice</td>
<td></td>
</tr>
<tr>
<td>Authenticity</td>
<td>Concern for the self disappears, yet paradoxically, the sense of self emerges stronger after the flow experience is over.</td>
</tr>
</tbody>
</table>

Much research has been conducted on student engagement and several quantitative aspects of student engagement have been studied (attendance, participation, punctuality, graduation rates, achievement, time on task, homework completion, extracurricular participation rates); however, little research exists on how the 10 design qualities in the WOW framework supported perceived learning, student attitudes toward school, and achievement. Schlechty (2002) discussed that teachers cannot control the social aspects of a child’s life. However, they can control two things: “the content of the curriculum they actually deliver to students, and the qualities and characteristics of the tasks assigned to students” (p. 39). The implementation and measurement of effective engagement strategies by trained teachers was identified as a need in
the field (Dunleavy & Milton, 2009; Gilbert, 2007; Harris, 2008; Willms, Friesen, & Milton, 2009). Through implementation of the design qualities of the WOW Framework and measurement of the changes in perceived learning, student attitudes toward school, and achievement, unprecedented efforts to improve instruction may be yielded to the American teacher.

**Problem Statement**

Students are disengaged in school and are dropping out at an alarming rate (Breidenstein, 2007; Thomas & Date, 2006). School engagement issues develop well before students enter high school. Not all students enter schooling innately and equally interested in learning. Downer, Rimm-Kaufman, and Pianta (2007) asserted that “not all children enter elementary school equally prepared to meet the demands of the classroom and children’s adaptation to the classroom environment is a well-established predictor of school success and adjustment problems” (p. 125). Third grade mathematics students in a Metro-Atlanta school district showed little growth in achievement over the past several years. Many students felt unsuccessful and frustrated with mathematics.

The influence of instructional design is a construct interesting educators. Without disrupting the public school setting, research to determine the influence of engagement design qualities on student perceived learning and attitudes toward school is needed to increase student achievement. Studies have shown that higher rates of perceived learning and positive attitudes toward school correlated with higher student achievement (Patrick, Ryan, & Kaplan, 2007; Shernoff, & Vandell, 2007; Skinner, Furrer, Marchand, & Kindermann, 2008; Tyler & Boelter, 2008). When learners believe they have accomplished and mastered a task or that they can use the knowledge or skills that were gained, they become more apt to be engaged in the course or
activity in the future. Csikszentmihalyi’s (1990) research team interviewed thousands of people from around the globe to further develop the Theory of Flow. Korean matriarchs, adults from Thailand and India, Tokyo teens, Navajo shepherds, Italian farmers, and Chicago assembly line workers portrayed optimal experiences similarly. When people were authentically involved in a task that was important and relevant to them, they continued to do the task even when it became difficult. Therefore, if the WOW Framework can help teachers to create more rigorous and relevant student experiences, thus influencing perceived learning, positive attitudes toward school, and higher achievement, this study may inform the practice of educators across the globe.

A review of the literature revealed the need to document the effectiveness of quality work design to promote student engagement, resulting in better attitudes toward school, greater perceived learning, and higher achievement.

**Purpose Statement**

The Theory of Flow defined optimal experience as “the state in which people are so involved in an activity that nothing else seems to matter; the experience itself is so enjoyable that people will do it even at great cost, for the sheer sake of doing it” (Csikszentmihalyi, 2009 p. 4). Across the world, this state of optimal experience, along with the psychological conditions that accompany the state, were described similarly. When reflecting on an optimal experience the following was often observed: (a) there was a task with a belief that there was a chance to complete said task, (b) the ability to concentrate on the task, (c) clear goals and immediate feedback were given, (d) worries and frustrations of everyday life were void, (e) there was a control over actions, (f) limited concern existed for self, yet sense of self emerged after flow experience, and (g) an altered sense of time. Considering the Theory of Flow, classes utilizing engagement design qualities based on the Working on the Work Framework provided
opportunities that promote an optimal experience, as opposed to classes utilizing traditional teaching methods. This implies that the use of engagement design qualities may create optimal experiences resulting in higher perceived learning, attitudes toward school, and achievement. The purpose of this quasi-experimental study was to examine if instruction design based on the Working on the Work Framework and guided by the Theory of Flow influenced the perceived learning, attitudes toward school, and achievement of third grade students, while controlling for third grade mathematics students in a Metro-Atlanta school district. The design qualities in the Working on the Work Framework were based on Schlechty’s (2002) research that grouped its design qualities to foster engagement in 10 categories: Content and Substance, Organization of Knowledge, Product Focus, Clear and Compelling Product Standards, Safe Environment, Affirmation of Performance, Affiliation, Novelty and Variety, Choice, and Authenticity.

**Significance of the Study**

Research has demonstrated that public school students are bored and disengaged (Breidenstein, 2007; Thomas & Date, 2006; Willms, 2003). If schools can identify strategies and ways to design instruction that will engage students, they can increase perceived learning and attitudes toward school, thus increasing student achievement. School districts will be able to use the results of this study to inform the design qualities of lessons, while instructional leaders can design professional development aimed at increasing school achievement. This study will also benefit the public. Students who learn authentically at school carry their knowledge to the workforce.

This study sought to show that through an increased effort by teachers to create engaging work, student work can be created that helps students enjoy school and feel a sense of learning or accomplishment in their endeavors. Employing design qualities such as Content and Substance,
Organization of Knowledge, Product Focus, Clear and Compelling Product Standards, Safe Environment, Affirmation of Performance, Affiliation, Novelty and Variety, Choice, and Authenticity allows educators to eliminate work avoidance behaviors and the tendency to give up.

**Research Questions**

The research questions for this quasi-experimental study are as follows:

**RQ1:** To what extent is there a statistically significant difference in perceived learning among third grade students participating in classes using engagement design qualities as opposed to participating in classes with traditional teaching methods, while controlling for the pre-test perceived learning?

**RQ2:** To what extent is there a statistically significant difference in third grade students’ attitudes toward school when participating in classes with engagement design qualities as opposed to participating in classes with traditional teaching methods, while controlling for pre-test attitudes?

**RQ3:** To what extent is there a difference between summative assessment achievement when third grade students participate in classes with engagement design qualities as opposed to participating in classes with traditional teaching methods, while controlling for the achievement pretest?

**Hypotheses**

The following are the research hypotheses:

**H1:** There will be a statistically significant difference in perceived learning among third grade students participating in classes using engagement design qualities as opposed to
participating in classes with traditional teaching methods, while controlling for pre-test perceived learning.

H₂: There will be a statistically significant difference in third grade students’ attitudes toward school when participating in classes with engagement design qualities as opposed to participating in classes with traditional teaching methods, while controlling for pre-test attitudes.

H₃: There will be a statistically significant difference between summative assessment achievement when third grade students participate in classes with engagement design qualities as opposed to participating in classes with traditional teaching methods, while controlling for the achievement pretest.

Alternatively, the following are the null hypotheses:

H₀₁: There will be no statistically significant difference in perceived learning among third grade students participating in classes utilizing engagement design qualities as opposed to participating in classes with traditional teaching methods, while controlling for pre-test perceived learning.

H₀₂: There will be no statistically significant difference in third grade students’ attitudes toward school when participating in classes with engagement design qualities as opposed to participating in classes with traditional teaching methods, while controlling for pre-test attitudes.

H₀₃: There will be no statistically significant difference between summative assessment achievement when third grade students participate in classes with engagement design qualities as opposed to participating in classes with traditional teaching methods while controlling for the pretest.
Identification of Variables

The independent variable, implementation of engagement design qualities of student work, was defined as teacher implementation of the 10 design qualities described in the Working on the Work Framework, as opposed to traditional teaching for the control group. Design qualities were operationally defined based on Schlechty’s (2002) work that grouped the design qualities that were assumed could foster engagement into 10 categories: Content and Substance, Organization of Knowledge, Product Focus, Clear and Compelling Product Standards, Safe Environment, Affirmation of Performance, Affiliation, Novelty and Variety, Choice, and Authenticity. The Working on the Work Framework can be used to guide teachers to design relevant and rigorous experiences for students.

Content and substance referred to “a shared understanding of what students are expected to know and to be able to do” (p. 19). The category organization of knowledge stated that information and resources should be “organized in ways that are most likely to appeal to the personal interests and aesthetic sensibilities of the largest possible number of students” (p. 19). Product focus was described as “performances, products, and exhibitions about which the students care and on which students place value” (p. 19). Clear and compelling product standards referred to when students were able to understand “the standards by which these projects, performances, or exhibitions will be evaluated” (p. 19). Safe environment was defined as “success is expected and failure is understood as a necessary part of learning,” along with mutual respect between teacher and student (p. 19). Affirmation of performance was defined as when “persons significant in the lives of the student observe, participate in, and benefit from students’ performance or product to affirm the significance and importance of the activity” (p. 19). Affiliation referred to working cooperatively with others. Novelty and variety was defined
as “the range of tasks, products, and exhibitions is wide and varied, and the technologies that students are encouraged to employ are varies as well” (p. 20). Choice referred to “numerous options in choosing what they will do and how they will go about doing those things in order to learn” (p. 21). Authenticity was defined as tasks that “have meaning and significance in their lives now and are related to consequences to which they attach importance” (p. 21).

The dependent variable, perceived learning, was defined as a self-reported level of learning as measured by the Perceived learning questionnaire (Richmond, Gorham, & McCroskey, 1987) and reported test-retest reliability for a study that utilized students in the United States. Learning (.85) and the loss of learning (.88) were reported over a five-day period. For this study, the dependent variable attitude toward school was defined as “a student’s state or disposition to act toward his or her school as a whole” (Damico, Hines, & Northrop, 1975, p. 10). The elementary form of the Battle Student Attitude Scale, normed for students below the sixth grade, was used for measuring student attitudes toward school (Damico, Hines, & Northrop, 1975, p. 29-34). The authors reported a relatively high correlation with total test score. They indicated that the test could be divided into subsets: self, other pupils, teachers, school administrators, and school as a whole. However, since the reliability of a test increases with increased length, validity is stronger when the whole scale is used. Reliability of this scale was determined using the split-halves method and ranged from .85 to .88. The dependent variable student achievement was defined as the scores of student performance on an expert validated unit test.

Research Summary

Because of the nature of the experiment, a quantitative approach to research was chosen. A quasi-experimental, pre-test post-test nonequivalent control group design was chosen because
the research was performed in a public school setting. Randomizing a sample when working within the structures and confines of a public school was difficult. To perform a true experimental study with randomization would be impossible due to the disruption it would cause in a public school setting; therefore, preexisting classrooms with mixed abilities were utilized. As such, to control for the selection threat to validity, a pre-test was also utilized. If no significant differences exist between the pre-test scores of both groups, selection bias should only be a limited threat to internal validity (Ary, Jacobs, & Sorenson, 2010).

This design permitted manipulation of the independent variable while maintaining a control group (Gall, Gall, & Borg, 2007). To determine if there were statistically significant differences in perceived learning between the experimental and control groups, analysis of covariance (ANCOVA) was chosen to compare the mean scores of each group using a perceived learning questionnaire (Richmond, Gorham, & McCroskey, 1987) to account for group difference pretreatment. ANCOVA was chosen to compare the attitudes toward school between the experimental and control groups. This design utilized a pre-test and a post-test for measuring the construct student attitudes toward school. The elementary form of the Battle Student Attitude Scale, composed of subscales, was administered at the onset of the study to determine group differences. Subscales were analyzed to ensure content validity and any subscale without a statistically significant correlation was determined to be removed from the analysis. ANCOVA was chosen to control for covariance between the pre-test and post-test total score of the Battle Student Attitude Scale. When a significant difference was found between the experimental and control group, ANCOVA was employed to control for the difference between mean pre-test scores of the two groups. Furthermore, ANCOVA was chosen to assess the difference in student achievement between pre- and post-test measures on an expert validated summative assessment.
The use of ANCOVA allowed comparison of mean scores provided from the summative assessment of the experimental and control group while “subtracting” the effects of a difference in pre-test scores to see what the relationship would be without it (Vogt, 2011).

**Assumptions**

Teachers assisting in the implementation of the Working on the Work Framework were invested in learning strategies that foster student engagement since they volunteered to participate in the professional learning and implementation of the engagement design qualities. Furthermore, the assumption was made that students participating in self-reporting of perceived learning were objective in their reporting due to the use of procedures put in place to assure anonymity of student responses. Teaching ability was also assumed to be similar for all teachers. The relationships between students and their teachers were assumed to be parallel for both groups. The materials and supplies used by teachers, other than the specific engagement qualities, were assumed to be comparable. Teachers used the Common Core Georgia Performance Standards to identify mathematics standards necessary for the implementation of the curriculum. Student abilities and background knowledge were assumed to be similar across both the experimental and control groups.

**Limitations**

“Where controls are lacking in a quasi-experiment, one must, in interpreting the results, consider in detail the likelihood of uncontrolled factors accounting for results. The more implausible this becomes, the more ‘valid’ the experiment” (Campbell & Stanley, 1963, p. 36). One of the biggest problems with self-reporting instruments is the lack of objectivity that could create inaccuracies when using self-report measures (Cronbach, 1971; Fiske, 1980). When asked how much they have learned, a high score for one student could be a lower score for another
student. This could be because students compare their performance to that of their peers. Because this study is quasi-experimental rather than true-experimental, several threats to validity should be noted. To increase objectivity, standardized conditions for administration of the Perceived learning questionnaire were employed. These conditions included a specific amount of time for testing, procedures for turning in the self-report to increase anonymity, and specific directions to limit the amount of interaction between the tester and test-takers. Students who completed the perceived learning scales folded their scales in half and placed them in an envelope for the researcher to review alone.

Due to the lack of randomization, there was the possibility of selection bias due to nonequivalent groups. To control for this, a pre-test and a post-test were given. It was determined that if there was a significant difference between pre-test scores, ANCOVA could be used to adjust the post-test scores (Ary, Jacobs, & Sorenson, 2010). ANCOVA can be used to statistically control covariance between groups (Ary, Jacobs, & Sorenson, 2010; Gall, Gall, & Borg, 2007; Tabachnick & Fidell, 2007).

The design of this study posed potential threats to history, maturation, testing, instrumentation, selection, and mortality. Campbell and Stanley (1963) emphasized the importance of similar experimental and control groups. They stated, “Assuming that these desiderata are approximated for purposes of internal validity, we can regard the design as controlling for the main effects of history, maturation, testing, and instrumentation,” (p. 48). Threats to the implementation of the independent variable were also evident. Implementing the Working on the Work Framework is viewed as challenging because of the many aspects of the framework. This study sought to implement only the portion of the WOW framework dealing with engagement design qualities. Research assistants must have a common understanding of
the language of the framework. For example, the WOW framework identified levels of engagement and explained student characteristics for each level of engagement.

Ensuring that each lesson and piece of student work met the standards for each design quality took time. For fidelity purposes, all teachers received professional development for implementing the 10 design qualities. To ensure additional fidelity and congruency, all teachers delivered the same mathematics content to students in both the experimental and control groups. To further minimize this threat, trainers were used to ensure that the design qualities were implemented in the experimental group by performing two to four observations of random lessons/lesson plans. These precautions ensured effective implementation. To control for the John Henry Effect, specifics of the research remained limited until debriefing. Additionally, four different schools were utilized. Two schools housed five experimental groups, while the other two schools housed five control groups.
CHAPTER TWO: REVIEW OF THE LITERATURE

Students across the United States of America are bored and disengaged in public schools. The high percentage of student dropouts, low levels of academic achievement, and poor student behavior has indicated that bored students give up (Thomas & Dale, 2006; Breidenstein, 2007). Disengagement has occurred partly because teachers compete with technologies such as cell phones, televisions, iPads, and video games. Researchers have identified disengaged students as one of the largest challenges facing education; between 25% (Willms, 2003) and 66% (Cothran & Ennis, 1997) of students in public schools are considered disengaged. Over the past 30 years, society has experienced change in both the family and the workplace. However, the public education system has not kept up with this trend.

Purposes of schooling must be modified from the current nineteenth century ideology. The workforce has changed drastically. Seventy-five percent of America’s workforce is now service oriented and students entering the workforce will be required to display more cognitively challenging skills than ever before (Kay, 2010). In fact, many of the jobs children will hold in the future have yet to be invented (ASCD, 2009). Kay (2010) quoted an Apple supervisor as saying, “Any employee who needs to be managed is no longer employable” (p. xxi). Building self-efficacy in children is essential for the modern day workforce. Of course, schools alone must have the assistance of a child’s support system outside of the schoolhouse.

In addition to changes in the workforce, many students return home from school to an empty house or a single-parent dwelling rather than to a family discussion at mealtime. Teachers are unable to control the environment surrounding a child. A child’s living situation, parents, family members, socio-economic status, and background are forces outside of an educator’s control. Besides school, perhaps the greatest factor that influences a child’s future is the family.
Research has illustrated that the involvement of a child’s family significantly affects students’ success either positively or negatively (Grandmond, 1997). Depending on the families’ experience with school, this could be beneficial or potentially hazardous. Mothers, fathers, step-mothers, step-fathers, aunts, uncles, grandparents, and guardians are each challenged with balancing personal lives, an unwavering economy, work, and children. To engage with school faculty and staff can be difficult, especially if the families have negative attitudes about school themselves. Engaged involvement of a child’s parents has been seen to enhance positive attitudes toward school (Flouri et al., 2002; Heaven et al., 2002). Consequently, parents are an integral link between the child and the school.

Research has indicated that parents’ perception of school influenced children’s attitudes toward school and their educational outcomes (Allen & Fraser, 2007). Children listen to their parent’s conversations and beliefs and often echo their parents’ feelings as their own. Similarly, children listen to their teachers and look for support and encouragement as they learn and grow. Some children have limited involvement with their families and crave the attention of a supportive teacher. When a child feels valued and an important member of a school, higher levels of achievement and attrition can be retrained (Booker, 2004). This essential understanding can be noted as early as pre-school. Early experiences with school have made drastic differences in the successes of children. If children do not begin school in pre-kindergarten, kindergarten becomes the first year of a child’s career. Research has noted a difference in gender identification as early as kindergarten. Orr (2011) suggested that as the female gender role is emulative in schooling, girls might have a smoother transition than young boys in their academic careers. Parents must be involved in their child’s education, beginning at the onset of school to ensure a positive adjustment from home to the classroom. Based on the research presented in
this study, young boys must be encouraged to engage in learning behaviors, perhaps by male role
models. Parents should also aim to read aloud and with their young boys frequently. Poor
adjustments to schooling can lead to low performance, behavior issues, and high rates of
absenteeism, retention, and in many cases, school dropout (Dauber et al., 1996).

Csikszentmihalyi (1990) argued that a parent’s interaction with a child has a large effect
on the kind of person that child will become, thus further revealing the initial attitudes of a child
toward society. In the studies conducted with the University of Chicago, Csikszentmihalyi
(1990) identified characteristics of the family that are typical in promoting student engagement
in school or activities at home. First, a child must have clarity in expectations. Therefore,
expectations, goals, and feedback must be clear. The second concept that was discovered was
centering. Children must perceive that their parents are interested in what they are doing in the
present. Third, children must have choice. They must be free to make decisions about their
future and understand that negative choices are accompanied by negative consequences. The
fourth characteristic identified was commitment. This characteristic requires trust, in that the
child must be willing to lower the defenses to engage in optimal experiences without fear of
teacher or parental disapproval. The last characteristic was challenge. Parents or educators must
be willing to continuously challenge their children as they continue to grow and mature.
Fostering these five characteristics increases the possibility of a child to experience true
engagement.

Although the world is transforming with the increased need for both parents to work and
a boost in technological resources has evolved, very little true alterations have occurred in the
public school system. The structure of public schools in the United States was established in the
nineteenth century and the purpose of schools was to address the goals of the masses. Teachers
were expected to verbally pass knowledge and skills on to their students (Schlechty, 2011). No longer does the teacher hold all of the information in a classroom. Information can now be accessed by youth through technology. To address this trend, teachers must learn to facilitate learning experiences rather than to control learning. Schlechty’s (2011) discussed student effort in depth. Ultimately, students determined whether or not they were willing to invest their attention in a task. Furthermore, students determined the quality of attention they applied in a given setting.

Depending on the task, students displayed various forms of engagement. An experience must be relevant for students to invest their full attention. Compliance will only yield short-term learning. Schlechty (2011) noted, “Just as Gutenberg’s printing press made the role of scribes obsolete, e-learning and all that surrounds it are on the way to making the role of teacher as instructor obsolete” (p. 10). A revolution in education is needed to address the changes in which society is experiencing. To prepare the future leaders and work force of the United States of America, educators must analyze the needs and goals of current students and make changes to their instructional pedagogy. Traditional methods that have been around since the one-room schoolhouse are no longer effective.

Many researchers have suggested that how successful or unsuccessful students are at school had a significant effect on their attitudes and how they chose to proceed in learning (Akhtar, 2007; Gray & Mclellan, 2006; Lightner, Bobe, & Willi, 2007; Lumsden, 1994). As long as students were successful in their work, their attitudes remained generally positive. However, when students were unsuccessful with a task, anxiety presented itself. Many times students gave up and became restless as they determine that such tasks were useless to their needs. Students experience a daily lack of success because they are bored and unable to see a
purpose for what they are learning. Work-avoidance then becomes a reality. Fake illnesses and skipping school become an art form. Lumsden (1994) offered that in an attempt to protect their self-worth, some students have chosen to actually avoid the work completely. Although teachers are unable to control the multifaceted factors that affect student learning outside the schoolhouse, teachers are able to impact student performance in two ways—the relationships they build with students and the quality of student work they challenge students to undertake (Schlechty, 2011).

When present at school, students exhibiting work-avoidance behaviors disrupt the learning of their peers. Dawson and McInerney (2001) stated that rather than being unsuccessful with an assignment, students may choose to act out and disrupt others to avoid work. How does this affect other students in the classroom? Work avoidance tactics that include copying, cheating, asking for help on easy assignments, “playing” with school supplies, tuning out, or pretending not to understand have become increasingly prevalent. Attitudes such as laziness, boredom, inertia, anger, and lethargy have emerged. Students with these habits make up a large part of classrooms across America. These students have frequently suffered from increased boredom or lack of authenticity in a task (Day, 2002; Means, 1997; Plucker & McIntire, 1996; Skinner, Furrer, Marchand, & Kindermann, 2008; Zorfass & Copel, 1995). Upon noticing this trend, educators began to seek instructional strategies and methodologies to increase the engagement of students. Student engagement studies began to emerge in the 1980s and have continued to evolve in the twenty-first century.

In a time of increased legislation requiring high-stakes tests, educators began to study constructs such as perceived learning and self-efficacy to determine how such attributes related to student engagement, especially in key areas such as language and mathematics. Research has connected increased self-efficacy with increases in perceived learning (Schunk & Hanson, 1985)
and math achievement (Pajares & Kranzler, 1995). Surveys of American children were analyzed to determine the importance of general attributes in their world. A little more that 82% of adolescents identified fun as one of the most important aspects of life (Lindstrom & Seybold). When a learning task was fun, students were consequently more likely to be engaged with the task (Robertson-Wilson, Baker, Dervinshyre, & Cote, 2003). Studies have shown that students spend approximately 49 minutes per day playing video games (Foehr, Rideout, & Roberts, 2005). This amount of time is likely to increase as each year passes. Where teachers were once the all-knowing source of information, students have now identified the power of the World Wide Web. Wade (2004) noted that many students indicated that they preferred to learn from one another or a game rather than teachers.

Upon reviewing the body of research on student engagement, the conclusion can be drawn that no single strategy will work for all children. However, researchers have considered Csikszentmihalyi’s (1975) study on those students who were innately engaged in an experience and the qualities that initiated such a state of mind. Few studies looked at specific frameworks that sought to build innately engaging experiences. Atkinson et al. (2004) called for more research to link the Flow Theory to learning. The purpose of this study was to review the implementation of engagement strategies presented in the Working on the Work Framework (WOW) through the lens of Csikszentmihalyi’s ‘flow’ theory. Flow typically refers to a state of consciousness where a person experiences intrinsic reward without external motivation. Finneran and Zhang’s (2005) work discussed the importance of explaining specific learning tasks in the classroom and how children can be guided towards a flow state.
Evolution and Definition of Engagement

In order for student engagement to be utilized effectively, a common definition was solidified. Engagement is a widely used and varied term in education and throughout the years the purpose of engagement has evolved to match the needs of the era. As early as the 1980s, engagement was used to promote equity in academics. The achievement gap between students living in poverty as compared to their high socioeconomic counterparts was wide. To keep students in school, engagement strategies were implemented to help them feel a sense of belonging. This form of engagement appeared to increase academic engagement (Dunleavy & Milton, 2009; Willms, Friesen, & Milton, 2009). The 1990’s initiated a paradigm shift regarding the use of engagement practices.

The presence of technology and birth of the World Wide Web began to emerge differentially across the United States. Where some children have used technology since birth, many adults in the Baby Boomer generation have just begun their journey with technology. Children beginning school in the early 1990s were labeled ‘digital natives,’ in contrast to the older generation, referenced as ‘digital immigrants’ (Trilling & Fadel, 2009). In contrast, Prensky (2009) who coined the terms ‘digital immigrants’ and ‘digital natives,’ deemed these terms invalid and that the characteristics of teachers in classrooms changed each year. Prensky (2009) instead coined the term ‘digital wisdom’ to describe educators and citizens alike with technological understandings relative to present day pedagogy. Although new teachers in the field are better equipped with pertinent technological knowledge and skills, many teachers remain who rely on traditional methods for teaching.

Students of the twenty-first century have shown many signs of disengagement. “Disengagement has been cited as a major cause of deviant behavior at school, truanting, and
low academic achievement” (Harris, 2008, p. 57). Research during this period indicated that teachers were interested in engaging students to reduce behavioral problems, thus gaining compliance. Although students were completing their work, researchers found that students were bored, alienated, and disconnected from school. Teachers began to create lessons and experiences aimed at engaging students so that they lost track of time (Shernoff et al., 2003). The importance of the Theory of Flow was made evident. This decade focused on individualized and differentiated learning. Teachers worked hard to identify learning styles and interests so they could use the children’s strengths as guides in the content being taught. Around 2003, educators identified the need to help children become self-directed lifelong learners. Therefore, motivation to learn became a primary goal for engagement.

Guiding students in discovering how they best learned was important to educational researchers at the beginning of the twenty-first century (Claxton, 2007; Dunleavy & Milton, 2009; Harris, 2008; Meyer & Turner, 2002). As the years passed, researchers began to notice a shift in the workforce and the economy. The Industrial Age began to develop into the Information Age. However, schools continued to teach students the same content in the same ways. Researchers such as Gilbert (2007) stated, “To address it we need to think differently about schools. We need to go ‘back to basics,’ to re-think many of our current ideas about schools, their purposes, and the best ways of achieving those purposes” (p. 4).

Student engagement was a construct commonly identified by researchers and practitioners as a way to reconnect bored and disengaged students with the desire to learn. Just as adults enjoyed freedom of choice each day, allowing students to choose an activity or way to present their learning was a strategy identified to promote engagement. Although most researchers used the term "student engagement," there were many ideas of what the term actually
meant. For this study, engagement was experienced when students were interested and actively involved in their learning. True engagement occurred when an assignment or a task was difficult and students still persisted in the activity without seeking extrinsic motivation (Patrick & Kaplan, 2007; Schlechty, 2001; Wasserstein, 1995). Retention of what was learned has distinguished the outcome of engaged learning (Sheldon & Biddle, 1998). Harris’s (2008) phenomonographic investigation defined student engagement in six qualitatively different ways. These definitions were consistent with the design qualities that fostered engagement and served as the conceptual framework for this study.

To keep students from dropping out of school when they reach the age of consent, they must be engaged during the early years of their education. This is especially true for low socioeconomic students. Increasing the engagement of low socioeconomic students in the early years leads to higher achievement in the following years. Bodovski and Farkas (2007) emphasized that “student engagement has a positive effect on mathematics development achievement gains at all grade levels tested. Further, engagement has the largest effect on achievement growth for students whose beginning achievement falls in the lowest category” (p. 125).

These initially low-achieving students showed the greatest gains when they were engaged with learning. Alternatively, these students gained the least when they were disengaged” (Bodovski & Farkas, 2007, p. 126). Furthermore, research by Ladd and Dinella (2009) indicated that a child’s ethnicity and socioeconomic status were highly associated with initial levels of achievement. Additionally, as these students progressed through the primary years, they maintained their initial school liking-avoidance behaviors. Educators must realize that students are only under the tutelage of the school system for 13% of their waking hours until
the age of 18. During these hours educators must utilize the most effective tools available to engage students in learning.

Recent studies on student engagement have noted that negative emotions hinder students from engaging in new activities (Marzano & Pickering, 2011; Schlechty, 2011). As previously discussed, a student’s authentic attention and willing persistence is required for true engagement. Students’ compliance for reasons of fear of punishment or loss of privileges is not true engagement (Schlechty, 2011). Skinner et al. (2009) identified emotions that were frequently associated with engagement, including enthusiasm, interest, enjoyment, satisfaction, pride, vitality, and zest (p. 227). Schlechty (2011) proposed four components that define engagement. Engaged students are attentive—they focus specifically on the work to be completed. They are voluntarily committed to a task without the need for extrinsic rewards. Engaged students are persistent and will continue with a task even when it becomes difficult. Engaged students find meaning and value in the task.

Equally important to the definition of engagement was Schlechty’s (2011) description of the multiple levels of engagement. The five levels of engagement described are authentic engagement, strategic compliance, ritual compliance, retreatism, and rebellion. This study focused on strategic compliance. Schlechty warned educators to be cognizant of the types of engagement that typify their classrooms and to be careful not to confuse true engagement with strategic compliance. Students exhibiting strategic compliance gave their attention to a task because they believed they would receive an extrinsic reward for complying with the teacher’s requests. However, these students only persisted in the task long enough to receive the reward (Schlechty, 2011). The challenge for educators is to take students beyond the immediacy of rewards to a place where they can authentically engage with meaningful content. Children must
deem a task as important and utilize their skills to achieve success. Marzano & Pickering (2011) described a model of engagement made up of four aspects: emotions, interest, perceived importance, and perceptions of efficacy. Many of these aspects were found throughout research as keys to engagement. Perceptions of efficacy, however, were not as prevalent.

Teachers often put on a show or entertain their students using high-energy dramatics. However, Brophy (2004) indicated that while dramatics can be successful, the value a teacher places on an activity could be just as effective. Humor was another instructional strategy rarely utilized by elementary school faculty. Yielding a 40-percentile point gain in instructional effectiveness, humor was found to reduce student stress and promoted high levels of thinking, thus increasing student engagement (Jonas, 2010). While students engage in tasks that they perceive as interesting, the goal of educators is to surpass situational interest and achieve individual interest. Rather than engaging a student with a brief science experiment, teachers should seek to capture individualized attention in a topic yielding long-term interest (Schiefefe & Csikszentmihalyi, 1995). Hattie (2009) reported the effects of games and game-like activities on student achievement. Although low effect sizes were found in these studies (Haystead & Marzano, 2009), percentile gains may increase with the introduced effects of utilizing games or game-like activities in the classroom (Marzano & Pickering, 2011).

Marzano and Marzano (2009) explained the hierarchy of goals established in the human mind. The basic level was synonymous with Maslow’s (1954) Hierarchy of Needs in that all humans need food and shelter. The next level of needs consisted of short-term goals. This type of need could be getting a job closer to home or buying a new car. The top of the hierarchy was where students held their long-term goals. Students were more engaged when an activity or task was authentic to these goals. When a student perceives that a task is relevant to their higher level
goals, they are more apt to experience flow. In considering the goals of public education, educators should correlate individual student goals with academic goals (Marzano & Pickering, 2011). Classrooms that offered choice would allow students to correlate their goals with the goals of public education.

**Cognitive, Behavioral, and Emotional Signs of Disengagement**

In addition to identifying emotions frequently associated with engagement, Skinner et al. (2009) also identified emotions frequently associated with disengagement, including boredom, disinterest, frustration, anger, sadness, worry, anxiety, shame, and self-blame (p. 227). Adults choose activities that they are interested in, watch television shows that grab their attention, and read books that are significant to them. There is no reward extrinsically for these choices, only intrinsic satisfaction. Several studies have identified extrinsic motivation as a faux sense of engagement. Stars, stickers, grades, and teacher approval were found to be unsuccessful in long-term learning (Brewster & Fager, 2000; Kohn, 1995; Lumsden, 1994; Strong, Silver, & Robinson, 1995). Conversely, students remembered creative teaching.

Physical education programs, music, and art classes are typically engaging, and students are eager to attend these courses. Physical education teachers have utilized the discovery method where children choose activities based on their interests to learn through actively building their own understandings (Heisler & Park, 1975). When students can transfer knowledge and skills from their schema and apply them to creative problem solving, they become truly engaged (Downer, Rimm-Kaufman, & Pianta, 2007; Jones, Valdez, Nowakowski, & Rasmussen, 1994). Still, many educators rely on programs to bridge the gap of instructional deficits.

Program after program has been implemented to remedy the problem of student failures. Unfortunately, programs are not going to provide a solution. The educational arena should take
a step back to assess the true quandary. A revolution in education is sure to occur once teachers have been guided through focusing on designing meaningful and engaging student work. Strong evidence was found to indicate that the classroom social environment was a very important component to student engagement. When students felt a sense of emotional support from their teachers and academic support from their peers, they were more likely to engage in difficult tasks (Patrick, Ryan, & Kaplan, 2007). Of course, many times students became innately engaged when they knew someone they valued would see their work. Perhaps this is yet another reason teachers should build positive relationships with their students.

Schlechty (2001) articulated, “Schools strive to provide students with tasks, assignments, and other experiences that engage students. The end result is that students learn things valued by their parents, themselves, and the society at large” (pp. xii-xiii). Strong, Silver, and Robinson (1995) asked a variety of teachers and students two specific questions at the onset of their research project: (1) What kind of work do you find engaging? (2) What kind of work do you hate? Research participants indicated that they enjoyed their work when working with others, exploring curiosities, and being creative. Conversely, the research participants despised worksheets and repetitive measures that required little thought. In summary, incorporating strategies such as choice, authenticity, and affiliation were successful in engaging students in difficult course content. When students were given seatwork and expected to complete the assignment without a rationale, alone, or in a large group, students tended to disengage quickly. However, studies found that when students participated in small group instruction they were more likely to be engaged as compared to their participation in the previously stated situations (Carnahan, Basham, & Musti-Rao, 2009; Downer, Rimm-Kaufman, & Pianta, 2007).
**Student Achievement**

When students experience true engagement, they are apt to learn more. A lack of achievement is evident in public schools across the United States of America. Studies have suggested that engaged students tend to achieve at higher levels than their disengaged peers. The No Child Left Behind Act of 2001 mandated achievement as measured by high-stakes testing. The No Child Left Behind Act made clear the nation’s expectations for greater achievement for all schools by 2014. Based on a recent U.S. Department of Education study, researchers found that out of the nation’s 100 largest public schools from Baltimore to Cleveland and from Atlanta to Oakland, 31 percent of students have dropped out of school or failed to graduate (Thomas & Dale, 2006). The researchers also noted that in some South Georgia schools, more than half of the students are not graduating. If public education in the United States of America is to improve, allowing for better attitudes toward school and a decrease in the number of students dropping out of school, educational professionals must begin to think of students as customers and deliver a product to the consumer that authentically engages them in the learning process (Schlechty, 2001).

Teachers in the United States and the non-Western world alike have pressured students to engage in school work that has little value to them, resulting in low achievement and work avoidance (Shih, 2008). Shih (2008) recommended listening to students and encouraging them to respond in their own way. Children make meaning in many ways. Ness (2009) found that using a joke book was an engaging way to teach reading fluency that allowed students to attain proficient scores on achievement tests, where Adomat (2009) found that student fluency increased through actively engaging with stories through drama. Carter (2009) found increased engagement through authenticity by allowing students to connect math with writing. Ponitz et al.
(2009) utilized the Observed Child Engagement Scale and found that children who engaged in learning presented higher achievement in a variety of areas. Bodovski and Farkas’s (2007) research suggested, “Techniques fostering engagement should be a major concern for teachers and policy makers seeking greater achievement by at-risk groups” (p. 126). Success in school improvement can be seen through students’ positive attitudes toward school, greater engagement in learning, and higher achievement of state and district tests (Beecher & Sweeney, 2008; Rock & Thead, 2009; Spires, Turner, & Johnson, 2008). When the quality of student work was higher, children were more likely to be engaged. Allowing students to own their work and be able to relate to a problem will typically keep them motivated to continue working (Downer, Rimm-Kaufman, & Pianta, 2007; Harmer & Cates, 2007).

Student Attitudes and Perceived Learning

A correlation exists between student attitudes toward school and their perceived learning when work is engaging. Student attitudes and their perceived learning are constructs that are frequently measured when researchers are interested in student achievement. Students are required to attend school until a specific age determined by each state. Although they must attend school, students are not legally required to commit their interest or attention. Researchers have suggested that there are characteristics of student work or course design that have been found to promote student engagement and increase student perceptions of learning (Booker, 2006; Caram & Davis, 2005; Diez, 2002; Dowson & McInerney, 2001; Hancock & Betts, 2002; Lumsden, 1994; Voke, 2002; Zorfass & Copel, 1995). Additionally, many studies have sought to look at student attitudes toward school or students’ perceived learning. How successful or unsuccessful students are at school has a great effect on student attitudes and how they choose to proceed in learning (Akhtar, 2007; Gray & Mclellan, 2006; Lightner, Bober, & Willi, 2007;
Lumsden, 1994). Additionally, Lumsden (1994) stated that to protect their self-worth, students might choose to actually avoid the work completely.

Rather than being unsuccessful with an assignment, students may choose to act out and disrupt others to avoid work. Dawson and McInerney (2001) looked at 86 middle school students through a completion of 114 interviews and 24 structured observations. Researchers found specific work avoidance tactics that included copying, cheating, asking for help on easy assignments, “playing” with school supplies, tuning out, or pretending not to understand. Through their study, they found that certain attitudes emerged that included laziness, boredom, inertia, anger, and lethargy. Students that have exhibited behaviors such as these are a large part of classrooms across America. Unengaged students come in a variety of forms. Not all of the unengaged are low ability learners. Research has indicated that an equal population exists of students who have high abilities; these students frequently suffer from increased boredom or lack of authenticity in a task (Day, 2002; Means, 1997; Plucker & McIntire, 1996; Skinner, Furrer, Marchand, & Kindermann, 2008; Zorfass & Copel, 1995). When work became boring or irrelevant to these students, they tended to choose easier assignments. Furthermore, they proceeded with avoidance techniques by trying to get others to do the assignment for them, by not attempting the work, or by doing the assignment in a sloppy or incomplete manner (Dowson & McInerney, 2001). Although there are few studies aimed at improving work avoidance, Downson and McInerney (2001) found that limited engagement occurred when students avoided work. Students who held positive attitudes toward school also perceived that they could learn more.

A positive attitude toward a particular subject approached through active learning was found to be important for student engagement (Ladd, 2009; Olgun, 2009). Students perceived
that they learned more when teachers found creative ways of teaching. Creative teaching is irresistible to young minds (Beran & Violato, 2009; Patrick & Kaplan, 2007; Tomlinson, 2003). Building relationships with students as a way to improve student perceived learning for at-risk youth (Day, 2002; Dowson & McInerney, 2001; Tomlinson, 2003) surfaced throughout this research review; however, much emphasis was placed on the alternative of developing relational ties linked to student interests (Smyth, 2006; Uekawa, Borman, & Lee, 2007). In addition to student attitudes, researchers suggested evaluating parent and teacher perceptions of student attitudes and perceived learning (Reschly, Huebner, Appleton, & Antaramian, 2008; Shirvani, 2007; Sullivan, Tobias, & McDonough, 2006).

Research on perceived learning has revealed significant characteristics to be used to inform teachers in implementation of instructional practices. The perceived learning of a student was characterized by two focuses in the literature: perceptions of oneself as a learner and perceptions of the learning environment. Perceptions of oneself as a learner, also known as self-efficacy (Bandura, 1997), was concerned with how a student understood concepts and how they approached learning (Liskin-Gasparro, 1998), where perceptions of the learning environment related to how a student perceived the classroom or instructor (Brown, 2009). Research consistently showed that when children believed that they were capable, they were more motivated to accept challenging assignments and endured the challenge to completion (Denissen, Zarrett, & Eccles, 2007) even as early as first grade (Hughes & Zhang, 2007). Self-efficacy joined the ranks of attributes that increased student perceptions of learning, thus improving student engagement. Relationships emerged again in the literature as related to perceived learning and attitudes toward school.
Developing learning situations that endorse student-instructor, student-content, and student-student interactions was recommended in the research (Garrison & Cleveland-Innes, 2005) as such practices have been found to yield positive effects on perceived learning in computer mediated conferencing (LaPointe & Gunawardena, 2004), as well as a variety of other learning modalities (Barab et al., 2000; Garrison & Cleveland-Innes, 2005; Young & Bruce, 2011). These studies indicated that purposeful interaction between the instructor, content, and peers with the learner increased the learner’s contentment with the experience. However, interaction between peers was not always cognitively engaging in nature. Many times interaction was social and reflected group unity (Garrison & Cleveland-Innes, 2005). Swan (2001) presented evidence that interaction between the learner and the instructor had greater effects than interaction between learners and their peers. These relationships are vital to children, especially at a young age or those with limited family interaction.

In addition to the construct of peer interaction, metacognition and feedback were identified as additional constructs significant to student perceptions of learning (Kemp, 2012). Kolb & Kolb (2009) found that educators fostered independence in the classroom by helping students identify their unique learning styles, which increased the metacognitive skills that allow students to build stamina in their thinking to persist even when presented with obstacles. During moments of disengagement, an “unbalance” between the rigor of the student work and the skills needed to complete the task often exists. Higher levels of self-efficacy yielded stronger commitments to goals and propelled students to recuperate from obstructions in learning (Winberg & Hedman, 2008). When students were able to set goals and work towards their goals they tended to have higher levels of self-efficacy (Friedel, Cortina, Turner, & Midgley, 2007). Self-efficacy uses metacognitive skills to make judgments regarding one’s ability to take on a
challenging task. Therefore, knowledge of metacognitive skills strengthened a child’s self-efficacy.

Based on a questionnaire that was administered to 609 students from Singapore, engagement evolved as students began using metacognitive strategies and taking ownership of their own learning. In the context of Kemp’s (2012) study, students utilized problem-based learning in a computer assisted environment. When a student found a task realistic and relevant, especially in a technologically advanced climate, engagement was heightened (Gijbels, Van De Watering, Dochy, & Van den Bossche, 2006). Considering the advancement of technology and implementation of internet-based resources available to classroom teachers, this study was relevant in considering constructs that informed a student’s perceived learning. When considering metacognition as related to perceived learning, Kolb & Kolb (2009) posited, “If a person does not believe that he or she can learn, he or she won’t” (p. 304). This understanding must be nurtured in young learners as educators facilitate metacognitive skills. Additionally, feedback from the instructor was also linked to student satisfaction with learning. Feedback comes in many forms and caution should be taken when delivering feedback to students in which a trusting relationship has not yet been formed.

Hattie and Timperley (2007) warned educators that the type of feedback and the way it was given could have varied levels of effectiveness. Eom, Wen, and Ashill (2006) found that increased rigorous feedback from the instructor led to greater student satisfaction with the course. Responsiveness, rather than timeliness, helpfulness, and concern for learning was found to be the most important factor related to feedback as reported by students in this online university course, whereas Moore and Anderson (2003) reported that timeliness was the most important factor related to student satisfaction with a course. Elementary school students
consistently enjoy positive feedback when they are successful in their academics or behavior (Burnett, 2001). In effective situations, students use feedback that is provided to them to gauge their perception of the information they have learned.

In order for students to believe they have learned something, the skill or concept must be authentic and relevant. Spronken-Smith et al. (2012) found that 79% of students with high rates of perceived learning rated a course highly for ‘understanding why they were studying what they were.’ Furthermore, Spronken-Smith et al. found that inquiry-based learning experiences promoted higher order learning outcomes. In considering a young child’s ability to rate perceived learning, maturity must be considered. Beginning around the third grade, a child’s account of learning and social competence becomes more objective than that of the child’s younger peers. Research has indicated that third-grade-children began to compare themselves with others (Cole et al., 2001; Kuklinski & Weinstein, 2001; Wigfield et al., 1997). Students who reported limited access to their online instructors typically reported lower levels of perceived learning as compared to those with increased interaction with their teacher (Frederickson et al., 2006). To improve overall learning and the learners’ perceived learning, students must have meaningful collaboration with peers (Barab et al. 2000; de Kock, Sleegers, & Voeten, 2004), receive specific and effective feedback (Hattie & Timperley, 2007; Shute, 2008), and develop metacognitive skills that translate to other situations (Bransford, Brown, & Cocking, 2000; Weigel, 2002). In addition to perceived learning, student attitude is a construct that factors into students’ engagement in learning.

Attitude is difficult to define as related to school. Research has indicated that attitudes are made up of three indicators: affective/evaluative, cognitive/belief, and behavioral/action (Kruglansky, 2007). Attitudes toward school have been researched frequently throughout
educational literature. Holfve-Sabel and Gustafsson (2005) developed research that looked at attitudes toward school related to classroom factors, views of teachers, and relationships with classmates, whereas Reynolds (2001) found a relationship between academic success in mathematics with positive attitudes toward school. Fredricks et al. (2004) argued that children’s attitudes toward school directly affected their own academic achievement. Studies on instructional frameworks that fostered positive attitudes toward school were void in the literature. However, much research supported the construct of a healthy student-teacher relationship.

Effective teachers mediated children’s attitudes toward school, even as early as preschool (Silva et al., 2011). The characteristic of effortful control was studied to determine if child characteristics predicted the quality of relationship a child had with the teacher, thus resulting in a positive or negative attitude toward school. The results of the study supported the findings of Myers & Pianta (2008) that stated children with effortful control developed closer relationships with their teachers. Similar results were found between older students and their teachers (Gest et al., 2005; Murray et al., 2008, Rey et al., 2007). When children were a part of an effective and caring relationship with their teacher, they were likely to have improved self-efficacy, thus increasing their motivation to participate in schoolwork. In turn, this created positive attitudes toward school (Silva et al., 2011).

Else-Quest et al. (2010) studied students’ basic mathematical knowledge and their ability to use their skills in the real world. These students were from 69 countries. Although girls did not show significant achievement differences in mathematics, girls were significantly less confident than boys in using their mathematical skills. This lack of self-efficacy was linked to lower achievement motivation. Winheller, Hattie, and Brown (2013) echoed this causality in
their study to determine factors that influenced early adolescents’ math achievement.

Performance in this study was predicted by self-efficacy ratings, thus improved by perceptions of learning.

When looking specifically at elementary students, perceptions of personal engagement in mathematics were reported as more important than perceptions of teachers’ helpfulness (Carroll et al. 2009). Winheller, Hattie, and Brown (2013) advised teachers to focus on quality of learning and building self-efficacy, rather than focusing on relationships with students and their peers or getting students to like math. There was a wealth of research that supported that differences in learning styles were real and that utilizing these learning styles had a significant effect on students’ attitudes toward school and achievement (Honigsfeld & Schiering, 2004; Kolb & Kolb, 2009; Tseng, Chu, Hwang, & Tsai, 2008). Learning styles, however, can be incorporated into methodological frameworks to design engaging student work.

Research has suggested that utilizing instructional strategies that foster multiple learning styles communicates a warm and structured environment that cultivates improved attitudes toward school and positive behavior (Kolb & Kolb, 2009). Across the research, the attitude of students has been defined in multiple ways. Most recently research has looked specifically at attitudes toward the specific learning situation, often encompassing attitudes toward the teacher and instructional practices (Gardner, 2005). Additionally, attitudes have been reviewed as related to a student’s community, whether focused on the classroom, school, or internationally. Children’s increased classroom participation can predict early academic achievement, even when considering background factors such as socioeconomic status and maturity.

Student attitudes toward school typically remain unwavering from first to third grade. Of course, every experience is different. The significance of beginning school with positive feelings
versus negative feelings can be seen in student achievement even in the fifth grade (Hauser-Cram, Durand, & Warfield, 2007). Even in first through third grades, children who liked school made great gains in achievement as compared to their lower-engaged peers who avoided schoolwork (Ladd et al., 2000; Ladd & Dinella, 2009). Hattie (2009) suggested that in order to build trusting relationships with students, teachers must foster a calm and caring learning environment where learning is engaging, enjoyable, and challenging. No instructional model can be effective without a respectful teacher that can be trusted and cares about student learning.

Successful teachers are cognizant of the social and emotional needs of their students. These teachers can provide support for the student to help the student persevere even with difficult tasks. In addition to the relationship with teachers, a relationship with peers is also important. In the elementary years, students were found to have a higher quality of school life when there was a group commitment to learning in their classroom. Seker (2011) developed a questionnaire on attitudes toward school. Seker found that attitudes toward school were positive when students could share their learning problems, feel supported, and remain engaged. They displayed positive attitudes when they were able to work collaboratively, ask questions, and receive feedback in a non-threatening way. Furthermore, they displayed positive attitudes when they felt a sense of belongingness to the school.

**Conceptual or Theoretical Framework**

Schlehty (2002) developed the Working on the Work Framework that aimed to guide teachers in designing student work that was engaging and relevant to the needs of students. There are specific qualities of student work that can be developed to ensure higher student engagement. Studies indicated that engaged students experienced long-term learning with increased satisfaction as compared to those who learned through traditional methods (Booker,
2006; Caram & Davis, 2005; Diez, 2002; Dowson & McInerney, 2001; Hancock & Betts, 2002; Lumsden, 1994; Voke, 2002; Zorfass & Copel, 1995). Whereas terminology differed throughout the research (Assor, Kaplan, & Roth, 2002; Brooks & Brooks, 1999; Day, 2002; Small, 1997), the same methods reappeared consistently. Schlechty delved deeply into exactly what educators needed to do to truly engage students. Schlechty’s Working on the Work Framework (WOW) provided a thorough summary of these qualities by identifying 10 categories that fostered engagement: Content and Substance, Organization of Knowledge, Product Focus, Clear and Compelling Product Standards, Safe Environment, Affirmation of Performance, Affiliation, Novelty and Variety, Choice, and Authenticity.

**Student Work Design Qualities**

Content and substance refers to lessons that involved what students needed to know at a particular grade level as defined by the community, teachers, and educational leaders (Schlechty, 2002). However, students are not always interested in all standards. To make the learning engaging for students, educators must motivate or hook students through connecting to their schema while asking higher order questions and facilitating authentic tasks. Getting students’ attention can be difficult. Using humor, asking thought provoking questions, providing discovery activities, and unexpected events have been used to evoke student attention (Assor, Kaplan, & Roth, 2002; Diez, 2000). Organization of knowledge was another design quality of engaging student work.

Students should have the necessary skills that enable them to do the assigned work. Schlecty (2001) asserted that the work must focus on situations that attract the interests of the greater classroom population. To appeal to a wide variety of students, educators must use different strategies such as arts or technology (Zorfass & Copel, 1995). Studies emphasized
success when teachers acted as a facilitator or “guide on the side” rather than the “sage on the stage” (Andermand & Midgley, 1998; Hancock & Betts, 2002). Building on schematic knowledge allows students to connect new learning to their mental storehouse. Teachers must get away from assigning chapters to read and questions to answer at the end of the text. When students have the opportunity to create a product, they are held responsible for their learning.

The standards-based classroom is a model used in many elementary schools. After students learn a specific skill or concept, they are asked to create a culminating activity that demonstrates their understanding. Often, teachers provide rubrics and make learning expectations clear to students. Other times, teachers provide an open-ended opportunity for students to engage. Schlechty (2001) stated:

The tasks students are assigned and the activities students are encouraged to undertake are clearly linked in the minds of the teacher and the students to problems, issues, products, performances, and exhibitions about which the students care and upon which students place value. (p. 113)

As discussed above, in order for product focus lessons to be engaging, many students require clear and compelling product standards. Tomlinson (2003) affirmed that students learn differently through various styles. Some students needed structure in determining exactly what the teacher wanted. Implementing product-focused lessons with clear expectations throughout a course allowed students to see that they could succeed if they followed the given instructions (Schlechty, 2001). Rubrics were especially effective in establishing these requirements (Diez, 2002). Providing clear and compelling product standards allowed students to see that the assignment was fair and worth pursuing.
Strong et al.’s (2005) research affirmed that many students come to school afraid of being made fun of or feeling inadequate in comparison to their peers. Students should be allowed the opportunity to make mistakes and fail. However, they must be given the opportunity to learn from those mistakes without fear of failure. Working with students to learn from their mistakes and allowing them to re-do assignments without terminal failure has been found effective in learning (Anderman & Midgley, 1998; Kohn, 1995). Additionally, providing “wait” time after asking a question, or giving suggestions or cues to students was conducive to student engagement (Marzano, 1992). Students should feel safe when they come to school.

When friends and family come to see a performance or view student work at parent conferences, the work becomes important to students. Schlechty (2001) suggested that significant others in the lives of students (including the parents, friends, peers, and family) all affirm the importance and significance of student work. When students knew that others would view their work, they were careful to take more time and paid more attention to detail. Additionally, engagement was enhanced when students worked with other students.

Working with others makes learning seem capable. Schlechty said, “Students are provided opportunities to work with others on problems, issues, products, performances, and exhibitions that are judged by them and others to be of significance” (p. 121). Students enjoy belonging to a group. Many at-risk students indicated that they appreciated working with a group because they felt a sense of accomplishment from completion of a task in which they might not have been able to complete otherwise (Marzano, 1992).

Research suggested that giving students choice increased task completion and positive student behavior (Katz & Assor, 2007; Morgan, 2006; Shernoff & Vandell, 2007), thus choice increased intrinsic motivation. Lehr et al. (2004) presented evidence that supported affiliation as
an important endeavor in increasing student engagement. Authenticity, through allowing students to see the importance or relevance of a task, was essential to student motivation (Jang, 2008). Students should be able to see the importance of a task and have a sense of autonomy when working toward completion of the task. Bowen’s (2008) literature review reported that “every description of research or practice that I found in the literature about activities that engage students fits into one of the ten areas of quality work suggested by Schlechty (2001) in his Working on the Work Framework” (p. 13). Using the design qualities of content and substance, organization of knowledge, product focus, clear and compelling product standards, safe environment, affirmation of performance, affiliation, novelty and variety, choice, and authenticity was effective in designing engaging lessons.

The effects of student engagement have been measured quantitatively throughout the literature as related to time on task, attendance, participation rates, punctuality, graduation rates, and extracurricular participation rates. However, studies continue to seek students’ perspectives regarding engagement. Additionally, little is known about what parents identify as engaging for their children. Furthermore, researchers have identified a need for more exploration aimed at student engagement structures and practices, locally grounded conceptualizations of student engagement that can be operationalized, tested and improved, and the development of local studies that paint a rigorous picture of practices and effects (Trowler, 2010). In conclusion, perceived learning and attitudes toward school were absent from the literature as variables related to student engagement. A review of the literature revealed the need to document the effectiveness of quality work design to promote student engagement resulting in better attitudes toward school, greater perceived learning, and higher achievement.
Many of the aspects that promoted engagement in schoolwork have been researched extensively (Lutz, Gutherie, & Davis, 2006; Schiefele & Csikszentmihalyi, 1995; Young, 2005) and when teachers employed these characteristics they were able to engage intrinsically motivated students to achieve (Ames, 1992). Unfortunately, all students are not intrinsically motivated. Educators across the globe are always looking for the “magic bullet” to increase student achievement. Wilson’s (2012) research asserted that models of student learning continue to be developed daily and although different, are based on similar theories. Regardless of the variety of methodologies available for practice, researchers agreed that further studies were needed to assess practical uses of pedagogy to increase educational outcomes (Evans & Waring, 2006; Hall & Moseley, 2005).

Teachers tend to teach the same way they were taught. A teacher is likely to use traditional teaching methods, as these were commonplace in their educational setting. Research has drawn attention to the need for providing training for teachers to meet the needs of their students in an ever-changing society (Cano-Garcia & Hughes, 2000; Evans & Waring, 2006; Rosenfeld & Rosenfeld, 2008). Dunn and Burke (2006) noted that students retained 75% or less of instruction delivered orally during lecture. This traditional method of delivery lacks active engagement and fails to consider the learning styles of a mixed ability group of learners. Students identified student-centered learning, as opposed to teacher-focused instruction, as instruction that was motivational and increased positive attitudes toward school (Bishop, 1968).

During lectures, students were less likely to engage in higher levels of thinking as well. Authentic engagement in student work was closely linked to student learning, whereas a lack of motivation can be a menace to achievement (Bembenutty, 2008; Tomlinson, 2007). A variety of students fill America’s classrooms each day. Merely walking in to a well-managed classroom
may give the common man a false belief that learning is occurring. Schlechty (2002) found that students complied with teacher requests because of ritual or strategic compliance. Students may comply rather than receiving lunch detention or time-out at recess, or perhaps to receive a reward or high grade. True engagement is found when students are engaging for the enjoyment of learning. These learners are “likely to be more effective learners over the long haul” (Tomlinson, 2005, p. 267) than the ritually or strategically compliant (Schlechty, 2002). This holds true for both male and female students. Children comply with requests from adults when they are rewarded and receive positive feedback from the learning situation. Similarly, Reynolds (1996) found that that control of students’ activities along with rewards has achieved positive results in creating positive attitudes toward school.

Children should be able to engage in student work that capitalizes on their personal interests and unique learning styles. Rather than giving all students the same task, employing a variety of educational experiences can level the playing field and support students in achieving at higher levels, thus reflecting true student learning (Tomlinson, 2005; Tomlinson, 2007). Noble (2004) asserted that the use of learning styles increases personal relevance. Connecting real life with the work expected of students in the classroom results in higher levels of student engagement.

In a study comparing the attitudes of boys and girls toward school over a period of 35 years, Holfve-Sabel (2011) compared the responses of nearly 1,500 students in 1967-68 with students in the same schools in 2003. An increase in responses for both girls and boys was found in the choices ‘I feel calm and secure at school,’ ‘Our teacher helps us a lot,’ and ‘It is fun to go to school.’ Although at first glance these students seem engaged in school, a closer look at genders revealed that the changes for girls related to interest in schoolwork, whereas the changes
for boys related to interest in peers. ‘Work atmosphere’ showed no significant changes over
time. “Neither the boys nor the girls confirmed that their work atmosphere had improved
between the decades” (Holfve-Sabel, 2011, p. 82-83). This suggests that attitudes toward school
showed little change between 1967 and 2003 for this population of students.

Similar to this study was the work of Whitelaw, Milosevic, and Daniels (2000), which
reviewed gender specific perceptions and found that although girls were more apt to demonstrate
a stronger drive to succeed academically, both boys and girls were very much interested in the
social aspects of school. In addition to gender differences, students in public schools come from
diverse socio-economic backgrounds. Low income was identified as a factor for detecting
students at-risk of failure even as early as first grade (Gutman, Sameroff, & Cole, 2003). The
achievement gap between economically disadvantaged students and their non-economically
disadvantaged counterparts will continue to grow throughout the elementary years without the
implementation of research-based instructional practices (Children’s Defense Fund, 1993).
Research is needed to identify research-based instructional practices to increase student
engagement.

In order for a child to be successful in school, the child must be actively engaged in
instruction. Active engagement was noted as a predictor of academic success (Buhs & Ladd,
2001; Ladd, Buhs, & Seid, 2000; Ladd & Dinella, 2009). Students developed either positive or
negative attitudes toward school depending on their engagement or disengagement (Fredricks et
al., 2004). Whereas a positive attitude toward school predicted higher achievement (Buhs &
Ladd, 2001; Valiente, Lemery-Chalfant, Swanson, & Reiser, 2008), negative attitudes toward
school were indicative of poor school achievement, especially in the early years (Ladd et al.,
2000).
The underpinnings of research regarding attitudes toward school and perceived learning were rooted in research from the 1970s and 1980s. The causal relationship between motivation and anxiety, coupled with attitudes and perceptions, was important to consider. Gardner (2005) studied this relationship. Motivation or anxiety can be used to understand a child’s attitude or perception. Major quantitative studies have reviewed the effects of motivation on achievement. In particular, Bernaus and Gardner (2008) related student attitudes toward a learning situation to motivation and achievement.

Challenges are motivating to many students and can serve as encouragement to strive towards higher levels of academic achievement. Research has indicated that when students are challenged in their schoolwork, positive educational outcomes ensue (Lutz, Guthrie, & Davis, 2006; Simon & Klein, 2007). Chae and Gentry (2011) sought to determine differences between perceptions of Korean and US gifted students. In this study, Korean students reported their classes as less appealing than their American counterparts and furthermore, the Korean students indicated that they had fewer choices in their learning activities than did the American students. The body of research that questions gifted students’ preferences in student work is conflicting.

Davis and Rimm (1998) indicated that gifted students preferred to work alone or with other gifted students as opposed to regular students. Rayneri, Gerber, and Wiley (2006) found just the opposite. Students who felt that their work was valued and appreciated by both their teachers and their peers typically preferred working with others, whereas students that lacked support had diminished attitudes toward learning (French, Walker, & Shore, 2011). Similarly, Vygotsky’s (1978) Social Constructivist Theory showed that students who did not feel supported in their environment preferred to learn alone. However, when learners are working within their zone of proximal development, they are able to learn even more when discussing ideas with
others who have knowledge beyond their own. Therefore, learning still becomes a social activity.

For intellectual development teachers should ensure that as proficiency with learning increases, the difficulty of a task also increases. Pianta et al. (2008) noticed that increased emotional support alongside increasingly difficult learning activities yielded higher performance on math tests. Elementary school students’ positive perceptions of relationships with peers improved their perceptions of their academic competence (Flook, Repetti, & Ullman, 2005). To truly consider exceptional learning environments the perceptions of the customer, the student, must be considered. When describing exemplary teachers, students mentioned those who fostered rigorous and effective learning environments, indicating that students value clear expectations, interesting content, and relevant and challenging student work (Thompson et al., 2008).

Furthermore, research has supported teacher enthusiasm, feedback, and content knowledge as valuable attributes to student motivation (Plucker & Callahan, 2008). Gentry, Steenbergen-Hu, and Choi (2011) surveyed students and identified teachers that were rated .090 standard deviations higher than other teachers in the sample and noted characteristics of teachers who increased perceived learning of their students. Qualitative findings included teachers who took personal interest in their students, those who set high expectations for themselves and their students, teachers who made learning meaningful and relevant, and teachers who had a clear passion for teaching. Hughes (2011) echoed recent researchers (Landry, Anthony, Swank, & Monseque-Bailey, 2009; Pianta, Mashburn, Downer, Hamre, & Justice, 2008) and called for classroom embedded professional development that would be implemented over time with proper mentoring supports to improve teacher and student interactions. Course format was a

Payne (2005) discussed driving forces among children from each of the classes: poverty, middle class, and wealth. Children of poverty sought to survive and placed much importance on relationships and entertainment. Thus, utilizing the design qualities of protection from adverse consequences, affiliation, and novelty and variety would meet the needs of children of poverty. In considering their social emphasis, children of poverty tended to include those they liked, thus choice, affiliation, and authenticity may be employed to meet these needs. Middle class students worked innately towards achievement. Utilizing the design qualities of product focus, clear and compelling product standards, and affirmation would be beneficial to their needs. Considering their social emphasis on self-governance and self-sufficiency, clear and compelling product standards may enhance their motivation. Finally, students of wealth were cognizant of financial, political, and social connections. Clear and compelling product standards and affiliation would be supportive of wealthy students meeting their goals. Children from wealthy families feared social exclusion, thus, the importance of utilizing content and substance, choice, authenticity, and protection from adverse consequences when designing student work.

**Theory of Flow**

In the 1960s, Csikszentmihalyi became fascinated with artists, musicians, and athletes who became lost in their work. Csikszentmihalyi developed a theory that explained true engagement. The Theory of Flow was related to Aristotle’s view that stated humans constantly seek happiness. For Americans, the Constitution proclaimed ‘pursuit of happiness.’ Happiness is private to each person. In order for students to feel fulfilled and achieve a sense of
understanding and happiness, a positive attitude, or a sense of fulfillment, the task at hand should be authentic to the needs of the student. To truly understand the Theory of Flow, one must understand the anatomy of consciousness. Csikszentmihalyi’s (1990) research suggested that consciousness represents a combination of the events both inside and outside of a human. In turn, these events are evaluated and acted on by the body. As such, bodies interpret the senses and act according to the schema. Consciousness is the part of all humans that allows them to daydream, lie, and synthesize information.

In order for something to appear in a person’s consciousness, attention must be given to the experience. Csikszentmihalyi (1990) related attention to energy; without attention no work can be done. Thus, how humans invest their energy or attention truly makes them who they are. Whenever something disrupts consciousness, known as psychic entropy (Csikszentmihalyi, 1990), the self can be weakened to a point where attention can no longer be invested in the task. This is related to the design quality of creating a safe environment in Schlechty’s (2002) WOW Framework. After reaching a flow experience, there has been a growth in complexity. Two types of complexities are discussed: differentiation and integration. Differentiation can be related to Schlechty’s (2002) design qualities of choice and authenticity, as differentiation implies uniqueness. Integration was described as a cooperative relationship with others to form ideas beyond the self and relates to the design quality of affiliation.

Csikszentmihalyi (1990) stated, “Neither one of these strategies is likely to make work much more enjoyable by itself; in combination, they should contribute enormously to optimal experience (p. 157). For example, allowing students to work collaboratively during a competition would yield different results than a student competing alone. If the student feels completely helpless, giving up is likely to ensue. A task is easier when true collaborations occur.
The word ‘compete’ in Latin ‘con petire’ means ‘to seek together.’ Thus, working together in a competitive situation could provide the engagement needed for learning. Through combining the following strategies as described by Schlechty (2002), true engagement may occur.

There is a body of research that associated flow with specific learning outcomes in adolescents (Rathunde, 2003; Shernoff, Csikszentmihalyi, Schneider, & Shernoff, 2003), music education (Custodero, 2002), and technology (Konradt, Filip, & Hoffman, 2003). In each case, flow was experienced when the learner discovered new knowledge in an authentic way. The learner experienced higher levels of performance and the learner’s understanding became more complex. Csikszentmihalyi (1975) posited that all components are not necessary to experience flow during an activity or lesson. In fact, flow experiences are not always pleasant during the experience itself. Consider the pain endured by the rock climber or bicyclist on the last leg of a journey. The sense of mastery is enough to guide the rugged sportsmen to completion. Rogers and Sawyers (1988) indicated that activities with fewer rules and extended choice were engaging to youth. In order for students to reach an optimal experience, educators must deliver engaging student work in a safe environment conducive to supportive feedback.

Csikszentmihalyi (1990) described flow as when the degree of challenge was equal or higher than the degree of skill. If a task is too challenging students may become frustrated. However, if the learner has greater skills than the challenge, the learner may become bored. Therefore, the balance between challenge and skill is flow. Every lesson or activity will not result in flow. However, flow can begin and end multiple times throughout a course (Pearce & Howard, 2004). Teachers frequently use external incentives to entice children to complete a task. This is also the case for much of the working world. Tasks that become enjoyable do not always begin enjoyable. However, once a task is started and meaningful feedback is received,
most tasks become intrinsically rewarding (Csikszentmihalyi, 1990). Klein et al. (2010) identified the effect of flow on learning performance using a multiple-choice test. However, an effect was found on students’ perceived learning and satisfaction with the course.

As expectations continue to rise for public school educators and students alike, mastering the amount of standards presented can seem like an insurmountable task. Educators and students alike must remain focused on the standards, yet find a way to master the standards in an enjoyable and meaningful way. Perhaps Csikszentmihalyi’s Theory of Flow can inform educators’ practices by encouraging a design of student work that absorbs a child completely in the use of relevant skills in coping with authentic challenges. Whereas individual engagement strategies are effective in various situations and for different students, the power of combined strategies could make a monumental difference (Csikszentmihalyi, 1975).
CHAPTER THREE: METHODOLOGY

Times are changing and the needs of students have changed as well. Students in classrooms today spend many of their waking hours encompassed with technology and visual stimulation. However, when they get to school, many students experience lecture and workbook teaching (Parsons & Traylor, 2011). Krause and Coates (2008) posited, “Student engagement focuses on the extent to which students are engaging in activities that higher education research has shown to be linked with high-quality learning outcomes” (p. 493). Teachers in the twenty-first century have been challenged with competing for the attention and interest of their students. Evidenced by high drop-out rates and emotional disengagement of students, there is a need to identify effective engagement practices aimed at improving student attitudes toward school for higher perceived learning and growth in achievement. A quasi-experimental study was conducted to examine the effects of implementing the engagement design qualities found in the Working on the Work Framework on the perceived learning, attitudes toward school, and student achievement of third grade mathematics students in a Metro-Atlanta school district. Csikszentmihalyi’s Theory of Flow was the driving theory that paralleled the Working on the Work Framework and was used in this study to examine differences between classes that utilized engagement design qualities as opposed to classes that utilized traditional methods. The purpose of this study was to determine if the use of engagement design qualities increased the perceived learning of students, their positive attitudes toward school, and their achievement. This chapter discusses the rationale for choosing the research design. Additionally, this chapter will identify and discuss the participants, setting, instrumentation, procedures, and data analysis techniques.
Design

A quasi-experimental pre-test post-test nonequivalent control group study was utilized to determine if there was a difference in perceived learning, attitudes toward school, and achievement for students participating in classrooms utilizing the Working on the Work Framework for designing engaging student work, as opposed to classrooms utilizing traditional teaching methods. A traditional teaching method was defined as the lack of implementation of the design qualities Content and Substance, Organization of Knowledge, Product Focus, Clear and Compelling Product Standards, Safe Environment, Affirmation of Performance, Affiliation, Novelty and Variety, Choice, and Authenticity when designing student work. Typically teachers use textbook and workbook activities to teach mathematics.

This research design was chosen because of the nature of educational research. A true experimental study with randomization was impossible due to the disruption it would cause in a public school setting; thus, the quasi-experimental design allowed for rigor without major disruption. Public schools create classrooms prior to the opening of a school year. Typically, these classrooms are balanced by race, ethnicity, and sex. Some schools also balance their classes to insure that each receives an equal number of students who have behavior issues. Furthermore, classrooms may also be balanced to include an equal amount of gifted and remedial learners. Rearranging classrooms for the purpose of this study was not practical, thus a quasi-experimental approach was taken. Campbell and Stanley (1963) defined this design as “one of the most widespread experimental designs in educational research involving an experimental group and a control group both given a pretest and a posttest, but in which the control group and the experimental group do not have pre-experimental sampling equivalence. Rather, the groups constitute naturally assembled collectives such as classrooms, as similar as availability permits
but yet not so similar that one can dispense with the pretest” (p. 47). To control for group nonequivalence, a pre-test was necessary. Confirming a lack of an initial significant difference between the experimental and control groups was necessary. If there were no significant differences between the pre-test scores of both groups, selection bias would only be a limited threat to the internal validity of the study (Ary, Jacobs, & Sorenson, 2010). A statistical control for covariance was utilized to control for group differences.

Teachers in both the experimental and control groups implemented the same mathematics unit based on the Common Core Georgia Performance Standards and the district curriculum map designed in August of 2013. However, teachers in the experimental group utilized the Working on the Work Framework to design student work using the 10 design qualities listed. Although matching was considered, as recommended by Campbell and Stanley (1963), classes were formed before the research was implemented. Whereas this research design was not as strong as true experimental designs, even true experimental designs only accept or reject a hypothesis. They do not prove anything. “The experiments we do today, if successful, will need replication and cross-validation at other times under other conditions before they can become an established part of science, before they can be theoretically interpreted with confidence” (Campbell & Stanley, 1963, p. 3).

**Questions and Hypotheses**

The research questions for this quasi-experimental study are as follows:

**RQ1**: To what extent is there a statistically significant difference in perceived learning among third grade students participating in classes using engagement design qualities as opposed to participating in classes with traditional teaching methods, while controlling for the pre-test perceived learning?
**RQ2:** To what extent is there a statistically significant difference in third grade students’ attitudes toward school when participating in classes with engagement design qualities as opposed to participating in classes with traditional teaching methods, while controlling for pre-test attitudes?

**RQ3:** To what extent is there a difference between summative assessment achievement when third grade students participate in classes with engagement design qualities as opposed to participating in classes with traditional teaching methods, while controlling for the achievement pretest?

The following are the research hypotheses:

**H₁:** There will be a statistically significant difference in perceived learning among third grade students participating in classes using engagement design qualities as opposed to participating in classes with traditional teaching methods, while controlling for pre-test perceived learning.

**H₂:** There will be a statistically significant difference in third grade students’ attitudes toward school when participating in classes with engagement design qualities as opposed to participating in classes with traditional teaching methods, while controlling for pretest attitudes.

**H₃:** There will be a statistically significant difference between summative assessment achievement when third grade students participate in classes with engagement design qualities as opposed to participating in classes with traditional teaching methods, while controlling for the achievement pretest.
Alternatively, the following are the null hypotheses:

\[ H_{o1} \]: There will be no statistically significant difference in perceived learning among third grade students participating in classes utilizing engagement design qualities as opposed to participating in classes with traditional teaching methods, while controlling for pre-test perceived learning.

\[ H_{o2} \]: There will be no statistically significant difference in third grade students’ attitudes toward school when participating in classes with engagement design qualities as opposed to participating in classes with traditional teaching methods, while controlling for pre-test attitudes.

\[ H_{o3} \]: There will be no statistically significant difference between summative assessment achievement when third grade students participate in classes with engagement design qualities as opposed to participating in classes with traditional teaching methods while controlling for the pretest.

**Participants**

Participants were selected through a convenience sample of third grade mathematics students enrolled in a metro Atlanta school district. The school district was home to 24 schools. Thirteen of the schools were elementary, five were middle schools, three were high schools, one was a K-8 theme school, one was a charter school, and one was an alternative school. The school district housed more than 19,000 students. All schools were accredited through the Southern Association of Colleges and Schools. Recruitment of teachers to participate in the study was made through advertisements sent via letter and e-mail from the researcher offering free professional learning hours. Third grade teachers volunteered to participate in the study, and the students were eligible to participate in the study if their teacher volunteered to be part of either the treatment or control group. Third grade teachers received consent forms to act as
research assistants in the experimental group and were tasked with implementation of the engagement design qualities for creating student work upon receiving twenty hours of professional learning related to the Working on the Work Framework. Third grade teachers in the control groups taught the same unit of study utilizing traditional teaching methods.

There were 90 students in the experimental group and based on design conventions 20-21 students in the control group was acceptable (Gay, 1987). Students with disabilities as well as gifted students were included in the sample to increase the reliability of results. Based on Cohen’s (1988) research, to detect an $r = .5$ with a two-tailed $a = 0.1$ at 90% power, 51 research participants were needed per group (p. 102). To control for a Type I or Type II error a power of 90% was selected. Student participants ranged in ages from eight to 10 years old. A letter of informed consent was given to each child’s parent and assent was solicited via letter from each child participant as well. Teacher research assistants provided help with distributing and collecting letters of consent and assent.

**Setting**

Third grade student participants were selected from elementary schools in a Metro-Atlanta School System. Schlechty (2002) developed the Working on the Work Framework that identified 10 strategies to design engaging student work. These strategies were used in five third grade mathematics classes to design engaging lessons by creating high-impact student work to identify differences in perceived learning, attitudes toward school, and achievement. This setting was chosen for convenience purposes. Classrooms chosen had comparable technology resources and materials. Students in chosen classrooms were heterogeneously mixed by ability. Teachers utilized the Common Core Georgia Performance Standards and school system curriculum map to develop a division mathematics unit.
All teachers in the experimental and control groups taught the same mathematics standards. Teachers in both experimental and control groups were asked to use the district curriculum map to ensure that instruction of specific standards was uniform in both groups. The only difference between the two groups was the implementation of the 10 design qualities identified in the Working on the Work Framework. Teachers in the experimental group taught the division standards and designed student work utilizing the following design qualities: Content and Substance, Organization of Knowledge, Product Focus, Clear and Compelling Product Standards, Safe Environment, Affirmation of Performance, Affiliation, Novelty and Variety, Choice, and Authenticity. Teachers in the control groups taught the same division standards using traditional teaching methods.

**Instrumentation**

Three dependent variables were measured in this study: perceived learning, attitudes toward school, and achievement. Perceived learning was measured using the Perceived learning questionnaire (Richmond, Gorham, & McCroskey, 1987) that reported a test-retest reliability for a study utilizing school-aged children in the United States. Learning (.85) and the loss of learning (.88) were reported over a five-day period. These measurements showed a high correlation between test and retest, thus demonstrating the questionnaire yields statistically significant results. Students were asked, “On a scale of 0-9, how much did you learn in this class, with 0 meaning you learned nothing and 9 meaning you learned more than any other class you’ve had?” Since this was a single item scale, no alpha reliability estimates were possible. For the purpose of this study, data was reported at the group level, thus making a lower level of item reliability acceptable (Gall, Gall, & Borg, 2007). Through the use of a bivariate correlation is SPSS, test-retest reliability was calculated at .81 (learning) and .84 (loss of learning).
The construct attitudes toward school was measured utilizing the elementary form of the Battle Student Attitude Scale (Battle, 1954), normed for students below the sixth grade. The authors of this scale reported a relatively high correlation with total test score. Participants decided whether statements such as “I think that teachers usually will not listen to student ideas,” “Some of the teachers are always using words that are too big for me to understand,” and “I am often afraid because of something I might do wrong,” were mostly true, half-true, or mostly false. The authors indicated that the test could be divided into subsets: self, other pupils, teachers, school administrators, and school as a whole.

Since the reliability of a test increased with increased length, validity was stronger when the whole scale was used. Reliability of this scale was determined using the split-halves method and ranged from .85 to .88. Scores ranged from 95-98 in the first stanine to 152-174 in the ninth stanine. Additionally, scores of 58-89 indicated the first percentile rank and scores of 158-161 indicated the 99.5 percentile rank (Damico, Hines, & Northrop, 1975). The subtests were made up of different numbers of questions. Therefore, in order to compare the different subsets, the number of items in the section was divided by the section score. After finding the averages by section, results were interpreted. A score of 1.00 indicated an unfavorable attitude, a score of 2.00 indicated a neutral attitude, and a score of 3.00 indicated a favorable attitude. Subscales were correlated to determine criterion validity. Chronbach’s alpha was calculated at .80.

The final independent variable, student achievement, was measured utilizing an 18-item expert validated third grade mathematics benchmark test created by the researcher and validated by a panel of experts in the field. This panel of eight experts in the field of education reviewed the third grade mathematics test and assessed its validity using an expert review template which asked experts to review the clarity and relevance of each item, complexity of language, and other
concerns (Gehlbach & Brinkworth, 2011). A panel of eight experts is seen as more than acceptable based on research (Veneziano & Hooper, 1997). The expert validated unit assessment was validated by one national board certified teacher, one assistant professor of mathematics, one retired school superintendent, one school system statistician, one professor of mathematics, one director of testing, research, and evaluation, one principal, and one assistant principal. All instrument reviewers utilized their professional knowledge of mathematics to determine the validity of the assessment. An Educator Qualifications for Test Validation Chart was included to document the experience and expertise of the assessment reviewers, as recommended by Williams (2009) (See Appendix H). The literature has supported the use of teacher-created tests in educational research (King, 2010; Martinez, Stecher, & Borko, 2009). Chronbach’s alpha for the expert validated unit assessment was calculated at .89.

Gehlbach and Brinkworth (2011) reviewed processes in place for enhancing the validity of assessments through expert validation. Gehlbach and Brinkworth (2011) indicated that construct relevance was necessary and that experts may utilize a review template to judge how well a set of test items accurately represents a construct. Furthermore, expert validation requires feedback on clarity of items, complexity of language, and other researcher concerns. Expert validation was found to be a process that enhanced the validity of research scales and tests (Rubio, Berg-Weger, Tebb, Lee, & Rauch, 2003). The Expert Review template used for this study can be found in Appendix I.

**Procedures**

District and school permission was sought by contacting the superintendent of schools via letter in the targeted school system. Upon receiving the superintendent’s permission, IRB approval was secured through the IRB application for Liberty University. Once IRB approval
was achieved, teachers were elicited to participate in the study through advertisements sent via letter and e-mail from the researcher. Advertisements offered free professional learning hours for third grade teachers. After volunteering to participate, teachers were randomly assigned to either the experimental or the control groups. Experimental participants attended approximately 20 hours of training before implementation of the engagement design qualities. Upon completion of the study, teachers in the control group also received the free professional development opportunity. Teachers in the control group were chosen from different schools in the district from the classrooms implementing the experimental treatment. To avoid diffusion of treatment, before choosing teachers to participate in the study as research assistants, candidates were asked to discuss past and present professional learning classes they had attended or taught.

**Working on the Work Training for Study Participants**

The training sessions were implemented using Schlechty’s (2002) text, *Working on the Work: An Action Plan for Teachers, Principals, and Superintendents*. In 2007, the researcher attended a conference in Dallas, TX facilitated by the Schlechty Center associates. The Schlechty Center provided an in-depth training of the Working on the Work Framework. During the three-day conference, the researcher worked closely with a design team and learned about the theories that underlie the Working on the Work Framework. A common language was identified and defined that provided a common understanding for design teams to begin to utilize the engagement design qualities to create well-designed student work. Terms such as engagement, strategic compliance, ritual compliance, retreatism, and rebellion, along with the 10 design qualities, were discussed in depth. Additionally, methods of student feedback to the teacher were discussed.
As a school administrator for the past six years, the researcher has had much experience utilizing the design qualities in guiding teachers to develop quality student work. For the purpose of this study, research assistants were provided specific training to utilize the 10 design qualities of the Working on the Work Framework over a period of four weeks. Total training and development of the lesson plans and student work added up to just over 22 hours of both after-school and Saturday meetings. The researcher utilized materials from the workshop attended, along with individual copies of the text listed above, to design training for the research assistants. Assistants worked closely with the researcher to understand the Theory of Engagement, as well as the Theory of Flow.

A common understanding of the levels of engagement was formed by reviewing the definitions and examples of each level of engagement and through watching video clips from the movie “School of Rock” to identify the different levels of student engagement ranging from rebellion to authentic engagement. Research assistants then watched a documentary on “work design” and the researcher led a discussion about the characteristics used by the engineers to build new technology. A parallel between the characteristics used by the engineers and the engagement design qualities was made to develop a common understanding of the design qualities. The researcher then gave examples of the design qualities of context: content and substance, organization of knowledge, clear and compelling product standards, and protection from adverse consequences for initial failures. Next, the researcher fully developed the design qualities of choice: product focus, affirmation of performance, affiliation, novelty and variety, choice, and authenticity. Examples of each design quality were reviewed and the needs of students from the experimental classrooms were identified. Steps for designing engaging work were reviewed by examining units that were previously developed using the design qualities.
Remaining time allowed the teachers to collaboratively design student work and lessons for the division mathematics unit. Allowing time during the training for the research assistants to collaboratively develop student work using the engagement design qualities was beneficial because the researcher was able to facilitate the conversation, thus guiding teachers to continuously build a common understanding of the design qualities.

Facilitation of dialogue between the teachers and frequent reference to examples from the text and workshop materials allowed for the creation of a common language. Research assistants teaching the control groups implemented the same Georgia Common Core Standards using traditional teaching methods. To insure the fidelity of content delivery, lesson plans were reviewed before unit implementation by the researcher. Reviewing the lesson plans and work design of the research assistants allowed the researcher to give specific feedback, clarify misconceptions, and offer alternative suggestions to insure the fidelity of the implementation of the engagement design qualities. Furthermore, reviewing the lesson plans and work design allowed the researcher to continuously guide the research assistants to use the specific design qualities they identified as needs for their students. Although they endeavored to utilize all of the engagement design qualities, the researcher was integral in guiding the research assistants to truly utilize the design qualities specific to the needs of the participants.

Letters to request informed consent from parents and assent from children were delivered to teachers. Teachers were asked to send the letters home to parents via the child’s agenda. Teachers were then asked to solicit unreturned permission slips during parent conferences. The researcher picked up the permission forms from the teachers one week prior to the beginning of the study. Students who did not return the permission slip were not included in data collection activities; however, they did participate in the instruction provided by their teacher. Teachers
administered the perceived learning questionnaire, expert validated mathematics assessment, and elementary form of the Battle Student Attitude Scale as a pre-test to both the experimental and control groups on the day before the experimental treatment began.

Next, teachers implemented the mathematics unit with or without the treatment over a six-week period. During the treatment period, the researcher and a research assistant specializing in mathematics performed observations of teacher implementation both in the classroom and through document analysis. Both the researcher and the research assistant specializing in mathematics performed document analysis to ensure fidelity of design quality implementation and the integrity of the mathematics instruction. The researcher used the design qualities to develop commentary in assessing the lesson planning and student work implementation when visiting and observing in the classroom. The researcher and mathematics research assistant took notes and offered suggestions to each of the teachers involved in the experimental treatment on ways to improve their implementation of the design qualities Content and Substance, Organization of Knowledge, Product Focus, Clear and Compelling Product Standards, Safe Environment, Affirmation of Performance, Affiliation, Novelty and Variety, Choice, and Authenticity, as well as the fidelity of the mathematics instruction delivered.

Finally, the perceived learning questionnaire, expert validated mathematics assessment, and elementary form of the Battle Student Attitude Scale were be administered by teachers as a post-test to both groups. A debriefing session with teachers and participants was held and professional development was provided for the control group teachers. The control group teachers received the exact same professional development received by the teachers who implemented the engagement design qualities with the experimental group. The results of the
study were shared with the teacher participants as a summarizing activity for the professional development opportunity.

**Data Analysis**

ANCOVA was chosen to determine if there was a statistically significant difference in students' perceived learning, attitudes toward school, and achievement among students participating in classes utilizing engagement design qualities as opposed to students participating in classes taught through traditional methods, while adjusting for initial differences between groups at the onset of the experiment. Ary, Jacobs, and Sorenson (2010) indicated effective use of this analysis for “analyzing the difference between posttest scores and what you would expect the posttest score to be, given the score on the pretest and the correlation between pre-test and posttest” (p. 287). In the event that no significant differences were found between groups, an independent *t*-test was identified as an alternative form of analysis. Since a significant interaction was found between the independent variable and the covariate, the interaction would not permit controlling for the covariate, thus violating the assumption of homogeneity of regression slopes for perceived learning and achievement. Metler and Vannatta (2005) along with Tabachnick and Fidell (1983) indicated that when the assumption of homogeneity of regression is not met, results from an ANCOVA are not meaningful and this statistical analysis should not be conducted. An independent sample *t*-test using pre-test posttest difference scores as the dependent variable instead of using the pretest as a covariate was an alternative solution presented by Tabachnick and Fidell (1983). Utilizing this research, analysis for perceived learning and achievement was conducted through the use of the independent sample *t*-test.

With any statistical analysis, caution must be taken to ensure that statistical assumptions are not violated. Assumptions of normality were examined through observation of Q-Q plots.
Furthermore, Levene’s test was conducted to test for homogeneity of variance. Linearity was tested with a scatter plot. Although the assumption of homogeneity of variance was violated, results were interpreted using the alternative $t$ value. SPSS was used to evaluate skewness and kurtosis. Based on Cohen’s (1988) research, to detect an $r = .5$ with a two-tailed $a = 0.1$ at 90% power, 51 research participants were needed (p. 102). Analysis of the data was expected to have at least a medium effect size of $d = .5$.

Analysis of covariance was used to determine the extent to which there was a statistically significant difference in students' attitudes toward school among students participating in classes utilizing engagement design qualities as opposed to students participating in classes taught through traditional methods while controlling for pre-test attitudes. An independent $t$-test was utilized to determine if there was a significant differences in pre-test scores for the total attitude scale score on the Elementary Form of the Battle Student Attitude Scale. Multiple scales make up the Battle Student Attitude Scale. The subscales included attitude toward self, other pupils, teachers, school administrators, and the school as a whole. Subscales of the Battle Student Attitude Scale Elementary Form were analyzed to determine if they were correlated and an attitude subscale correlation matrix was developed. Subscales would have been eliminated from the overall score if they were not significantly correlated.

Researchers have found this method to be useful when they were unable to randomly assign participants to research groups they intended to compare. Ary et al. (2010) reported that ANCOVA “is a statistical technique used to control for the effect of an extraneous variable known to be correlated with the dependent variable” (p. 297). Gall, Gall, and Borg (2007) reported, “The effect of ANCOVA is to make the two groups equal with respect to one or more control variables” (p. 320). To determine if there was a significant difference between the pre-
test scores of each group, the scores of each group were averaged and compared to the mean scores. Due to a ten point or larger difference between the mean scores, ANCOVA was used to statistically control for covariance between groups, as suggested by Vogt (2011).

This analysis was appropriate because there was a nominal independent variable and one interval/ratio dependent variable with a possible covariate. Assumptions of normality were examined through the use of Q-Q plots. Furthermore, Levene’s test was conducted to test for homogeneity of variances. Linearity was tested with a scatter plot. Finally, to ensure the homogeneity of regression slopes, scatterplots and univariate tests were utilized.
CHAPTER FOUR: FINDINGS

Restatement of the Purpose

The purpose of this study was to investigate the effects of instruction, designed using the Working on the Work (WOW) Framework, on the perceived learning, attitudes toward school, and achievement of 3rd grade mathematics students. Participants included third grade students enrolled in ten pre-existing third grade classrooms at four accredited elementary schools in a Metro Atlanta School System. With increased accountability, public schools have been tasked with strategically planning to graduate all students successfully prepared to enter a college or career path. Additionally, research has shown increased numbers of students dropping out of school due to boredom and disengagement in the classroom. Authentic student engagement has been identified as a characteristic of successful students and the implementation and measurement of effective engagement strategies by trained teachers was identified as a need for further research. This study contributed to a growing body of knowledge in the field of education by investigating student engagement through the lens of Flow Theory, thus determining the extent of difference that instruction designed by using engagement design qualities may have on students’ perceived learning, attitudes toward school, and achievement as compared to students receiving instruction through traditional methods. Furthermore, this study was rooted in foundational literature that surveyed the evolution of student engagement, student achievement, perceived learning, and attitudes toward school.

This chapter is made up of four main sections. The chapter opens with a restatement of the research questions and their respective null hypotheses. Next, demographic data was reported to summarize the participant population. Third, descriptive results are presented with
an explanation of assumption testing for each of the three research questions. Finally, a
summary of the results is presented in closing.

Research Questions and Hypotheses

The following research questions were investigated:

**RQ1:** To what extent is there a statistically significant difference in perceived learning
among third grade students participating in classes using engagement design qualities as opposed
to participating in classes with traditional teaching methods, while controlling for the pre-test
perceived learning?

**RQ2:** To what extent is there a statistically significant difference in third grade students’
attitudes toward school when participating in classes with engagement design qualities as
opposed to participating in classes with traditional teaching methods, while controlling for pre-
test attitudes?

**RQ3:** To what extent is there a difference between summative assessment achievement
when third grade students participate in classes with engagement design qualities as opposed to
participating in classes with traditional teaching methods, while controlling for the achievement
pretest?

The following were the corresponding research hypotheses:

**H1:** There will be a statistically significant difference in perceived learning among third
grade students participating in classes using engagement design qualities as opposed to
participating in classes with traditional teaching methods, while controlling for pre-test perceived
learning.
**H₂**: There will be a statistically significant difference in third grade students’ attitudes toward school when participating in classes with engagement design qualities as opposed to participating in classes with traditional teaching methods, while controlling for pretest attitudes.

**H₃**: There will be a statistically significant difference between summative assessment achievement when third grade students participate in classes with engagement design qualities as opposed to participating in classes with traditional teaching methods, while controlling for the achievement pretest.

Alternatively, the following are the null hypotheses:

**H₀₁**: There will be no statistically significant difference in perceived learning among third grade students participating in classes utilizing engagement design qualities as opposed to participating in classes with traditional teaching methods, while controlling for pre-test perceived learning.

**H₀₂**: There will be no statistically significant difference in third grade students’ attitudes toward school when participating in classes with engagement design qualities as opposed to participating in classes with traditional teaching methods, while controlling for pre-test attitudes.

**H₀₃**: There will be no statistically significant difference between summative assessment achievement when third grade students participate in classes with engagement design qualities as opposed to participating in classes with traditional teaching methods while controlling for the pretest.

**Demographics**

A combined total of 178 students participated in either the experimental or control group with the experimental group consisting of \( n = 90 \) and the control group consisting of \( n = 88 \). Students were enrolled in one of 10 3rd grade classes in an accredited public elementary school in
a Metro Atlanta School System. Classes were pre-existing and chosen due to the interest of the classroom teacher to participate in a research study. The classroom teacher delivered the instruction by utilizing the district’s curriculum maps aligned to the Georgia Common Core Standards.

Table 2

*Ethnicity of Students by Instructional Group*

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Treatment Group</th>
<th>Control Group</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
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<tr>
<td>African American</td>
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<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>90</td>
<td>100</td>
<td>88</td>
</tr>
</tbody>
</table>

Table 3

*Gender of Students by Instructional Group*

<table>
<thead>
<tr>
<th>Gender</th>
<th>Treatment Group</th>
<th>Control Group</th>
<th>Total</th>
</tr>
</thead>
<tbody>
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<td></td>
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</tr>
<tr>
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</tr>
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<td>54.5</td>
<td>55</td>
</tr>
<tr>
<td>Total</td>
<td>90</td>
<td>100</td>
<td>88</td>
</tr>
</tbody>
</table>
Within the combined total of 178 student participants in this study, 74 participants were male and 104 participants were female. A total of 13 participants were students with disabilities participating in inclusion classrooms. A total of 16 participants were students identified as gifted. A total of 13 students were students identified as English-language learners. To provide a more in-depth description of the participants, race was identified and reported. Of the total 178 participants, 38 students were Caucasian males, 50 students were Caucasian females, 20 students were African American males, 35 students were African American females, eight students were Hispanic males, 16 students were Hispanic females, eight students were males with more than one reported race, and three students were females with more than one reported race. Socioeconomic status was not reported as a part of this study due to the age of the student participants. Third grade students would not likely report such information accurately.

**Research Question One**

Research question one was as follows: To what extent is there a statistically significant difference in perceived learning among third grade students participating in classes using engagement design qualities as opposed to participating in classes with traditional teaching methods? In testing the independent variable on nonequivalent groups, thus increasing power and removing predictable variance from the error term (Tabachnick & Fidell, 1983), the use of an analysis of covariance (ANCOVA) was chosen to control for pretest differences. Upon inspection of the assumption of homogeneity of regression slopes, a significant interaction was detected between the independent variable and the covariate. This interaction did not necessitate controlling for the covariate.

When the assumption of homogeneity of regression is not met, results from an ANCOVA are not meaningful and this statistical analysis should not be conducted (Metler & Vannatta,
2005; Tabachnick & Fidell, 1983). Since the data was unable to meet the stringent assumptions of ANCOVA, an alternative analysis was sought. Since pre-test scores were obtained, Tabachnick & Fidell (1983) suggested an independent sample $t$-test using the pre-test posttest difference scores as the dependent variable instead of using the pretest as a covariate. As a result, the null hypothesis was revised to: $H_{01}$: There is no statistically significant difference in perceived learning among third grade students participating in classes utilizing engagement design qualities as opposed to students participating in classes taught through traditional methods.

**Descriptive Results**

Table 4 presents descriptive statistics for the perceived learning pre-test and posttest scores disaggregated by experimental and control groups.

Table 4

*Descriptive Statistics for Perceived Learning Pre-Test and Posttest*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group</th>
<th>$n$</th>
<th>$M$</th>
<th>$SD$</th>
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<tr>
<td>Perceived Learning Pre-test</td>
<td>Experimental</td>
<td>90</td>
<td>6.40</td>
<td>2.53</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>88</td>
<td>6.50</td>
<td>2.29</td>
</tr>
<tr>
<td>Perceived Learning Posttest</td>
<td>Experimental</td>
<td>90</td>
<td>8.86</td>
<td>1.45</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>88</td>
<td>7.20</td>
<td>2.12</td>
</tr>
</tbody>
</table>
Table 5

*Descriptive Statistics for Difference in Perceived Learning Between Pre-Test and Posttest*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group</th>
<th>n</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Learning Difference</td>
<td>Experimental</td>
<td>90</td>
<td>2.72</td>
<td>2.25</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>88</td>
<td>1.64</td>
<td>1.26</td>
</tr>
</tbody>
</table>

To ensure robustness, assumptions of the independent *t*-test were evaluated. Both the experimental and control groups contained more than 50 participants, therefore results of Kolmogorov-Smirnoff were evaluated to test the assumption of normality (Tabachnick & Fidell, 2013). Results of Kolmogorov-Smirnoff for both the experimental group and the control group appeared to violate the assumption of normality (*p* = .00 which was less than *α* = .05). Due to the extreme rigidity of the Kolmogorov-Smirnoff test, Q-Q plots were analyzed to inspect normality. Although independent sample *t*-tests are robust even when there are moderate violations to the assumption of normality, analysis of Q-Q plots revealed tenability of the assumption of normality.
Figure 1. Q-Q plots for Perceived Learning Pre-test and Posttest
Prior to conducting an independent samples t-test, the relationship between pre-test perceived learning and posttest perceived learning was examined and found to be linear ($r = .41, p = .00$). The assumption of homogeneity of variance for perceived learning data was examined with Levene’s test. Levene’s test for homogeneity of variance reported a significance level of .00, indicating that the homogeneity of variance assumption was violated. Thus, results were interpreted from the alternative $t$ value reported when equal variances are not assumed.

Table 6

*Results of Assumption Testing for Research Question One*

<table>
<thead>
<tr>
<th>Assumptions</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent Observations</td>
<td>Assumption Not Violated</td>
</tr>
<tr>
<td>Normal Distribution</td>
<td>Assumption Not Violated</td>
</tr>
<tr>
<td>Linearity</td>
<td>Assumption Not Violated</td>
</tr>
<tr>
<td>Homogeneity of Variance</td>
<td>Assumption Violated (Use of alternative $t$ value)</td>
</tr>
</tbody>
</table>

An independent samples $t$-test was conducted to compare the difference scores on the perceived learning posttest for the experimental and control groups. Students participating in classes with engagement design qualities ($M = 2.72$, $SD = 2.25$, $n = 90$) had statistically significant higher perceived learning difference scores than those participating in classes with traditional teaching methods ($M = 1.64$, $SD = 1.26$, $n = 88$), $t(140.58) = 3.99$, $p < .001$, two-tailed, $d = 0.5$. The effect size was medium. A power of $(1-\beta \text{ err prob} = 0.91) 90\%$ indicates that if the study was conducted 10 times it is likely to yield the same result 9 times (Cohen, 1988).
Levene’s Test indicated unequal variances \((F = 45.72, p = .00)\), so degrees of freedom were adjusted from 176 to 140.58. Since the same data set was utilized to analyze three dependent variables, a Bonferroni adjustment (Tabachnick & Fidell, 2007) was made to recalculate the \(p\)-value, indicating statistical significance for each analysis \((p < .02)\). The independent \(t\)-test provided evidence to reject the null hypothesis.

**Research Question Two**

Research question two was as follows: To what extent is there a statistically significant difference in third grade students’ attitudes toward school when participating in classes with engagement design qualities as opposed to participating in classes with traditional teaching methods, while controlling for pre-test attitudes? A one-way analysis of covariance (ANCOVA) was used to analyze the second null hypothesis. \(H_0:2\): There will be no statistically significant difference in third grade students’ attitudes toward school when participating in classes with engagement design qualities as opposed to participating in classes with traditional teaching methods, while controlling for pre-test attitudes. The independent variable included two levels: participation in classes with engagement design qualities and participation in classes with traditional teaching methods. The dependent variable was the attitude scale score on the Battle Student Attitude Elementary Form. Pretest scores on the Battle Student Attitude Elementary Form served as the covariate. To ensure effectiveness of ANCOVA, preliminary analyses were conducted to evaluate assumptions.

Upon inspection of the intercorrelation matrices (see Tables 7 & 8), pre-test and posttest scores for the five subscales that encompassed the Battle Student Attitude Scale Elementary Form revealed a high correlation between each of the subscales. Statistically significant correlations across all subscales indicated criterion-related validity for measuring attitudes.
toward school. In reviewing the pre-test correlations, linearity was found between attitudes toward self and others ($r_s = .50, p < .01$), attitudes toward self and teacher ($r_s = .36, p < .01$), attitudes toward self and whole school ($r_s = .24, p < .01$), attitudes toward self and principal ($r_s = .21, p < .01$), attitudes toward others and whole school ($r_s = .49, p < .01$), attitudes toward others and principal ($r_s = .43, p < .01$), and attitudes toward teacher and principal ($r_s = .67, p < .01$), whereas multicollinearity was found between attitudes toward others and teacher ($r_s = .71, p < .01$), attitudes toward teachers and whole school ($r_s = .72 p < .01$), and attitudes toward whole school and principal ($r_s = .75, p < .01$). Attitude total score was comprised of all five subscales, and the validity of the five subscales rendered validity of the total scale. If any of the subscales had not been correlated, the subscale would have been excluded from the analysis. The purpose of the analysis of each subscale was to ensure criterion validity of the total scale score.

Table 7

*Attitude Pretest Subscale Correlation Matrix*

<table>
<thead>
<tr>
<th></th>
<th>Self</th>
<th>Others</th>
<th>Teacher</th>
<th>Whole</th>
<th>Principal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self</td>
<td>1.00</td>
<td>.50**</td>
<td>.36**</td>
<td>.24**</td>
<td>.21**</td>
</tr>
<tr>
<td>Others</td>
<td>1.00</td>
<td>1.00</td>
<td>.71**</td>
<td>.49**</td>
<td>.43**</td>
</tr>
<tr>
<td>Teacher</td>
<td></td>
<td>1.00</td>
<td>.72**</td>
<td>.67**</td>
<td></td>
</tr>
<tr>
<td>Whole</td>
<td></td>
<td></td>
<td>1.00</td>
<td>.75**</td>
<td></td>
</tr>
<tr>
<td>Principal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.00</td>
</tr>
</tbody>
</table>

**$p < 0.01$ (2-tails)**
Table 8

*Attitude Posttest Subscale Correlation Matrix*

<table>
<thead>
<tr>
<th></th>
<th>Self</th>
<th>Others</th>
<th>Teacher</th>
<th>Whole</th>
<th>Principal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self</td>
<td>1.00</td>
<td>.60**</td>
<td>.44**</td>
<td>.37**</td>
<td>.32**</td>
</tr>
<tr>
<td>Others</td>
<td>1.00</td>
<td>.77**</td>
<td>.66**</td>
<td>.62**</td>
<td></td>
</tr>
<tr>
<td>Teacher</td>
<td></td>
<td>1.00</td>
<td>.76**</td>
<td>.68**</td>
<td></td>
</tr>
<tr>
<td>Whole</td>
<td></td>
<td></td>
<td>1.00</td>
<td>.69**</td>
<td></td>
</tr>
<tr>
<td>Principal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.00</td>
</tr>
</tbody>
</table>

**p < 0.01 (2-tails)**

In reviewing the posttest correlations, linearity was found between attitudes toward self and others \((rs = .60, p < .01)\), attitudes toward self and teacher \((rs = .44, p < .01)\), attitudes toward self and whole school \((rs = .37, p < .01)\), attitudes toward self and principal \((rs = .32, p < .01)\), attitudes toward others and whole school \((rs = .66, p < .01)\), attitudes toward others and principal \((rs = .62, p < .01)\), attitudes toward teacher and principal \((rs = .68, p < .01)\), and attitudes toward whole school and principal \((rs = .69, p < .01)\), whereas multicollinearity was found between attitudes toward others and teacher \((rs = .77, p < .01)\) and attitudes toward teacher and whole school \((rs = .76, p < .01)\).

**Descriptive Results**

Reliability of the covariate was calculated using a Pearson correlation (.80). Normality was examined by inspecting Q-Q plots. Both the experimental and control groups contained more than 50 participants, therefore results of Kolmogorov-Smirnoff were evaluated to test the assumption of normality (Tabachnick & Fidell, 2013). Results of Kolmogorov-Smirnoff for both the experimental group and the control group appeared to violate the assumption of normality.
\( \rho = .00 \) which was less than \( \alpha = .05 \). Due to the extreme rigidness of the Kolmogorov-Smirnov test, Q-Q plots were analyzed to inspect normality. Analysis of Q-Q plots revealed tenability of the assumption of normality.

Figure 2. Q-Q Plots for Attitude Pre-test and Posttest
Levene’s test for homogeneity of variances produced a significance level of .76, indicating that the homogeneity of variances assumption was not violated. Examining a scatterplot tested linearity. SPSS was utilized to create a scatterplot using the dependent variable (attitude posttest) as the Y-axis, and the covariate (attitude pre-test) as the X-axis. Fit lines were added to distinguish between the control and experimental groups. Since the lines appeared to be straight, the general distribution of attitude scores indicated a linear relationship. Thus, linearity was tenable. Linearity was also tested statistically. The relationship between pre-test total attitude and posttest total attitude was examined and found to be linear ($r = .80$, $p = .00$), providing evidence for multicollinearity.

Figure 3. Scatterplot for Total Attitude Scales Between Pre-test and Posttest
The assumption of homogeneity of regression slopes was also tested statistically to determine if there was a significant interaction between the treatment and covariate. A test of between-subjects effects revealed that the interaction was not significant: $F(1, 174) = 1.09, MSE = 151.73, p = .30$, indicating no homogeneity of regression slopes.

With all assumptions tenable, a one-way between-groups analysis of covariance (ANCOVA) was conducted to compare the effectiveness of implementation of engagement design qualities on student attitudes toward school. Participants’ pre-intervention total scores on the Battle Student Attitude Scale Elementary Form were used as the covariate in this analysis.

Table 9

*Results of Assumption Testing for Research Question Two*

<table>
<thead>
<tr>
<th>Assumptions</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement of Covariate</td>
<td>Covariate</td>
</tr>
<tr>
<td>Reliability of Covariate</td>
<td>Cronbach’s $\alpha = .80$; appropriate</td>
</tr>
<tr>
<td></td>
<td>(Tabachnick &amp; Fidell, 2013)</td>
</tr>
<tr>
<td>Normal Distribution</td>
<td>Assumption Not Violated</td>
</tr>
<tr>
<td>Linearity</td>
<td>Assumption Not Violated</td>
</tr>
<tr>
<td>Homogeneity of Regression Slopes</td>
<td>Assumption Not Violated</td>
</tr>
<tr>
<td>Homogeneity of Variance</td>
<td>Assumption Not Violated</td>
</tr>
</tbody>
</table>
Table 10

Descriptive Statistics by Test

<table>
<thead>
<tr>
<th>Test</th>
<th>Group</th>
<th>n</th>
<th>M</th>
<th>SD</th>
<th>Kurtosis</th>
<th>Skew</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude Pre-test</td>
<td>Control</td>
<td>88</td>
<td>126.39</td>
<td>21.23</td>
<td>.10</td>
<td>-.45</td>
</tr>
<tr>
<td></td>
<td>Experimental</td>
<td>90</td>
<td>128.39</td>
<td>19.88</td>
<td>-.26</td>
<td>-.37</td>
</tr>
<tr>
<td>Attitude Posttest</td>
<td>Control</td>
<td>88</td>
<td>134.22</td>
<td>20.62</td>
<td>-.48</td>
<td>-.26</td>
</tr>
<tr>
<td></td>
<td>Experimental</td>
<td>90</td>
<td>139.54</td>
<td>18.87</td>
<td>-.21</td>
<td>-.65</td>
</tr>
</tbody>
</table>

Table 11

Analysis of Covariance Summary

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude Pre-Test</td>
<td>44321.23</td>
<td>1</td>
<td>44321.23</td>
<td>318.35*</td>
</tr>
<tr>
<td>Group</td>
<td>635.11</td>
<td>1</td>
<td>635.11</td>
<td>4.56</td>
</tr>
<tr>
<td>Error</td>
<td>24363.99</td>
<td>175</td>
<td>139.22</td>
<td></td>
</tr>
</tbody>
</table>

*Note. *p < .0166

Adjusted means for the experimental group (M = 138.78) and the control group (M = 135) were calculated for the attitude posttest. After accounting for the influence of the pre-test \(F(1,175) = 318.35, p < .001\) and implementing an adjusted \(p\) value per the Bonferroni adjustment, there was no significant difference \(p < .02\) between the experimental group \((M = 139.54, SD = 18.87)\) and the control group \((M = 134.22, SD = 20.62)\), \(F(1,175) = 4.56, p = .03\), two-tailed, \(d = 0.25\), and adjusted \(R^2\) squared = .65 on post-intervention total scores of the Battle Student Attitude Scale Elementary Form. The effect size was small. A power of \((1-\beta \text{ err prob} = 0.91)\) 90% indicates that if the study was conducted 10 times it is likely to yield the same results 9 times (Cohen, 1988), thus failing to reject the null hypothesis.
Research Question Three

Research question three was as follows: To what extent is there a difference between summative assessment achievement when third grade students participate in classes with engagement design qualities as opposed to participating in classes with traditional teaching methods, while controlling for the achievement pretest? As with the dependent variable perceived learning, upon analysis of assumptions before employing ANCOVA, the assumption for homogeneity of regression was not tenable. Therefore a significant interaction was detected between the independent variable and the covariate. Subsequently, any difference found when analyzing the dependent variable among the independent variable could vary as a function of the covariate rather than being associated with either group.

When the assumption of homogeneity of regression is not met, results from an ANCOVA are not meaningful and this statistical analysis should not be conducted (Metler & Vannatta, 2005; Tabachnick & Fidell, 1983). Since the data was unable to meet the stringent assumptions of ANCOVA, an alternative analysis was sought. Since pre-test scores were obtained, Tabachnick & Fidell (1983) suggested an independent $t$-test on difference scores as the dependent variable instead of using the pretest as a covariate. An independent samples $t$-test was used to analyze the third null hypothesis. As a result, the null hypothesis was revised to: $H_{03}$: There is no statistically significant difference between summative assessment achievement when third grade students participate in classes with engagement design qualities as opposed to participating in classes with traditional teaching methods while controlling for the pretest.

Descriptive Results
Table 13 presents descriptives for the difference in achievement posttest scores disaggregated by experimental and control groups.

Table 12

*Descriptive Statistics for Achievement Between Pre-Test and Posttest*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group</th>
<th>n</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achievement Pre-Test</td>
<td>Experimental</td>
<td>90</td>
<td>7.17</td>
<td>4.59</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>88</td>
<td>6.92</td>
<td>4.02</td>
</tr>
<tr>
<td>Achievement Posttest</td>
<td>Experimental</td>
<td>90</td>
<td>14.64</td>
<td>3.23</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>88</td>
<td>11.67</td>
<td>4.32</td>
</tr>
</tbody>
</table>

Table 13

*Descriptive Statistics for Difference in Achievement Between Pre-Test and Posttest*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group</th>
<th>n</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achievement Difference</td>
<td>Experimental</td>
<td>90</td>
<td>7.48</td>
<td>4.66</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>88</td>
<td>4.75</td>
<td>3.88</td>
</tr>
</tbody>
</table>

To ensure robustness, assumptions of the independent *t*-test were evaluated. Both the experimental and control groups contained more than 50 participants, therefore results of Kolmogorov-Smirnoff were evaluated to test the assumption of normality (Tabachnick & Fidell, 2013). Results of Kolmogorov-Smirnoff for both the experimental group and the control group appeared to violate the assumption of normality (*p* = .00 which was less than *α* = .05). Due to the extreme rigidity of the Kolmogorov-Smirnoff test, Q-Q plots were analyzed to inspect normality. Although independent sample *t*-tests are robust even when there are moderate violations to the assumption of normality, analysis of Q-Q plots revealed tenability of the assumption of normality.
Figure 4. Q-Q Plots for Achievement Pre-test and Posttest
Prior to conducting an independent samples \( t \)-test, the relationship between pre-test achievement and posttest achievement was examined and found to be linear \( (r = .43, p = .00) \). The assumption of homogeneity of variance for achievement data was examined with Levene’s test. Levene’s test for homogeneity of variance reported a significance level of .49, indicating that the homogeneity of variance assumption was violated by .01. Thus, results were interpreted from the alternative \( t \) value reported when equal variances are not assumed.

Table 14

*Results of Assumption Testing for Research Question Three*

<table>
<thead>
<tr>
<th>Assumptions</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent Observations</td>
<td>Assumption Not Violated</td>
</tr>
<tr>
<td>Normal Distribution</td>
<td>Assumption Not Violated</td>
</tr>
<tr>
<td>Linearity</td>
<td>Assumption Not Violated</td>
</tr>
<tr>
<td>Homogeneity of Variance</td>
<td>Assumption Violated (Use of alternative ( t ) value)</td>
</tr>
</tbody>
</table>

An independent samples \( t \)-test was conducted to compare the difference scores on the achievement posttest for the experimental and control groups. Students participating in classes with engagement design qualities \( (M = 7.48, SD = 4.66, n = 90) \) had statistically significant higher achievement difference scores than those participating in classes with traditional teaching methods \( (M = 4.75, SD = 3.88, n = 88) \), \( t(171.66) = 4.25, p < .001, \) two-tailed, \( d = 0.5 \). The effect size was medium. A power of \( (1-\beta \) err prob = 0.91) 90% indicates that if the study was
conducted 10 times it is likely to yield the same result 9 times (Cohen, 1988). Levene’s Test indicated unequal variances ($F = 3.92, p = .05$), so degrees of freedom were adjusted from 176 to 171.66. Since the same data set was utilized to analyze three dependent variables, a Bonferroni adjustment was made to recalculate the $p$-value, indicating statistical significance for each analysis ($p < .02$). The independent $t$-test provided the results needed to reject the null hypothesis.

**Table 15**

*Results of Statistical Analysis per Null Hypothesis*

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Rejected</th>
<th>Failed to Reject</th>
</tr>
</thead>
<tbody>
<tr>
<td>$H_{o1}$: There will be no statistically significant difference in perceived learning among third grade students participating in classes utilizing engagement design qualities as opposed to participating in classes with traditional teaching methods, while controlling for pre-test perceived learning.</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>$H_{o2}$: There will be no statistically significant difference in third grade students’ attitudes toward school when participating in classes with engagement design qualities as opposed to participating in classes with traditional teaching methods, while controlling for pre-test attitudes.</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>$H_{o3}$: There will be no statistically significant difference between summative assessment achievement when third grade students participate in classes with engagement design qualities as opposed to participating in classes with traditional teaching methods while controlling for the pretest.</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

**Summary of Results**

The purpose of this study was to determine if there was a statistically significant difference between students’ perceived learning, attitudes toward school, and achievement when students participated in classes with engagement design qualities as opposed to classes utilizing
traditional teaching methods. Difference scores were calculated between the perceived learning pre-test and perceived learning posttest, as well as the achievement pre-test and posttest. Pre-test attitude total scores were used as a covariate to determine differences between experimental and control groups post-intervention. The research from this study indicated that statistically significant differences could be found in perceived learning and achievement when students participated in classes utilizing engagement design qualities as opposed to participating in classes utilizing traditional teaching methods. Although statistically significant differences were not found in student attitudes toward school at $p < 0.17$ per the stringent Bonferroni adjustment, the found significance $p = .034$ did meet the a priori set significance level of .05.
CHAPTER FIVE: DISCUSSION

This chapter encompasses a summarization of this quasi-experimental pre-test posttest nonequivalent control group study and a discussion of the study’s findings. The chapter opens with a statement of the problem followed by the purpose of the study. Next, the findings of each research question are presented with a discussion of the results inclusive of connections to relevant literature and theory. This is followed by theoretical implication, implications for practice, methodological implications, and implications for future research. The chapter concludes with a discussion of limitations and conclusions based on the findings of this research study.

Statement of the Problem

Historically, the purpose of education was to prepare society to read, write, and perform basic arithmetic. Primarily, students were learning to read from the Bible or other holy books. Over time, the purpose of schooling changed. The purpose for schooling can vary for different families. For some, school provides a safe place for students to go while parents work. Other families promote school as a place to learn social skills. Most families expect schools to provide students with college or career readiness. With changes in the purpose of education, came changes in family structures. As time progressed, single parent families and children being raised by grandparents or other guardians became more common. The agrarian workforce became more factory and service oriented, thus shifting family customs and values. As technology became more and more accessible to the world’s youth, adult guidance became less valued. Students in today’s classrooms live in a world where they have found their independence earlier in life than in past times. These students are surrounded by information accessible via the Internet on their cell phones, computers, tablets, and watches. Twenty-first
century learners can vary based on their backgrounds. Some students enter school with an enormous base of background knowledge due to their life experiences. These students have visited parks, zoos, and museums. They have searched the Internet for answers to their questions and have participated in online learning. Their parents spent much time reading with them and engaging them in conversations using extensive vocabulary. Other students enter school without the experience of ever leaving their own neighborhood. Due to excessive shift work and societal issues, their parents were void of time to read to their child or engage their child in conversation. Such challenges are evident for the twenty-first century teacher.

In an effort to capture student interest and attention, teachers must find a way to transform public education to ensure successful preparation for students. Family structures have changed. The workforce has changed. However, the way educators teach remains the same. To empower students who are ready to go to college or begin a career, teachers must rethink how they ‘do’ education. The implementation and measurement of effective engagement strategies by trained teachers was identified as a need in the field (Dunleavy & Milton, 2009; Gilbert, 2007; Harris, 2008; Willms, Friesen, & Milton, 2009). Perhaps lessons eliciting student engagement can empower students to experience higher levels of perceived learning, better attitudes toward school, and higher achievement. Through the lens of Flow Theory, this study aimed to investigate engagement strategies that create optimal experiences for students. Engaging students in school, helping them to feel successful, and empowering them to succeed are prerequisites to success.

Utilizing the theory of Flow, this quasi-experimental study sought to determine the effects of third grade mathematics instruction designed using WOW engagement design qualities (Schlechty, 2002) to create “optimal experiences” (Csikszentmihalyi, 2009 p. 4), resulting in
higher perceived learning, attitudes toward school, and achievement. Perceived learning was measured by a perceived learning questionnaire (Richmond, Gorham, & McCroskey, 1987), attitudes toward school was measured using the Battle Student Attitude Scale Elementary Form (Damico, Hines, & Northrop, 1975), and achievement was measured using an expert validated unit assessment.

The independent variable was the type of learning (instruction using engagement design qualities or traditional teaching methods). Instruction utilizing engagement design qualities was defined as teacher implementation of the 10 design qualities described in the Working on the Work Framework based on Schlechty’s (2002) work.

Review of Methodology

This quasi-experimental study utilized a pre-test posttest nonequivalent control group design. Unfortunately, randomization of the sample was not possible because classrooms are formed differently in public schools based on the needs of each school. Breaking classrooms apart and reforming classes to meet the needs of this study was impossible and inappropriate. This design was chosen because it was the next strongest design in the continuum with only true experimental designs representing more strength (Campbell & Stanley, 1963; Gall et al., 2007). A convenience sample of 10 pre-existing third grade mathematics classes ($N = 178$) at four elementary schools in a Metro Atlanta school system was assigned to either an experimental or a control group. Both the experimental and control group received equivalent mathematics instruction using the Common Core State Standards and county issued curriculum maps. Students participating in the control group received instruction using a canned mathematics curriculum composed of a textbook and workbook approach through modeling, guided practice, and independent practice. However, the experimental group received instruction designed
utilizing the engagement design qualities listed in the Working on the Work Framework. A Perceived learning questionnaire (Richmond, Gorham, & McCroskey, 1987), the Battle Student Attitude Scale Elementary Form (Damico, Hines, & Northrop, 1975), and an expert-validated unit assessment were administered before and after treatment. Following treatment, results were statistically analyzed and reported.

**Summary of Results**

**Research Question One**

Research question one was as follows: To what extent is there a statistically significant difference in perceived learning among third grade students participating in classes using engagement design qualities as opposed to participating in classes with traditional teaching methods? Prior to analysis, an independent t-test was used to determine if there was a statistically significant difference between the pre-test scores of the experimental and control groups. Results indicated that no significant difference existed between the two groups. Therefore, the assumption of normality and equal variance was tested between the perceived learning pre-test and posttest scores. Equal variance was not deemed tenable, so the assumption of homogeneity of regression slopes was tested to ascertain the use of a more stringent analysis of covariance (ANCOVA). A significant interaction was found between the independent variable and the covariate, thus rendering the ANCOVA analysis inappropriate (Metler & Vannatta, 2005; Tabachnick & Fidell, 1983). Based on Tabachnic and Fidell’s (1983) research, difference scores were calculated between the pre-test and posttest for perceived learning and used as the dependent variable rather than utilizing the pre-test as a covariate. Results indicated that there was a statistically significant difference in third grade students’ perceived learning as measured by the perceived learning questionnaire when participating in classes utilizing
engagement design qualities as compared to students participating in classes utilizing traditional teaching methods. Examination of the mean difference scores between groups indicated that the experimental group’s perceived learning scores were higher than the control group’s perceived learning scores; thus, students participating in classes with engagement design qualities experienced greater or higher perceived learning than their counterparts participating in classes utilizing traditional teaching methods.

**Research Question Two**

Research question two was as follows: To what extent is there a statistically significant difference in third grade students’ attitudes toward school when participating in classes with engagement design qualities as opposed to participating in classes with traditional teaching methods, while controlling for pre-test attitudes? Prior to analysis, an independent $t$-test was used to determine if there was a statistically significant difference between the pre-test scores of the experimental and control groups. Results indicated that no significant difference existed between the two groups. Therefore, the assumption of normality and equal variance was tested between the total attitude pre-test and posttest scores. Equal variance was not deemed tenable, so the assumption of homogeneity of regression slopes was tested to ascertain the use of a more stringent analysis of covariance (ANCOVA). The assumptions of homogeneity of regression slopes, as well as the remaining assumptions, were tenable, thus allowing the use of the analysis of covariance (ANCOVA) to determine whether a statistically significant difference existed between the experimental and control group total attitude scores. Results indicated that there was no statistically significant difference in third grade students’ total attitudes toward school as measured by the Battle Student Attitude Scale Elementary Form when participating in classes using engagement design qualities as compared to students who participated in classes using
traditional teaching methods. A Bonferroni adjustment was necessary because the same data set was used for three separate analyses, thus decreasing the $p$ value from .05 to .0166. Before adjusting the $p$ value, a statistically significant difference was found, indicating that total attitude scores were higher for students in the experimental group as compared to the control group. Thus, students participating in classes using engagement design qualities experienced higher total attitude scores compared to students in classes using traditional methods.

**Research Question Three**

Research question three was as follows: To what extent is there a difference between summative assessment achievement when third grade students participate in classes with engagement design qualities as opposed to participating in classes with traditional teaching methods, while controlling for the achievement pretest? Prior to analysis, an independent $t$ test was used to determine if there was a statistically significant difference between the pre-test scores of the experimental and control groups. Results indicated that no significant difference existed between the two groups. Therefore, the assumption of normality and equal variance was tested between the achievement pre-test and posttest scores. Equal variance was not deemed tenable, so the assumption of homogeneity of regression slopes was tested to ascertain the use of a more stringent analysis of covariance (ANCOVA). A significant interaction was found between the independent variable and the covariate, thus rendering the ANCOVA analysis inappropriate (Metler & Vannatta, 2005; Tabachnick & Fidell, 1983). Based on Tabachnick and Fidell’s (1983) research, difference scores were calculated between the pre-test and posttest for achievement and used as the dependent variable, rather than utilizing the pre-test as a covariate. Results indicated that there was a statistically significant difference in third grade students’ achievement as measured by the expert validated unit assessment when participating in classes
utilizing engagement design qualities as compared to students participating in classes utilizing traditional teaching methods. Examination of the mean achievement difference scores between groups indicated that the experimental group’s achievement scores were higher than the control group’s achievement scores; thus, students participating in classes using engagement design qualities experienced higher achievement than students participating in classes using traditional teaching methods.

Discussion of Results

Research Question One

The variance in the mean difference scores on the perceived learning questionnaire, with students participating in classes with engagement design qualities scoring higher than students in classes with traditional methods, can be understood in light of the research on perceived learning and engagement. Characteristics of student work or course design have been identified that promote student engagement and increased student perceptions of learning. When incorporated into meaningful learning experiences, characteristics such as authenticity, choice, and affiliation make learning real and relevant. (Booker, 2006; Caram & Davis, 2005; Diez, 2002; Dowson & McInerney, 2001; Hancock & Betts, 2002; Lumsden, 1994; Voke, 2002; Zorfass & Copel, 1995). When a student feels successful, they are more likely to continue with the task at hand instead of giving up. Engagement design qualities utilize organizational techniques to provide a safe environment for students. A fear of failure is taken away from learning and students are encouraged to share their thoughts and explain their thinking. Students received frequent affirmation of performance to promote a positive self-efficacy and self-confidence.

Even at a young age, students who believed they were capable were more likely to accept challenging assignments (Hughes & Zhang, 2007). Students participating in classes using
engagement design qualities were provided with authentic experiences and scaffolded challenges. Teachers consistently explained the purpose of each task and essential questions guided students to apply their learning to real-life situations. Spronken-Smith et al. (2012) found that 79% of students with high perceived learning rated a course highly for ‘understanding why they were studying what they were.’ Authentic and relevant tasks were presented to collaborative groups and students were given the opportunity to struggle with the task while peers provided support for each other. In comparison, students in classes using traditional methods experienced isolation along with drill and practice. When students were unsuccessful with a task, they would often give up or reject the task altogether. In the current study, students participating in classes with traditional teaching methods may have experienced such challenges and thus, had lower perceived learning than their counterparts in classes with engagement design qualities. Dawson and McInerney (2001) found that middle school students displayed work avoidance tactics such as copying, cheating, asking for help on easy assignments, “playing” with school supplies, tuning out, or pretending not to understand in an effort to avoid work. Perceived learning had two focuses in the literature: perceptions of oneself as a learner (Bandura, 1997) and perceptions of the learning environment (Brown, 2009).

Self-efficacy was an important characteristic for teachers to foster in students. A student’s perception of oneself as a learner must be developed. Students must be able to understand how they approach learning. Classes utilizing engagement design qualities spent time fostering independence through discussions and math talks. Students were encouraged to explain their thinking and to listen to the thinking of their peers. Students in traditional classrooms spent their time listening to the teacher rather than their peers. Listening to peers allows students to see that there are common misunderstandings about mathematics, which can
be a powerful motivator for students who find mathematical thinking difficult. Learning from each other and knowing where to find resources was beneficial to the experimental group. Students spent time developing relationships with their peers and their teacher through engaging in relevant tasks and sharing of ideas. At-risk students perceived learning increased when their relationships with peers and teachers were positive (Day, 2002; Dowson & McInerney, 2001; Tomlinson, 2003). Feedback also played a role in perceived learning.

At the elementary school level, students enjoy positive feedback. Positive relationships between student and teacher are necessary for a student to accept correctional feedback. Students participating in classes using engagement design qualities received immediate feedback from their teachers through verbal interactions, whereas students participating in traditional methods typically received correctional feedback in the form of a grade. Eom et al. (2006) found that increased feedback fostered higher perceived learning. Hattie and Timperley (2007) warned that the type of feedback and the way it is given can have varied levels of effectiveness. The use of student feedback to the teacher was employed in classes using engagement design qualities. Students had frequent opportunities to share their thoughts about the activities they were participating in during instruction. For example, after a lesson students were asked to place a marble in a cup that represented their satisfaction with the task. Cups were labeled ‘I didn’t understand this lesson,’ ‘I understand but this was boring,’ ‘I understand and I enjoyed this lesson,’ and ‘This was awesome!’ Teachers in the experimental group used this feedback to tailor their instruction for future lessons.

The findings of this study supported research that discussed the importance of designing relevant and authentic learning tasks. Furthermore, this study supported research indicating the importance of teacher-student and peer relationships. A significant relationship was found
between perceived learning and student-centered teaching, as students in classes using engagement design qualities spent significantly more time in student-centered tasks than their counterparts. Another significant finding was related to feedback. Student feedback to the teacher was found to be an important aspect of perceived learning. Students reporting their satisfaction with a task or learning objective yielded formative assessment information for the teacher that would have otherwise been unknown.

**Research Question Two**

Attitudes toward school are extremely important, especially during the early years of a child’s life. Even in the first through third grades, children who liked school made great gains in achievement as compared to their lower-engaged peers who avoided schoolwork (Ladd et al., 2000; Ladd & Dinella, 2009). This study indicated that no difference existed between groups participating in classes using engagement design qualities and classes using traditional methods. Attitudes toward school are often developed even before a child walks through the schoolhouse doors. Children listen to their parents, siblings, and family and pick up on the feelings associated with school expressed by their loved ones. Hauser-Cram et al. (2007) found that the effects of beginning school with positive feelings versus negative feelings were seen in student achievement, even as early as the fifth grade. Therefore, varying levels of support must be provided to students at a young age to ensure positive feelings and attitudes toward school. Silva et al. (2011) posited that even in studies of pre-school students, an effective teacher could mediate a child’s attitude toward school. Perhaps a longer implementation of the engagement design qualities would have combated against preconceived attitudes. While students participating in classes using engagement design qualities received student-focused learning tasks with varying levels of differentiation, a statistically significant difference was not found
due to the stringent $p$ value set during the Bonferroni adjustment. Teachers implementing the engagement design qualities were teachers with an interest in student engagement. Therefore, students in the experimental group may have had limited growth in their attitudes toward school due to their current positive satisfaction toward their classroom learning environment.

Due to varying levels of background knowledge, some students experience frustration with instructional tasks, while others experience boredom. Unengaged students come in a variety of forms. Educators typically provide low ability learners with much attention, unintentionally neglecting students who have high abilities. These students with high abilities suffer from increased boredom or lack of authenticity in a task (Skinner, Furrer, Marchand, & Kindermann, 2008). This could explain some of the variance in posttest total attitude scores. Students participating in classes using engagement design qualities experienced authenticity in a task on a daily basis. Instruction was designed to allow for creativity and to promote rigor in thinking. Students with high abilities may have noted better attitudes toward school due to a lowered sense of boredom during mathematics. The findings of this study supported research on using differentiated instruction to increase student attitudes toward school.

Differentiation based on student interest and ability must be considered when designing student work. When students develop their own goals they are able to take ownership of their learning. When given the opportunity, discuss their strengths and weaknesses and pinpoint their interests. Such conversations guide teachers in facilitating learning experiences that cater to individual learning differences. One of the underlying strategies of the WOW framework was related to challenging students to become so engaged with their work that they would persist even when faced with a difficult task. Increasing metacognitive skills allow students to build stamina in their thinking and persist even when presented with obstacles (Kolb & Kolb, 2009).
Attitudes toward school are more positive when students have increased metacognitive skills, which yield higher levels of self-efficacy. Students participating in classes using engagement design qualities are presented with metacognitive skills, where students in traditional classrooms typically receive mathematics instruction in abstract ways. The use of individual learning styles had a significant effect on students’ attitudes toward school (Felder & Brent, 2005; Felder, 1996; Fine, 2003; Honigsfeld & Schiering, 2004; Kolb & Kolb, 2009; Tseng, Chu, Hwang, & Tsai, 2008).

Students participating in classes using engagement design qualities are encouraged to participate in authentic hands-on experiences, as compared to the drill and practice in traditional settings. As Yashima (2009) illustrated that increased classroom participation can predict positive attitudes toward school, classes utilizing engagement design qualities should yield more positive student attitudes than the traditional classroom methodology. However, Hauser-Cram et al. (2007) noted that student attitudes toward school typically remained unwavering from first to third grade.

Research Question Three

The overall difference in the mean difference scores on the expert-validated unit assessment, with students participating in classes using engagement design qualities scoring higher than students participating in classes using traditional methods, can be understood by analyzing the research on student engagement that provided ways to increase student achievement. Students are required by law to attend school until a certain age that varies depending on location. However, students choose to give teachers their interest and attention. To design work that elicits the interest and attention of students, teachers should use engagement design qualities, thus increasing student engagement and time on task. Shih’s (2008) research
indicated that when students did not value schoolwork presented to them, work avoidance became rampant and student achievement decreased.

Children make meaning in many ways. Traditional textbook and worksheets rarely provide the high-interest and authentic experiences necessary to engage youth. Encouraging students to respond in their own way through product-focused learning or allowing choice in delivery were engagement qualities utilized in the WOW Framework. Schlechty (2001) posited that educators must deliver a product to the consumer that authentically engages them in the learning process. When the quality of student work is higher, children are more likely engaged.

A study presented by Else-Quest et al. (2010) identified students’ basic mathematical knowledge and their ability to use their skills in authentic real world experiences. Students represented 69 countries. Girls were significantly less confident in their mathematical skills than boys. Winheller, Hattie, and Brown (2013) echoed this study, indicating authenticity as a characteristic that influences early adolescents’ self-efficacy and math achievement. In traditional classrooms, mathematical algorithms are presented out of context or in a method unfriendly to student background knowledge, whereas classes using engagement design qualities use relevant experiences to make learning concrete before progressing to representational or abstract learning.

Traditional teaching methods rely heavily on lecture, note-taking and guided practice. Dunn and Burke (2006) noted that only 75% of information delivered orally was retained by students during lecture. Also, during traditional lectures students typically watch and listen, rather than participate in higher level thinking and understanding. When students are presented with performance tasks on standardized tests, they are unable to apply their mathematical understanding because their foundational skills were undeveloped through rigorous and authentic instruction. Students participating in classes using engagement design qualities utilize
manipulatives at the concrete instructional level and progress to representational understandings and abstract thinking. Therefore, when they are presented with performance tasks, they are able to conceptually think through the problem before responding hastily through the use of an algorithm.

The findings of this study supported the proposal that in considering the goals of public education, educators should correlate individual student goals with academic goals to increase achievement (Marzano & Pickering, 2011).

**Implications**

**Theoretical**

The results of this study supported the Theory of Flow, which purported that in order for students to feel fulfilled and achieve a sense of understanding and happiness, a positive attitude, or a sense of fulfillment, the task at hand should be authentic to the needs of the student. When the degree of challenge was equal to or higher than the degree of skill, students experienced flow (Csikszentmihalyi, 1990). Given that significant differences were found in both students’ perceived learning and achievement for students participating in classes using engagement design qualities, this study concluded that the Theory of Flow could inform educators’ practice by encouraging the design of student work that absorbs a child completely in the use of relevant skills in coping with authentic challenges.

Teachers must design student work that appeals to students’ interests and attention. Csikszentmihalyi (1990) related attention to energy; without attention, no work can be done. Participants in classes using engagement design qualities were presented with tasks appealing to their interests, thus eliciting their attention. While expecting every lesson to result in flow is unreasonable, purposeful planning utilizing engagement design qualities could contribute to
creating optimal experiences. Traditional methods typically rely on the use of external incentives to entice children to complete work. However, in classes using engagement design qualities, most tasks become intrinsically rewarding through the use of purposeful implementation of engagement design qualities and effective feedback from the teacher or peers. During classroom observations, the researcher noted authentic engagement rather than strategic or ritual compliance when students were using division standards to plan for a Fall Carnival. The students were not only excited about the math, but also came up with the idea to write local businesses to donate supplies for the Carnival. Students were frequently engaged in mathematical discussions and came up with the idea to divide the profits of the Carnival between each of the participating classes. Observations of the control group yielded engagement indicative of strategic and ritual compliance.

The curriculum presented to both groups was content standards taken from the Georgia Common Core Standards, but the work presented to students varied depending on the group. In considering those who typically experience flow (artists, musicians, rock climbers, etc.) the researcher noted that these people chose to invest their time and attention to the task at hand. While painting, reading music, or climbing a mountain can be exhilarating, these people also faced adversity when encountering challenges during their performance. Because they intrinsically invested themselves in the task, they were less willing to give up when the task was difficult. In education, teachers have the ability to design student work that is interesting and authentic. Furthermore, teachers can utilize engagement design qualities to mitigate challenges that students face when they are doing their work, thus remedying the need for students to utilize work avoidance behaviors.
The results of this study may inform instructional practices at the elementary school level when teachers aim to increase students’ perceived learning and achievement through increased student engagement. The state of Georgia implemented a new accountability system aimed at graduating students who are college and career ready upon completion of high school. Elementary schools are being rated on achievement indicators that predict high school readiness. For promotion to fourth grade, third grade students are required to pass the state test for reading. However, the new College and Career Readiness Performance Index utilizes reading, English language arts, mathematics, science, and social studies scores from grades three through five to assign a rating to schools. The Working on the Work (WOW) Framework encompasses more than just engagement design qualities. The framework provides conceptual understandings that promote changes in the way that educators ‘do’ school. Although teachers are unable to control the multifaceted factors that affect student learning outside the schoolhouse, teachers are able to impact student performance in two ways: the relationships they build with students and the quality of work they challenge students to undertake (Schelechty, 2011).

The WOW framework provides ten design qualities that can be incorporated into any content discipline to enhance student engagement. As stated before, assuming that all lessons and activities could be designed to elicit maximized student engagement would be impractical. However, teachers could identify a difficult concept for students and utilize the engagement design qualities to develop student work that intrigues students and elicits their interest and attention. The use of engagement design qualities holds promise for increasing perceived learning and student achievement. Although not demonstrated in this study, future studies may lengthen implementation of the design qualities in an effort to improve student attitudes toward
school. Using the engagement design qualities required an understanding of each design quality and effective implementation of the quality based on the needs of the students. All design qualities are not effective for all students. Teachers must work with students to help them determine the characteristics of their learning styles and use this knowledge to employ the design qualities effectively. Whereas many studies have determined the effectiveness of teacher feedback to students, teachers should consider allowing students to provide feedback to them.

Allowing students to give feedback can be unsettling for educators. However, when teachers view students as customers and utilize feedback to design lessons that truly engage their customers, great gains in student achievement can be made. Typically educators teach in the same way that their teachers taught them. Teachers may have difficulty altering their teaching style unless they work for administrators who have similar pedagogical thoughts and perceptions. Rather than completely transitioning from traditional methods, teachers are advised to incorporate and experiment with the engagement design qualities that complement their students’ learning styles.

**Limitations**

Multiple limitations existed in this study. The lack of randomization due to the use of pre-existing third grade classes provided a weaker design than the true experimental design (Campbell & Stanley, 1963), thus providing a threat to internal validity. Unfortunately, randomization of the sample was impossible because the convenience sample was taken from preexisting classes in the middle of a school year. Therefore, a quasi-experimental design was employed. In an effort to control for the lack of randomization, a pre-test was administered for each of the dependent variables. Using the pre-test for each of the dependent variables was
instrumental in addressing the internal threats of selection, participant history, maturation, and regression.

Generalizability may also be a limitation to this study. The assumption was made that the sample population was representative of all third grade students in the state of Georgia. However, schools utilized in the implementation of the engagement design qualities had a smaller population of low socioeconomic students as compared to the schools using traditional methods. To determine generalizability, future studies may be necessary that lend themselves to randomization.

Background knowledge was discussed in this study. Student history is another possible limitation. The Metro Atlanta school system utilized in this study reported a 45% mobility rate. Students participating in this study may have only been enrolled in the school for a short period of time before implementation began. Also, students had varying amounts of prior knowledge about the mathematics content standards before implementation of the study. This threat to internal validity was mediated through the use of a pre-test posttest design.

Implementation may have been a limitation to this study. Although classroom teachers participating in this study were required to implement the same curriculum content utilizing the county curriculum guides and Georgia Common Core Standards, participants in the experimental and control groups may have had alternative experiences. Every effort was made to ensure treatment fidelity. The assumption was made that both groups received the same content delivered in different ways. Similar teaching abilities were assumed for all teachers. However, ten teachers were used for this study. The assumption was made that the materials and supplies used by teachers, other than the specific engagement qualities, were comparable. Training was provided to the five teachers implementing engagement design qualities prior to beginning the
study. A detailed explanation of the training can be found above. Also, access to technology was similar for all ten classrooms. The researcher reviewed all lesson plans developed by the experimental group teachers and provided feedback on incorporation of the engagement design qualities. Together, the researcher and the mathematics research assistant performed four observations of random lessons to ensure effective implementation of the engagement design qualities and accuracy of mathematics content delivery. The researcher provided feedback to the teacher research assistants regarding the use of engagement design qualities, whereas the mathematics research assistant provided feedback regarding the accuracy of mathematics content delivery.

Researcher bias may have been evident in the study’s implementation. Because of the researcher’s preference for the use of engagement design qualities, the researcher paid specific attention to the data collected to control for this threat. Results were not manipulated. Objective methods were utilized to collect the data, as research assistants were utilized to input scores into SPSS and to grade the expert validated unit assessment. The researcher utilized a Bonferroni adjustment to control for error. Utilizing multiple observers and trainers with well-developed and collaborative background knowledge to develop common understandings of the engagement design qualities may help to further eliminate researcher bias in future studies.

To control for social threats of the John Henry Effect, the control group teachers were not given specifics of the research until all data was collected. Furthermore, teachers implementing the engagement design qualities and traditional methods were held confidentially from each group. Classrooms implementing the engagement design qualities were in different schools than classes using traditional methods.
Treatment fidelity utilizing the perceived learning questionnaire, Battle Student Attitude Scale Elementary Form, and the expert validated unit assessment may have been employed with minor differences among the groups. To ensure treatment fidelity, multiple processes were put in place. Students were required to self-report their perceived learning and attitudes toward school. Lack of objectivity may have created inaccuracies (Cronbach, 1970; Fiske, 1980; Kerlinger, 1973). However, standardized conditions were established to increase objectivity. A specific amount of time for testing, procedures for turning in the self-report to increase anonymity (fold in half and place in the envelope), and specific directions to limit the amount of interaction between the tester and test takers were strategies used to increase objectivity. Pre-test sensitization was a threat to external validity as well. However, the duration of the study was six weeks.

**Recommendations for Further Research**

Future research should focus on replication of the results of this study as well as studying the effects of the use of engagement design qualities in other content areas. Although mathematics was chosen as the content area for this study, engagement design qualities are replicable in all content areas to increase engagement for higher perceived learning, positive attitudes toward school, and increased achievement. To increase generalizability of the results of this study, further research should aim to explore the use of engagement design qualities in other content areas, grade levels, and populations. The majority of participants in this study were Caucasian females in a Metro Atlanta school system. Thus, to increase generalizability of the results of this study, further research is needed to explore other populations, such as African American males or other ethnicities and sexes in rural or urban settings. In addition to exploring other populations, future research should lengthen the duration of the implementation of the
engagement design qualities to determine if the length of implementation has a statistically significant effect on student attitudes toward school. This study spanned six weeks. Before implementation of the study, teachers spent four weeks learning about the Working on the Work Framework and planning instructional lessons and student work. Lengthening the study may allow the use of state tests rather than expert validated assessments, further eliminating the possibility of pretest sensitization with younger children.

Additionally, further research may consider the role of students in providing feedback on instructional tasks and student work. Whereas perceived learning and achievement were found higher for students participating in classes using engagement design qualities, students gave frequent feedback to the teacher regarding their satisfaction and understanding of instructional tasks. However, this is only one engagement design quality listed in the WOW Framework. Student feedback was not as prevalent in the review of the literature as the role of the teacher in giving feedback. Qualitative studies might explore the effects of student feedback on teacher development of instructional tasks. Furthermore, the Working on the Work Framework offers much in regards to students recognizing and reporting their own levels of engagement. Perhaps additional research could be aimed at student perceptions of their own engagement through the use of engagement profiles using the levels of engagement noted in the Working on the Work Framework.

Future studies may include a random sample allowing for a true experimental design, rather than using pre-existing classes to strengthen the design of the study (Gall, Gall, & Borg, 2007).
Conclusion

The purpose of this study was to determine the effects of classes using engagement design qualities on students’ perceived learning, attitudes toward school, and achievement. Results indicated that there was a statistically significant difference in perceived learning between students participating in classes using engagement design qualities as compared to classes using traditional teaching methods, with students participating in classes with engagement design qualities experiencing higher perceived learning. Furthermore, results of this study indicated that there was no significant difference in student attitudes toward school between students participating in classes using engagement design qualities as compared to students participating in classes with traditional methods. Results of this study indicated that there was a statistically significant difference in achievement between students participating in classes using engagement design qualities as compared to classes using traditional teaching methods, with students participating in classes with engagement design qualities experiencing higher achievement. Based on these results, classes using engagement design qualities were found to produce an increase in students’ perceived learning and achievement, suggesting the need for further examination of current pedagogy utilizing engagement design qualities in the elementary school to engage students in authentic and relevant instruction through high quality teacher designed student work.


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October 17, 2013

Michael Forehand
IRB Exemption 1632.101713: Working on the Work Framework for Engagement: Impacting Students’ Perceived Learning, Attitudes toward School, & Achievement

Dear Michael,

The Liberty University Institutional Review Board has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds your study to be exempt from further IRB review. This means you may begin your research with the data safeguarding methods mentioned in your approved application, and that no further IRB oversight is required.

Your study falls under exemption category 46.101(b)(1, 2), which identifies specific situations in which human participants research is exempt from the policy set forth in 45 CFR 46:

(1) Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as (i) research on regular and special education instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.

(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless:

(i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects’ responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects’ financial standing, employability, or reputation.

Please note that this exemption only applies to your current research application, and that any changes to your protocol must be reported to the Liberty IRB for verification of continued exemption status. You may report these changes by submitting a change in protocol form or a new application to the IRB and referencing the above IRB Exemption number.

If you have any questions about this exemption, or need assistance in determining whether possible changes to your protocol would change your exemption status, please email us at irb@liberty.edu.

Sincerely,

[Signature]

Division Chair
Counseling

(434) 592-4054

Liberty University | Training Champions for Christ since 1971
October 14, 2013

Liberty University
IRB Board

To whom it may concern:

Michael Forehand is authorized to conduct a research study in the County School District. He has permission to conduct an analysis of teachers’ ability to use “The Working on the Work Framework” instructional strategies based on data gathered from students through questionnaires, surveys and unit assessments for purposes of fulfilling research requirements. Confidentiality requirements of the County School System and the university’s Institutional Review Board must be followed.

If you have any questions, please contact me at extension.

Sincerely,

Director of Testing, Research and Evaluation
APPENDIX C: PARENTAL CONSENT FORM

CONSENT FORM

WORKING ON THE WORK FRAMEWORK FOR ENGAGEMENT: IMPACT ON STUDENTS’ PERCEIVED LEARNING, ATTITUDES TOWARD SCHOOL, AND ACHIEVEMENT

Michael Joshua Forehand
Liberty University
College of Education

Your child is invited to be in a research study of the implementation of the Working on the Work Framework with elementary school students in the [County] County School System. Your child was selected as a possible participant because he or she is between the ages of 8 and 11 years old. I ask that you read this form and ask any questions you may have before agreeing for your child to participate in the study.

This study is being conducted by Michael Joshua Forehand, a doctoral candidate with the College of Education at Liberty University in Lynchburg, Virginia.

Background Information:

The purpose of this study is to determine if there is a difference in students’ perceived learning, attitudes toward school, and achievement when students participate in classes where the teacher utilizes the engagement strategies presented in Phillip Schlechty’s “Working on the Work” Framework, as opposed to classes utilizing traditional teaching methods.

Procedures:

If you agree for your child to participate in this study, I would ask your child to do the following things:

- Take a perceived learning pre-assessment, attitudes toward school pre-assessment, and math unit pre-assessment. The perceived learning pre-assessment consists of one question and should only take one minute or less to complete. The attitudes toward school pre-assessment consists of multiple questions about your child’s perception of themself as a learner, other students, teachers, and school administrators and should take 10 minutes or less to complete. Finally, the math unit pre-assessment will consist of 15-20 questions that measure what your child is learning in mathematics. The assessment time of this test varies depending on your child’s understanding of the mathematical content assessed but will be delivered during the instructional day.

- Participate in daily classroom instruction. Math units vary from four to six weeks. Your child will be learning the same standards as all students in the [County] County School System.

- Take a perceived learning post-assessment, attitudes toward school post-assessment, and math unit post-assessment. The perceived learning post-assessment consists of one question and should only take one minute or less to complete. The attitudes toward school post-assessment consists of multiple questions about your child’s perception of themself as a learner, other students, teachers, and school administrators and should take 10 minutes or less to complete. Finally, the math unit post-assessment will consist of 15-20 questions that measure what your child is learning in mathematics. The assessment time of this test varies depending on your child’s understanding of the mathematical content assessed.

Risks and Benefits of being in the Study:

Risks encountered in this study are minimal and are no more than your child would encounter in everyday life.

There will be no direct benefits to participation.

Compensation:
Your child will not be compensated for 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 I will have access to the records. All paper documents will be address by participant numbers, rather than names. The data will be stored under lock and key in my office.

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 your and/or your child’s current or future relations with Liberty University or the County School System. If you decide to allow your child to participate, you and/or your child are free to not answer any question or withdraw at any time without affecting those relationships.

Contacts and Questions:

The researcher conducting this study is Michael Joshua Forehand. You may ask any questions you have now. If you have questions later, you are encouraged to contact him at mforehand@liberty.edu or (678) 416-6583. You may also reach the researcher’s advisor Dr. Mark A. Lamport at malamport@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, Suite 1837, Lynchburg, VA 24515 or email at irb@liberty.edu.

You will be given a copy of this information to keep for your records.

Statement of Consent:

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

Signature of parent or guardian: ___________________________ Date: __________________

Signature of Investigator: ___________________________ Date: __________________

IRB Code Numbers: 1632

IRB Expiration Date: 10/17/14
Assent of Child to Participate in a Research Study

What is the name of the study and who is doing the study?
My name is Mr. Forehand and I am doing a study called Engaging work to impact students' perceived learning, attitudes, and achievement.

Why am I doing this study?
I am interested to find out if teachers can create fun tasks for kids in order to help them to like school more and do better on their tests.

Why am I asking you to be in this study?
You are being asked to be in this research study because you are in the third grade.

If you agree, what will happen?
If you are in this study you will be asked to tell me how much you are learning in your math class now and how much you learned after a recent math unit. This will take 1 minute or less each time. Also, I will ask you to tell me about what you think about your school, friends, teachers, and principals. This will take about 10 minutes or less each time. Next, you will take a pre-test before you begin your next four to six weeks math topic. Then you will take a test after the unit to show what you learned.

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 tell the researcher. If you don’t want to, it’s OK to say no. The researcher 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 the researcher. If you do not understand something, please ask the researcher to explain it to you again.

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

Signature of Child ______________________ Date ______________

Michael Forehand, mforehand@liberty.edu, (678) 416-6583
Dr. Mark A. Lamport, malamport@liberty.edu
Liberty University Institutional Review Board,
1971 University Blvd, Suite 1837, Lynchburg, VA 24515
or email at irb@liberty.edu.
APPENDIX E: PERCEIVED LEARNING QUESTIONNAIRE(S)

PRE-TEST AND POST-TEST

Perceived Learning Questionnaire-Pre-Test
Circle one Number

On a scale of 1 to 10, with one (1) representing (not much) and ten (10)
representing (very much), how much have you learned in Math this school year?

1 2 3 4 5 6 7 8 9 10

Name: ____________________________

Perceived Learning Questionnaire-Post-Test
Circle one Number

On a scale of 1 to 10, with one (1) representing (not much) and ten (10)
representing (very much), how much did you learn during this math unit?

1 2 3 4 5 6 7 8 9 10

Name: ____________________________
APPENDIX F: BATTLE STUDENT ATTITUDE SCALE - ELEMENTARY FORM

Battle Student Attitude Scale

Form B: Elementary Form

Circle **MT** if the statement is **mostly true** or **true** for you.

Circle **S** if the statement is **half-true** and **half-false** for you.

Circle **MF** is the statement is **mostly-false** or **false** for you.

<table>
<thead>
<tr>
<th>MT</th>
<th>S</th>
<th>MF</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td>It is very hard for me to meet new people or talk to my whole class.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>2</td>
<td>I feel like I need to make excuses lots of times.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>3</td>
<td>Sometimes I will change the way I act just to make someone else like me.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>4</td>
<td>I worry if I think someone may not like me.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>5</td>
<td>I don't think I can be of much help to other people.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>6</td>
<td>When I first meet someone, I want to know if they like me.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>7</td>
<td>I don't think I deserve the good things some people say about me.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>8</td>
<td>I am often afraid because of something I have done wrong.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>9</td>
<td>I am often afraid because of something I might do wrong.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>10</td>
<td>I could be happier if I were not afraid of some things I think or do.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>11</td>
<td>It is hard for me to go to parties and other large groups.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>12</td>
<td>When my feelings change from happy to sad or sad to happy, I do not know why.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>13</td>
<td>I don't like some of the people in my class.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>14</td>
<td>I feel I am left out of most things at school.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>15</td>
<td>Members of my class do not know each other very well.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>16</td>
<td>I feel unhappy a lot of the time.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>17</td>
<td>Many people at this school leave others out of activities in school.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>18</td>
<td>A few students at this school run everything.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>19</td>
<td>Many of the students at this school do not act their age.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>20</td>
<td>Many boys and girls do not feel they belong at this school.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>21</td>
<td>Not much is done to help new students feel welcome at this school.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>22</td>
<td>It is hard for me to really be interested in the things some of my friends do.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>23</td>
<td>Most students at this school don't try to help other students who are in trouble.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>24</td>
<td>When I am first getting to know others my own age, I compare myself with them to see who is better.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>25</td>
<td>I think that the teachers usually will not listen to student ideas.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>26</td>
<td>I feel that few of the teachers are willing to help one student at a time.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>27</td>
<td>Some of the teachers favor girls more than boys.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>28</td>
<td>Some of the teachers favor boys more than girls.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>29</td>
<td>I feel that many of the teachers think I know less than I do know.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>30</td>
<td>It seems to me that some of the teachers often talk unkindly to students.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>31</td>
<td>It seems to me that several of the teachers are nervous and easily excited.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>32</td>
<td>Some of the teachers are always using words too big for me to understand.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>33</td>
<td>I believe that most of the teachers are too strict.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>34</td>
<td>The teachers expect too much of me.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>35</td>
<td>I believe I have a teacher who would give a higher grade because a student complimented him or her or did a favor for the teacher.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>36</td>
<td>I hate at least one of the teachers.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>37</td>
<td>I think that some of the teachers seem to feel that they are always right and the student is always wrong.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>38</td>
<td>I believe that some of the teachers try to make students afraid of them.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>39</td>
<td>It seems to me that some of the teachers are ‘bossy.’</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>40</td>
<td>I feel that none of the teachers grade ‘fairly.’</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>41</td>
<td>I believe that most of the teachers should be more pleasant and cheerful.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>42</td>
<td>I think that most of the teachers would rather not see and talk to me when school is out.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>43</td>
<td>I feel that the teachers do not want me to express my real opinion, thoughts, or ideas.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>44</td>
<td>I don’t think the things I am learning in school will help me when I am an adult.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>45</td>
<td>Students don’t get a chance to make friends in other rooms at this school.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>46</td>
<td>I believe there are too many rules in this school.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>47</td>
<td>Some students from special families get treated better than students from other families.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>48</td>
<td>The books and things we use in school are old and not up-to-date.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>49</td>
<td>I think things get torn up and treated badly at this school.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>50</td>
<td>My parents don’t know very much about my classwork or this school.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>51</td>
<td>I feel that the Principal does not like suggestions from the students.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>52</td>
<td>I think the Principal is too strict.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>53</td>
<td>I would not go to the Principal’s office to talk the Principal unless I was made to go.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>54</td>
<td>I don’t think the Principal would want to help me with a personal problem.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>55</td>
<td>I believe this school would run just as well without our Principal.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>56</td>
<td>I don’t know what our Principal does to make this school run better.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>57</td>
<td>There are many things about my Principal that I wish he or she would improve.</td>
</tr>
<tr>
<td>MT</td>
<td>S</td>
<td>MF</td>
<td>58</td>
<td>I believe this school could be run much better.</td>
</tr>
</tbody>
</table>

Name: ___________________________  Today’s Date: _______
1. Which number makes both number sentences true? (8-1)
   \[ 7 \times \_ \_ = 42 \]
   \[ 42 \div 7 = \_ \_ \]
   A 5
   B 6
   C 7
   D 8

2. Which number sentence is true? (8-7)
   A \[ 8 \div 1 = 1 \]
   B \[ 7 \div 0 = 7 \]
   C \[ 6 \div 1 = 6 \]
   D \[ 5 \div 5 = 0 \]

3. Fred has 18 apples he wants to put equally into 3 baskets. Which number sentence is in the same fact family as \[ 18 \div 3 = 6 \]? (8-2)
   A \[ 2 \times 3 = 6 \]
   B \[ 6 \div 3 = 9 \]
   C \[ 6 \times 3 = 18 \]
   D \[ 18 - 3 = 15 \]

4. Aliza bakes 5 trays of muffins. Each tray contains 6 muffins, for a total of 30 muffins. Which number sentence is NOT in the same fact family as the others? (6-3)
   A \[ 5 \times 6 = 30 \]
   B \[ 6 \times 5 = 30 \]
   C \[ 30 \div 5 = 6 \]
   D \[ 30 - 5 = 25 \]

5. Giselle has 40 tomato plants. She wants to put them into 5 rows with an equal number in each row. How many tomato plants will go in each row? (8-2)
   A 32
   B 20
   C 12
   D 8
6. There are 54 people going on a trip. They will travel in vans with 6 people in each van. How many vans are needed for all of the people? (8-3)
   A 9
   B 48
   C 60
   D 64

7. What number makes this equation true? (8-6)
   \( n \div 8 = 6 \)
   A \( n = 1 \)
   B \( n = 6 \)
   C \( n = 36 \)
   D \( n = 48 \)

8. Which number sentence is in the same fact family as \( 6 \times 9 = 54? \) (8-4)
   A \( 6 + 9 = 15 \)
   B \( 54 - 9 = 45 \)
   C \( 42 \div 6 = 7 \)
   D \( 54 \div 9 = 6 \)

9. Juan has 24 marbles and 6 bags. Write a number sentence that shows how many marbles he can put in each bag if he puts the same number of marbles in each. (8-9)

   Marbles in each bag

10. The picture below shows how 18 apples were arranged on a tray. Write a division sentence that can be written using the picture. (8-1)

11. Martin has 32 quarters in his piggy bank. He wants to trade them for dollars. There are 4 quarters in one dollar. How many dollars can Martin get? (8-8)
12. Joe has 72 marbles in 8 bags. Each bag has 9 marbles. Write a multiplication fact that uses these three numbers. (8-4)

13. Seven children have 7 crayons to share equally. How many crayons will each child get? (8-7)

14. What is the quotient of \( 36 \div 9 \)? (8-4)

15. Each group of tables in the cafeteria is set up in 3 rows with 3 tables in each row. Mr. Grant needs 27 tables for the open house. How many groups of tables does he need to set up? (8-5)

16. Mario buys tickets to a play for a group. There are 2 adults and 4 children in the group. Adults' tickets cost $8 each. Children's tickets cost $5 each. How much does he pay for all the tickets? (8-5)

17. Selma made 5 clay sculptures for her friends. If she gives 1 sculpture to each friend, how many friends will get a sculpture? (8-7)

18. Stephanie has a banner that is 32 feet long. She wants to divide it into 4 equal parts. What will be the length of each part? (8-6)

\[
\begin{array}{cccc}
\text{32 feet} \\
\hline
n & n & n & n \\
\end{array}
\]

\[
32 \div 4 = n
\]
### APPENDIX H: EDUCATOR QUALIFICATIONS FOR VALIDATION OF THE ACHIEVEMENT UNIT ASSESSMENT

<table>
<thead>
<tr>
<th>Educator</th>
<th>Position(s) Held</th>
<th>Years in Position</th>
<th>Degree(s)</th>
<th>Certifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3rd Grade Teacher</td>
<td>15</td>
<td>B.S; M.S; Ph.D</td>
<td>National Board</td>
</tr>
<tr>
<td>2</td>
<td>Asst. Professor of Math</td>
<td>19</td>
<td>B.S.; M.S; Ph.D</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Retired Superintendent</td>
<td>38</td>
<td>B.S.; M.S; Ed.S; Ed.D</td>
<td>Social Sciences</td>
</tr>
<tr>
<td>4</td>
<td>Statistician</td>
<td>21</td>
<td>B.S.; MBA; Ph.D</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Professor of Mathematics</td>
<td>26</td>
<td>B.S; M.S; Ph.D</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Director of Testing</td>
<td>20</td>
<td>B.S; M.S; Ed.S; Ed.D</td>
<td>Leadership</td>
</tr>
<tr>
<td>7</td>
<td>Principal</td>
<td>21</td>
<td>B.S; M.S; Ed.D</td>
<td>Leadership</td>
</tr>
<tr>
<td>8</td>
<td>Assistant Principal</td>
<td>13</td>
<td>B.S; M.S; Ed.S</td>
<td>Leadership</td>
</tr>
</tbody>
</table>
APPENDIX I: EXPERT VALIDATION OF UNIT PRE-TEST/POST-TEST

Common Core Standards

MCC3.OA.2 Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each.

MCC3.OA.3 Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

MCC3.OA.4 Determine the unknown whole number in a multiplication or division equation relating three whole numbers. For example, determine the unknown number that makes the equation true in each of the equations 8 × ? = 48, 5 = □ ÷ 3, 6 × 6 = ?, × ? = 48, 5 = □ ÷ 3, 6 × 6 = ?. Understand properties of multiplication and the relationship between multiplication and division.

MCC3.OA.5 Apply properties of operations as strategies to multiply and divide. Examples: If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known. (Commutative property of multiplication.) 3 × 5 × 2 can be found by 3 × 5 = 15, then 15 × 2 = 30, or by 5 × 2 = 10, then 3 × 10 = 30. (Associative property of multiplication.) Knowing that 8 × 5 = 40 and 8 × 2 = 16, one can find 8 × 7 as 8 × (5 + 2) = (8 × 5) + (8 × 2) = 40 + 16 = 56. (Distributive property.)

MCC3.OA.6 Understand division as an unknown-factor problem. For example, find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8. Multiply and divide within 100.

MCC3.OA.7 Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations.

MCC3.OA.8 Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

MCC3.OA.9 Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.

Educator # _____  Position(s) Held ___________________________  Years in Education ____

Degree(s) Held ________________________________________________________________

Certifications/Endorsements ______________________________________________________
Directions: Based on the attached assessment, please answer the following questions:

YES  NO  Does the test have clear, complete directions?
Comment/Suggestions:

YES  NO  Do the test questions measure the specific elements of the math standards listed?
Comment/Suggestions:

YES  NO  Do the test questions use the language of the standard?
Comment/Suggestions:

YES  NO  Is an adequate number of questions included per element for this standard?
Comment/Suggestions:

YES  NO  Do you think the level of the test is appropriate for third grade students?
Comment/Suggestions:

YES  NO  Do you think that students will have sufficient time to complete this test in a 30-45 minute class time?
Comment/Suggestions:
APPENDIX J: EXAMPLE OF LESSON PLANS WITH ENGAGEMENT STRATEGIES IDENTIFIED

Division as Sharing 7-1

BAKERY THEME

Objective

Domain: Operations and Algebraic Thinking

Objective: Use models to solve division problems involving sharing and record solutions using division number sentences.

Essential Understanding: Sharing involves separating equal groups and is one way to think about division. [content and substance]

EQ: How can you think if division as sharing?

Vocabulary: division, sharing, quotient, divisor, dividend, equal groups

Materials: two color counters, index cards, pumpkin

National Standards

3.OA.A.2 Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each.

Problem of the Day: Subtraction review—Solve with multiple strategies - Relate it to Bakery Theme

If we bake 385 cookies on Monday and 429 on Friday. How many more did we bake on Friday than Monday?

Number Talk: 73-25=48
Activating Strategy

Word splash: Share

Develop the Concept Concretely

Give students colored counters and index cards. The color counters represent lemon pies and cherries pies that were baked at the bakery. Have students solve the following problems using the idea of pies and people in the bakery.

a) 20 cherry pies, 4 people, how many does each person get to take home
b) 20 lemon pies, 2 people, how many does each person get to take home
c) 20 cherry pies, 1 person, how many does he get to take home

Discuss: When did the people get less pies and why?

Have students CHOOSE a friend (affiliation) to give scenarios for the following division problems: 15/3; 16/4; 18/6

Develop the Concept Representatively

Organization of knowledge: It's time for the students to go on a field trip to get pumpkins for the pumpkin pies they have to make.

We have 21 students who will be baking pumpkin pies. There are 3 buses to take us to the pumpkin patch. If we want an equal number of students one each bus, how many students will be on each bus?

Encourage students to draw buses and students on their papers to solve.

Model part-whole boxes and groups

Develop the Concept Abstractly

We get to the pumpkin patch and there are 6 pumpkins in a spot. If two people are to pick the pumpkins, how many will each student pick? Estimate: Will the answer be more than 6 or less than six? Discuss: How can you solve this in your head?

Close and Assess
When sharing, are groups always going to be equal? Open a pumpkin and have students grab a handful of seeds (small groups). Count the seeds, share the seeds with the group members. Draw a picture to show happened in the group. **Product Focus; Affiliation; Authenticity**

**Differentiate**

Center activities are differentiated by ability.

**Homework**  **My Notes**

P7-1 and R7-1

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**Division as Sharing**  **Division as Repeated Subtraction 7-2  Bakery Theme**

**Objective**

**Domain:** Operations and Algebraic Thinking

**Objective:** Use models to solve division problems involving repeated subtraction and record solutions using division number sentences.

**Essential Understanding:** Repeated subtraction involves separating equal groups and is one way to think about division. *(content and substance)*

**Essential Question:** How can you think of division as repeated subtraction?

**Vocabulary:** repeated subtraction, division, divisor, dividend, quotient, equal groups

**Materials:** pumpkin seeds, index cards *(novelty and variety)*

**National Standards**  **AAC3F649DC7B1**
3.OA.A.2 Interpret whole-number quotients of whole numbers, e.g., interpret $56 \div 8$ as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each.

**Problem of the Day:** Spiral back to addition - Yesterday I counted the pumpkin seeds. One group had 134 seeds, another group had 86 seeds, and the other had 109. How many seeds did they have in all?

**Number Talk** $87 + 45 = 132$

**Activating Strategy**

**Compare and contrast subtraction and division**

**Develop the Concept Concretely**

Give each student 12 pumpkin seeds and some index cards from yesterday. Our task is to give as many people as possible 2 seeds. How do I do this? Explain your reasoning. Use your seeds. (authenticity, product focus, novelty and variety)

Record student responses on the board to provide feedback.

Use the same 12 seeds to give people 3 seeds each. How many friends will get seeds? This provides multiple attempts to increase understanding with feedback. (protection from adverse consequences or initial failures)

**Develop the Concept Representatively**

Choose one of the following tasks to solve: choice

Task: The bakery has saved 28 pumpkin seeds to use for decoration. If they put 4 seeds on each pie they bake. How many pies will they be able to bake before they run out of seeds? Show your mathematical thinking and explain your reasoning in words.

Task: The bakery has saved 48 pumpkin seeds to use for decoration. If they put 8
seeds on each pie they bake. How many pies will they be able to bake before they run out of seeds? Show your mathematical thinking and explain your reasoning in words.

Task: The bakery has saved 16 pumpkin seeds to use for decoration. If they put 2 seeds on each pie they bake. How many pies will they be able to bake before they run out of seeds? Show your mathematical thinking and explain your reasoning in words.

**Develop the Concept Abstractly**

If we had 28 pumpkin seeds and we put more than 4 seeds on each pie, would we be able to bake more or fewer pies. Why? (authenticity)

**Close and Assess**

Create your own definition of division and share it with a friend. (affirmation of performance).

**Differentiate**

Center activities are differentiated by ability. (affirmation of performance)

**Homework My Notes**

R7-2, P7-2

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**Finding Missing Numbers in a Multiplication Table 7-3 Bakery**

**Theme**

**Objective**

Domain: Operations and Algebraic Thinking
Objective: Use multiplication tables to find answers to division problems.

Essential Understanding: Any division problem can be thought of as a multiplication fact showing a missing factor. Then, an answer can be found using a multiplication table. (content and substance)

Essential Question: How can you use a multiplication table to solve division problems?

Vocabulary: division, multiplication

Materials: multiplication chart, apples, apple pies, playdoh, index cards

National Standards

3.OA.B.6 Understand division as an unknown-factor problem. For example, find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8

Problem of the Day: Spiral Back - Division as Sharing - Today we’re baking apple pies. If I have 36 pies and I want to share them equally between 6 people. How many pies will each person get? (Use manipulatives if necessary) (organization of knowledge)

Number Talk: 198-176= 22

Activating Strategy

View the recipe for an apple pie. Have a pie to taste. (authenticity)

Develop the Concept Concretely

Give each student a multiplication chart and have students find the product of 3 equal groups of 6. Once they find the product have them write it on a sticky note. (18)

Give groups (choice: affiliation) of three playdoh. Together they should make 18 apples using the playdoh. After they have 18 apples, they need to share the apples to make 3 pies (index cards). How many apples are there in each pie? Have students explain how their answer correlates to the multiplication fact 3 x 6 = 18.

In the same groups, students should use the multiplication table to identify a
multiplication fact (record it on a sticky). They should use the playdoh to show how
the multiplication fact relates to division (make apples and share them among the
pies). Students should also record the division equation on the sticky note with the
multiplication equation. (Repeat until time is called)

**Develop the Concept Representatively**

If you have 45 apples to make 9 apple pies, and you want to share the apples equally.
How many apples will go in each pie? Have students draw a picture and explain their
reasoning using a mathematical explanation. *(product focus)*

Use the generic rubric: *(Clear and compelling product standards)*

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<thead>
<tr>
<th><strong>Not there yet- 1</strong></th>
<th><strong>Getting Closer to Goal- 2</strong></th>
<th><strong>On Target- 3</strong></th>
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<tr>
<td>Makes significant errors or omissions, uses unsuccessful approaches to solve math problems</td>
<td>With help from an adult/peer makes some errors or omissions, but uses successful approaches in solving math problems</td>
<td>Completes the task with only minor errors, uses successful approaches to solve math problems</td>
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**Develop the Concept Abstractly**

\[
\frac{21}{3} = n \text{ so } 3 \times n = 21 ; \text{ Solve for } n.
\]

**Close and Assess**

Compare and Contrast multiplication and division in small groups.
Complete an interest survey: Movie Rating *(novelty and variety)*.

**Differentiate**

Centers are differentiated by ability. *(protection from adverse consequences for initial failures)*

**Homework** My Notes
Problem Solving: Choose an Appropriate Equation 7-4

Objective

Domain: Problem Solving

Objective: Solve word problems by writing equations that represent the problem situations

Essential Understanding: Frequently word problems can be solved by writing equations that represent the quantitative relationships involved. (content and substance)

Essential Question: How can you describe a problem situation using an equation?

Vocabulary: division, multiplication, equation, inverse

Materials: unifix cubes, plates, dry erase boards, markers

National Standards

3.OA.A.4 Determine the unknown whole number in a multiplication or division equation relating three whole numbers. For example, determine the unknown number that makes the equation true in each of the equations 8 x ? = 48, 5 = ? ÷ 3, 6 x 6 = ?.

Problem of the Day: Spiral Review- Multi-step multiplication and subtraction
On the field trip to the pumpkin patch there were 4 buses. Each bus had 12 kids on it. When the kids got off the bus 8 students went to the bathroom. How many students were left?

Number Talk: 247 + 28 = 275
Activating Strategy

Work with a partner to create all the equations you can using the number 24.

Develop the Concept Concretely

Give students unifix cubes to represent cupcakes and plates to represent ovens. Pose the following scenario and have students act it using manipulatives. Students may work with a friend.

We baked 24 cupcakes using 4 ovens. If each oven had an equal amount of cupcakes, how many cupcakes were in each oven? On a dry erase board create as many equations as possible to go with the scenario (24-4-4-4-4-4=0, 24/4=n, n x 4 = 24, n + n + n + n = 24, 4 x n = 24) Discuss findings as a class to give students examples of equations they may not have thought of.

Pose the following to solve again. Hopefully students will think of more equations on their own.

If we bake 20 hours each week to complete orders and we’re open for 4 hours each day. How many days a week are we open? List as many equations as possible that go with the scenario.

Develop the Concept Representatively

Actually bring 21 cookies to share with the students after the problem is solved. You can use the cookies to show the scenarios that the students create.

At the bakery we have 21 cookies to bake on three pans. If each pan has an equal amount of cookies, how many cookies will be on each pan? List all the possible equations that could be used to help you solve the problem. Draw a picture if necessary! Explain your answer using mathematical explanations.

Share your answer with a friend. If your friend has an equation you don’t have, add it.
Develop the Concept Abstractly

Write a story problem for the following equation $3 \times n = 15$. Be sure to think of other equations that mean the same thing as $3 \times n = 15$.

Close and Assess

How does understanding the relationship between multiplication and division help with finding equations to word problems?

Differentiate

Centers are differentiated by ability.

Homework My Notes

P7-4, R7-4

Relating Multiplication and Division

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Objective

Domain: Operations and Algebraic Thinking

Objective: Give a multiplication fact, state a related division fact, and vice versa

Essential Understanding: Multiplication and division have an inverse relationship. (content and substance)

EQ: How are multiplication and division related?

Vocabulary: dividend, divisor, quotient

Materials: center materials, real life arrays, counters,

National Standards AAC3F649DC7BI

3.OA.C.7 Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that $8 \times 5 = 40$, one knows $40 \div 5 = 8$) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.
Problem of the Day: At next Fall Festival, one of our challenges is to plan for Dart Game. 24 balloons will be used. Explore all rectangular possibilities (arrays) of using 24 balloons. State accompanying multiplication and division sentences to explain each possible arrangement of balloons (array).

Activating Strategy Show real-life arrays (ex: like ones Maria used on ipads w/ intro of multiplication) Describe arrays as many ways as possible. Require students to include descriptions beginning with total number of objects in the array rather than with recognition of number of columns and rows. Introduce students with challenge of helping to plan for next Fall Festival. Relate some of real life arrays that could be part of festival (ex: cupcakes, cases of drinks, cups, plates, etc.) Expand discussion or real-life arrays to include both division sentences that apply to prepare for work with Fact Families.

Develop the Concept Concretely – Provide students with 24 counters. Encourage (but not require) partner work. Whether or not students work with a partner, each has designated “shoulder buddy (affiliation)” Remind students that rectangular arrangements (arrays) are required. Students orally share possible solutions with other students. Encourage students describe solutions in more than one way to reinforce commutative property of multiplication. Lead students into verbalizing division sentences shown in arrays, focusing on new vocabulary (dividend, divisor, quotient). Allow students time to practice using the new terms with their partner.

Develop the Concept Representatively: Repeat the process using 16 concrete items. After building a model of an array with 16 objects, have each student provide pictorial model of each solution (organization of knowledge). Encourage discovery of multiple solutions. When discussing possible arrays, require students to label dividend, divisor and quotient in drawings of arrays.

Develop the Concept Abstractly- Use fact family relationships to solve multiplication and division sentences.

Close and Assess Provide small groups of students with multiple possible scenarios related to planning and preparing for a Fall Festival in which students must use multiplication and/or division (authenticity). Provide access to manipulatives for students to use in finding solutions, but also require illustrated models with verbal explanations. Finally, have students write multiplication and division sentences to express possible solutions. Students work collaboratively to be sure each solution set includes all possible multiplication and division sentences, and that these relationships form Fact Families (protection from adverse consequences for initial failures).

Differentiate- Center Activities will include opportunities to form fact families from a variety of models to represent real-life application of multiplication/division situations in planning/participating in Fall Festival.

Challenge: Provide similar examples working with higher quantities.

Remedial: Have students sort models/descriptions to show different fact families

ELL: Provide extended opportunities with usage of new vocabulary.

Homework P8-1 and R8-1
Objective

Domain: Operations and Algebraic Thinking

Objective: Give quotients for division facts with divisors of 2, 3, 4, and 5.

Essential Understanding: The inverse relationship between multiplication and division can be used to find division facts; every division fact has a related multiplication fact.

EQ: How can understanding relationships between multiplication and division help solve division problems?

Vocabulary: dividend, divisor, quotient

Materials: index cards with varying amounts of prizes and bags for partners to apply multiplication fact in solving, paper/pencil for recording solutions and manipulatives to defend answers

Easy- 14 prizes, 2 bags- How many in each bag?
Average- 18 prizes, 3 in each bag- How many bags?
Challenge- 36 prizes, 4 bags- How many in each bag?

Problem of the Day: Review- Multistep problem involving finding value remaining tickets after spending part of tickets at Heard-Mixon’s Fall Festival
Ex: Mrs. Jones bought 24 tickets for fall festival for .50 each, and she used 8 tickets on pizza and 12 tickets on the cake walk. What is the value of her remaining tickets?

Math Talk Missing Addend \[ 24 + \_ = 82 \] ****Create Fall Festival connection
Include multiple strategies in discussion (choice in strategies utilized) (affiliation as students paraphrase strategies used by peers)

Activating Strategy While Auction Baskets for Fall Festival, Mrs. Gilbert put 30 items into 5 baskets. She put an equal number of items into each basket. How many items were in each basket? Write a division sentence to solve. Show your work. Students are given time to work in pairs to solve before being invited to compare their solutions with students from another group. (affirmation of performance)
Line to prior knowledge by writing other multiplication and division sentences from the fact family of the solution to word problem.

Develop the Concept Concretely Provide students with a variety index cards with varying amounts of prizes and bags for partners to apply multiplication fact in solving along with and manipulatives to defend answers (index cards should have color code to show level of difficulty - red (easy), yellow (average), green (challenge) (affiliation, protection from adverse consequences for initial failures)

Develop the Concept Representatively Provide paper/pencil for recording solutions. With partner’s help, students draw model and record related division sentence that represents solution. Encourage students to use variety of strategies in checking work (repeated subtraction, number jumping, part-whole box, etc.) (novel and variety)
Develop the Concept Abstractly  If our class meets in the cafeteria to eat pizza during the Fall Festival, how would 54 pieces of pizza be shared equally with 18 people? What division sentence could be used to solve this problem? Support answers with a model before sharing strategy with a friend.

Close and Assess  Write 2 division number sentences using the three numbers 7, 28 and 4. Then use the same numbers to write two other number sentences. Label each number with its special math name. Create a possible Fall Festival situation involving your number sentences.

Differentiation  Center activities provide reinforcement of skills and are differentiated by ability and/or choice (affirmation of performance) content and substance

Homework  R 8-2 and P8-2

Fact Families with 6 and 7

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Division as Sharing

Objective  Domain: Operations and Algebraic Thinking

Objective: Give quotients for division facts with divisors of 6 and 7

Essential Understanding: The inverse relationship between multiplication and division can be used to find division facts; every division fact has a related multiplication fact.

EQ: How can the inverse relationship between multiplication and division be used to solve division problems?

Vocabulary: dividend, divisor, quotient

Materials: small cups to model Ping Pong game set up

Design Qualities of Context: content and substance, organization of knowledge, protection from adverse consequences for initial failures

Design Qualities of Choice: product focus, affirmation of performance, affiliation, novelty and variety (work varied in methods and format so students use variety of skills, media and modes of analysis) choice (in ways of doing work and methods of presentation), authenticity (related to consequences in present lives of students)
3.OA.C.7 Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 x 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.

Problem of the Day:

Math Talk:

Activating Strategy

Develop the Concept Concretely One of our jobs in setting up for Fall Festival is to arrange cups for Ping Pong game in which people try to ring the cups with the Ping Pong balls. If 18 cups are used in this game, how many cups will be in 6 rows? Provide cups to model finding solution. 

Develop the Concept Representatively Allow time for students to solve problem and draw/build model to support answers. Require math sentences (division) to describe process. Share models with at least one other group and compare/contrast strategies used to find answers. Provide time for students to add to or edit work after collaborating with other students.

Develop the Concept Abstractly Explain to students that different ages play the Ping Pong toss differently. For example Adults use 36 cups with 6 cups on each row. 3rd, 4th and 5th graders play with 28 cups in 7 rows, and 2nd graders and below play with only 12 cups in 6 rows. Work with a partner and draw a model and write a division sentence to support model of each of these cup arrangements. Record related multiplication fact(s) that are related to division sentence used in each solution.

Close and Assess Write a story to tell how/why/where Mr. Sheppard might arrange 42 chairs and 6 tables at our Fall Festival. Draw a model and write multiplication/division sentences to clarify your story.

Differentiation Center activities provide reinforcement of skills and are differentiated by ability and/or choice

Homework R 8-3 and P8-3

Fact Families 8 and 9

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Objective Domain: Operations and Algebraic Thinking

Objective: Give quotients for division facts with divisors of 8 and 9.
**Essential Understanding**: The inverse relationship between multiplication and division can be used to find division facts; every division fact has a related multiplication fact.

**EQ**: How can inverse relationships between multiplication and division be used to find answer to division problems?

**Vocabulary**: dividend, divisor, quotient

**Materials**: 72 rings,

**National Standards**

3.OA.C.7 Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 x 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.

**Problem of the Day**: If Mrs. Hargrove buys each one of her 3 boys a bracelet to wear at Fall Festival instead of buying tickets, how much change would she get back from a $50 bill? Show how you would find your answer. authentic

**Number Talk**: 233 – 57 =

Provide time for students to verbalize strategies utilized in solving this problem. Share multiple approaches. Students restate other student's explanations of strategies used affirmation of performance, choice

**Activating Strategy**

Our room mom needs to help set up for the Ring Toss game at Fall Festival. She dumped 72 rings from 8 different boxes into a bucket to be used in the game. How many rings were in each box? Work with a partner to write and solve a division sentence for this problem. Show your work with a model. Affiliation organization of knowledge

Ask: What division sentence can be used to find out how many boxes of rings there were? (72 divided by 8)
What question do you ask yourself to solve this problem? (8 times what number equals 72?) What multiplication fact can help solve this problem? (8 x 9 = 72)

***USE PART WHOLE BOX TO SHOW WORK

**Develop the Concept Concretely** On the board (or on index cards) write: 48 rings- boxes of 8-How many boxes?
36 balloons- 4 equal rows- How many in each row?
64 pizzas of pizza, 8 pieces in whole pizza- How many whole pizzas?
96 people on jumpers, 8 people jump at a time- How many different groups of jumpers?

Students work with a partner Affiliation to think of a multiplication fact to help solve each problem. Write the multiplication fact and division problem.

**Develop the Concept Representatively**- Draw a model and write related multiplication and division facts used in one of the solutions above. Use a part/whole box to help explain your work. organization of knowledge

**Develop the Concept Abstractly** Write your own division problem that can be solved by dividing 8 or 9. Exchange problems with a friend and solve. affirmation

**Close and Assess** Mrs. Jones tore tickets in 63 tickets in strips of 7, but she can’t remember how many people bought the strips. To make it even worse, she doesn’t remember what number times 7 equals 63. How could you help Mrs. Jones find the quotient of 63 divided into groups of 7? Explain your plan step by step.
Differentiation

Center activities provide reinforcement of skills and are differentiated by ability and/or choice (affirmation of performance) content and substance.

Homework- R8-4 and P8-4

Problem Solving: Multiple Step Problems

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<th>Problem Solving</th>
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<tr>
<td>Objective:</td>
<td>Use previously learned skills to solve multiple-step problems.</td>
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<tr>
<td>Essential Understanding:</td>
<td>Some problems can be solved by first finding and solving one or more sub-problems and then using the answer(s) to solve the original problem</td>
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<tr>
<td>Vocabulary:</td>
<td>divisor, dividend, quotient</td>
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<td>Materials:</td>
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3.OA.A.3 Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

Problem of the Day: Your friend from the other class bid $12 on the Hunting Basket, $15 on Sports Basket, and $13 on Chocolate Lover’s Basket. He has $35 to spend at the Fall Festival. Will he have enough money if he wins all three baskets? Why or why not?

Model with Teaching Tool 1 from Envision to help with organization of information. organization of knowledge

With multi-step problems, focus on finding the “hidden question” (Step 1) and being sure not to stop working until gaining the information needed to answer the “final question.”

Activating Strategy Show addition fact family for 2 and 3 as addends, as well as a multiplication fact family with 2 and 3 as factors. Compare/contrast each. Use analogies to reinforce math vocabulary: addition is to __________ like multiplication is to division; multiplication is to addition as _______________ is to subtraction

Tell students that today we will be using a variety of operations as we plan for our Fall Festival. Continue using Teaching Tool 1 from Envision to help with organization of information. organization of knowledge

With multi-step problems, focus on finding the “hidden question” (Step 1) and being sure not to stop working until gaining the information needed to answer the “final question.”

Develop the Concept Concretely Work with a partner to solve following:
Three girls and four boys planned to go to Fall Festival together. The total cost of their tickets was $42. They paid the same amount for each ticket. What was the cost of each ticket? Work with a partner and use any method you choose to solve the problem. Use Problem Solving Recording Sheet (Teaching Tool 1 from Envision) (Provide work time, access to money as well as other manipulatives, choice and then invite students to share their solutions with others.) affirmation, affiliation

Develop the Concept Representatively: Ask groups to draw a model to show how they found the cost of each ticket. Require students to write a related number sentence to help them solve the problem.

Explain to students that we are creating a book to help in planning for future Fall Festivals. Present rubric to be used in grading. Clear and compelling standards

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<td>Completes the task with no errors when solving real-world problems which require multi-step operations.</td>
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Have premade index cards with multi-step problems for students to draw from a bag. When they get multi-step problem, they are to work together to identify the hidden question needed in order to ask the "final" question. Then students work together to find the answer to their word problem. A variety of prizes, game items, and other items needed in preparation for Fall Festival will be available for students' to use with models, as well as a problem solving sheet like one used earlier in lesson (optional). Teachers should take pictures of student models to go with their story problems in the book. Feedback will be provided throughout. Protection from adverse consequences for initial failures.

If students complete one, they may do more if time allows.

Develop the Concept Abstractly

When is a time when you have needed to solve a real-life problem requiring more than one step? How did you find your answers?

Close and Assess

Share process used in solving multi-step problems with other students (book entry).

Differentiate

Centers are differentiated by ability.

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Domain: Operations and Algebraic Thinking

Objective: Use multiplication and division facts to decide if both sides of an equation are equal; find the value
of an unknown number in an equation.

**Essential Understanding:** Multiplication and division equations show a balance between what is on the right side and what is on the left side of the equal sign.

**EQ:** What must happen to balance multiplication and division equations? How can math equations show this balance?

**Vocabulary:** no new vocabulary

**Materials:** pan balance

---

**National Standards**

3.OA.A.3 Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

**Math Talk:** Use Adjusting one number to make an easier problem strategy (with subtraction): 123 – 59

Add 6 to 123 to get digit on top to be easier to work with, then adjust answer. 59 + 1 = 60. 123 – 60 = 63 + 1 = 64

**Activating Strategy**

Have students try to balance a pencil by horizontally placing it on their pointer finger.

Ask: What does the word balance mean to you? What are some situations in which you might hear/use the word balance?

Today we will be working with using the equal sign as a balance between two sides of a multiplication and/or division equation.

**Problem of the Day:** Draw pan balance on board to show 24/6 on right side. Tell students that one game at Fall Festival requires finding as many ways as possible within a specified amount of time to equal a certain amount. In this case, the challenge is to write as many equations as possible to make the balance scale (see saw) equal to the quotient in the given equation which is 24/6.

**Develop the Concept Concretely**

Students will continue to work with a pan-balance metaphor as a representation of a mathematical equation by working together to find as many solutions as they can to the preceding equation. Use square tiles or similar other manipulative to help represent solutions. Encourage students to consider a variety of operations in their explorations. Have balance pans available to check answers.

**Develop the Concept Representatively**

Students draw model and write math equations to express solutions after verifying accuracy with balance pan. Require multiple possible solutions.

**Develop the Concept Abstractly**

Write 15 on the left side of a drawing of a balance pan. Write n x 3 on the left side of the balance pan. Tell students that a seesaw on the playground had a 15 pound pumpkin on the right side. Ask them to find out what number (n) of pound pumpkins would be needed to balance the seesaw.

Provide other similar problems with a variety of difficulty to offer differentiation.
Close and Assess: Challenge students to create their own equations, provide model and math sentences to express their solutions.

Differentiation (see previous activity)

Center activities provide reinforcement of skills and are differentiated by ability and/or choice (affirmation of performance) content and substance.

Homework R8-6 and P8-6

**Multiplication and Division Facts**

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Objective

Domain: Operations and Algebraic Thinking

Objective: Use multiplication facts and division facts to solve problems.

Essential Understanding: Patterns and known facts can be used to find unknown multiplication facts. Division facts can be found by thinking of a related multiplication fact

EQ: How can patterns and/or known facts be used to find unknown multiplication facts?

Vocabulary: no new vocabulary

Materials: about 10 index cards for each partner group of students, approximately 40 discs or 1 in tile squares to represent people/chairs, pair of dice for each partner group, paper/pencils for recording fact family, real-life table/chair situations applicable in preparing for Fall Festival

To be used in representative/connecting activity:

Ex: If there are 48 people and 4 chairs at each table at BINGO game, how many tables would be needed?

If there are 12 tables to put the 6 baskets to be auctioned off at Silent Auction, how many baskets would be on each table?

Abstract: provide mixture of possible prizes, index cards with division sentences (include a few w/ missing fact like 6 x _____ = 24) that could be situations in which prizes need to be divided

**CHALLENGE** If 64 people are in cafeteria eating dinner and 16 seats are at each table, how many tables are needed?

**CHALLENGE** Mrs. Hargrove’s 3 boys have 12 dollars in quarters to share equally. How many

National Standards AAC3F649DC7BI

3.OA.C.7 Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 x 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers

Math Talk: Use Adjusting one number to make an easier problem strategy (with subtraction):
Add 7 TO 92 to get digit on top to be easier to work with, then subtract 69 from 99 to get 30. Adjust by subtracting 7 to get 33. **students will need to be able to count back to do this**

Activating Strategy
Problem of the Day: There are 4 quarters in a dollar. You have 12 quarters left to spend. Cotton candy costs 4 quarters. How many cotton candies can you buy with 12 quarters? What number times 4 is 12? **authenticity**

Use quarters to assist with this problem. After solving problem, list both multiplication and division facts in this fact family.

Develop the Concept Concretely Tell students that part of planning for a Fall Festival involves arranging furniture. Specifically, tables need to be arranged in the cafeteria for our Heard-Mixon Cafe. There are 56 people and 7 tables. Work with a partner and use index cards to represent tables and 2 color discs to represent people. Solve to find out how many people would sit at each table. Partners find another pair of students and orally describe process used to determine answer. Teacher promotes/observes/praises successful productive talk. Extend discussion by requiring verbalization of all multiplication/division sentences included in fact family of solution. Before moving to next level, take time to remind students of variety of strategies that could have been used: repeated subtraction, part/whole box, drawing array, repeated subtraction. During this discussion teacher creates visual for future reference. **variety**

Develop the Concept Representatively Give students a mixture of possible Fall Festival prizes and index cards with division situations prewritten on them. Tell students they are planning for prize distribution. **authenticity** Encourage partners to solve each and support solution by drawing a model and recording math sentence and its solution on index card. Encourage them NOT to take time to draw actual item, but to represent it instead with a quicker symbol. Also encourage proving answer by using more than one division strategy. While observing work, teacher praises different ways to showing answer (arrays, equal groups, repeated subtraction) **affirmation**

Develop the Concept Abstractly Give each group of 2 students a pair of dice. Students roll dice to determine factors to be used in creating multiplication/division fact family sentences. Partners share task of writing one multiplication sentence each and one division sentence for each set of factors. **Affiliation**

Close and Assess Each partner group join with another group and “Share and Compare” answers. Adjust answers if needed. **affirmation of performance**

Differentiation Center activities provide reinforcement of skills and are differentiated by ability and/or choice (affirmation of performance). **content and substance**

Homework: R8-8 and P8-8
Objective
Domain: Problem Solving

Objective: Solve division problems involving sharing and repeated subtraction by drawing a picture and writing a number sentence.

Essential Understanding: Information given in a problem can often be shown in a picture or diagram that can be used to understand and solve the problem. Some problems can be solved by writing and completing a number sentence or equation.

EQ: What strategies can be used to assist with problem solving? How can models/pictures help you?

Vocabulary: No new vocabulary

Materials: 48 pieces of candy corn/ M&Ms/Smarties and 4 sorting cups (cupcake papers) per child

Design Qualities of Context: content and substance, organization of knowledge, protection from adverse consequences for initial failures

Design Qualities of Choice: product focus, affirmation of performance, affiliation, novelty and variety (work varied in methods and format so students use variety of skills, media and modes of analysis) choice (in ways of doing work and methods of presentation) , authenticity (related to consequences in present lives of students)

National Standards

3.OA.A.3 Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

MATH TALK: Review division by giving a division sentence and discussing variety in strategies available in solving

Activating Strategy: Show Pumpkin Card used at Fall Festival. Discuss its use, then discuss its array-arrangement.

Problem of the Day: At the next Fall Festival, you have a Pumpkin Card to share with 3 other friends (4 total) If the card is shared equally, how many pumpkins would each get to spend? Draw a model and show math sentence to prove your answer. ***Accept and praise any model used, but be sure to include part/whole box model before moving on! Affirmation, protection from adverse consequences for initial failures

Develop the Concept Concretely: Provide students word problem with situations related to concrete item provided. Authentic Students use sorting cups and edible item to find quotient/product.

Possibilities:
You have 24 prizes to divide equally with 3 people. How many prizes will each person get?**You may want to go ahead and to representative part for this problem before going to next one.

After Fall Festival you had 32 pieces of candy to share equally 4 ways. How many pieces will each person get?**Do representative part before moving on

**CHALLENGE You have 48 treats to share with your best friend. How many pieces will each get**Do representative part before moving on
TAKE ADVANTAGE OF OPPORTUNITY IN GAINING FAMILIARITY W/ PART WHOLE MODEL

**Develop the Concept Representatively** Students draw model and write sentence to show how answer in above problems to found. ****Require part/whole box model organization of knowledge

**Develop the Concept Abstractly** Give this problem. Have students draw model (other than part whole box) and write math sentence to show solution. Use part/whole box model as way of representing the solution.

24 children went on a hayride, but only 6 could go at a time. How many hayrides were necessary for this to happen?

**Close and Assess** Share work with shoulder buddy/partner. **Affirmation**
Reinforce 3 crucial parts in problem solving: 1) DRAW A MODEL  2)WRITE NUMBER SENTENCE TO SHOW HOW YOU SOLVED  3) BE SURE YOU ANSWER THE QUESTION BEING ASKED!

**Differentiation** possible challenge situations:
There will be 3 inflatables at Fall Festival. 27 kids are in line to jump/play. If kids are equally divided among the inflatables, how many kids would be in each? Draw a model and write a math sentence to show your work. Use a part/whole box to show your answer.

If 28 people can participate in Cake Walk at one time and each time there are 4 cakes given away, how many Cake Walks would it take to use all of the cakes? Draw a model and write a math sentence to show your work. Use a part/whole box to show your answer.

Center activities provide reinforcement of skills and are differentiated by ability and/or choice (affirmation of performance) content and substance

Homework P8.9 and R8.9