Fall 12-2011

A Quantitative Study of Learning in the School Cafeteria Using Educational Placemats

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The University of Southern Mississippi

A QUANTITATIVE STUDY OF LEARNING IN THE SCHOOL CAFETERIA

USING EDUCATIONAL PLACEMATS

by

Keshia Lasha Gaines

Abstract of a Dissertation
Submitted to the Graduate School
of The University of Southern Mississippi
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Philosophy

December 2011

ABSTRACT

A QUANTITATIVE STUDY OF LEARNING IN THE SCHOOL CAFETERIA

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This study investigated if there was a difference in student achievement after

participants were exposed to educational placemats in a school cafeteria for four days

each (four different placemats). Also, the student's gender and ability grouping was

considered in relation to achievement. This study included 49 ability grouped third grade

students in an elementary school in south Mississippi. Students were pre-tested with

researcher-made math instruments before the educational placemats were introduced and

post-tested afterwards. For research purposes, some placemats served as a control and

did not relate to the pre-test and post-test content. Statistical measurements of the

differences were derived from a mixed model ANOVA in SPSS statistical software.

Overall, two of the hypotheses proposed a significant interaction of condition (pre-test

and post-test) by either gender or ability group. Neither of these interactions was

significant for the math placemats. However, after being exposed to math placemats,

post-test scores were significantly higher than the pre-test scores across genders and

groups. In contrast, after exposure to the control placemats, post-test scores across

genders and groups were lower than pre-test scores and did not differ significantly. As a

result of these findings, the researcher recommends methods principals should consider

that allow students to be exposed to educational content in the school cafeteria and other

non-traditional learning areas of the school.

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ACKNOWLEDGMENTS

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CHAPTER I

INTRODUCTION

Why are students not learning academic content outside the classroom? Research

has shown that academic achievement is related to the amount of time a student is

exposed to academic content (Huyvaert, 1998). In America, students are performing

significantly below other countries in academic achievement, especially mathematics.

Time is one factor that has the ability to increase student achievement. The length of

academic learning time has the potential to impact student learning (Huyvaert, 1998). In

addition to time factors, other variables such as incidental learning, visual learning, social

learning, brain-based learning, ability grouping, and gender considerations could prove

beneficial.

Problem Statement

There is insufficient research on learning mathematics outside the classroom on

educational placemats or students learning in non-traditional areas such as the school

cafeteria. This research study will contribute to the knowledge base on student

achievement methods. This study's intent is to see if educational placemats in the school

cafeteria will make a difference on academic achievement with elementary third grade

students in Mississippi. Also, data will be collected regarding differences in academic

achievement and gender while considering that the students are in ability groups.

Purpose of the Study

The purpose of this study is to see how achievement levels of third grade students

will differ after being exposed to educational placemats in the school cafeteria for four

days each (four different studies). The ultimate goal of this study is to provide school

principals and other stakeholders with research findings about learning outside the classroom that could benefit overall student achievement. Hopefully, this study will help principals understand how to utilize missed learning opportunities within the school day. Overall, this study prompts future research of gender comparisons and learning mathematical content outside the classroom.

Hypotheses

The hypotheses for this study are as follows:

1. The differences between non-control pre-test and post-test averages will be significantly greater after students have been exposed to educational placemats for four days each.

2. The differences between non-control pre-test and post-test averages for male students will be significantly greater than female students after all students have been exposed to educational placemats for four days each.

3. The pre-test and post-test averages will be different for the three ability groups after all students have been exposed to educational placemats for four days each.

Research Questions

1. If there are differences in scores, do the differences between pre-test and post-test averages have a greater significant difference after the placemat exposure?

2. If there are differences in scores, do the differences between pre-test and post-test averages in boys and girls have a significant difference after the placemat exposure?

3. If there are differences in scores, do the differences between pre-test and post-test averages in the three ability groups differ after the placemat exposure?

Definitions of Terms

The following terms are defined according to their context in this study:

Academic achievement- when students increase mastery of academic content

Brain-based learning or Brain-based education- "the engagement of strategies based on principles derived from an understanding of the brain" (Jensen, 2008, p. 4).

Cafeteria- an area in the school where food is served and eaten

Cafeteria tables- tables inside the area of the school where food is served. For the purpose of this study, educational placemats will be attached to the top of this.

Constructivism- as a result of interactions and experiences, children construct knowledge

Educational placemats- a mat with educational content that is set on a cafeteria table beneath a place setting

Gender- whether a participant is male or female

Learning outside the classroom- areas other than the classroom where students can learn academic content by being exposed to educational content

Social learning- learning process involving interactions with others

Visual learning- learning process involving sight and images

Delimitations

1. The participants are delimited to one school and grade level in the state of Mississippi.

2. Third grade students that did not submit consent and assent forms were excluded from the study.

3. Participants that have missing or incomplete data were excluded from the study.

4. Educational content on placemats were delimited to mathematical concepts and do not include other subject areas.

Assumptions

1. During the study, there will be no interruptions occurring such as intercom announcements or fire drills.

2. Mathematical concepts on placemats have not been taught and will not be taught until after this research study concludes.

3. All participant academic efforts on the pre-tests and post-tests were the best of their ability.

Justification

Academic achievement in America is a concern because it lacks in comparison to other countries (Itzkoff, 1994). Since students are not meeting academic expectations in the general classroom, it is important to consider all methods and areas for students to learn. Learning outside the classroom might make a significant difference in academic achievement in America if opportunities are introduced properly. This is supported by current literature. Researchers and practitioners have identified the need to develop alternative teaching and learning opportunities. In short, research related to learning outside the classroom could be expanded upon to help school administrators understand ways to increase student achievement in non-traditional ways.

CHAPTER II

LITERATURE REVIEW

One myth of contemporary education is that most learning takes

place in a classroom and depends upon the physical presence of a

teacher, printed textbooks, and 'proper motivation' (Sommer &

Becker, 1974, p. 601).

This literature review concerns mathematical achievement and learning outside

the classroom in the school cafeteria, which is a non-traditional learning area. The

review of literature begins with theoretical foundations and includes an overview of Lev

Semenovich Vygotsky's social learning theory and scaffolding as a learning technique.

Following the overview on social learning theory, this review analyzes academic learning

time, ability grouping, brain-based learning, visual learning, incidental learning, and

gender and mathematics achievement, as it relates to learning outside the classroom.

Vygotsky's Social Learning Theory

Lev Semenovich Vygotsky (1896-1934), a Russian theorist, is best known for his

research on social learning. Vygotsky's social learning theory involves cultural and

social contexts of learning and how it shapes development. He believed "every function

in the child's cultural development appears twice: first, on the social level, and later, on

the individual level; first, between people (interpsychological) and then inside the child

(intrapsychological)" (Vygotsky & Cole, 1978, p. 57). These social interactions, which

are influenced by personal, social, and cultural factors, work together for learning to take

place.

Vygotsky's theory has origins in constructivism, a learning theory founded by Jean Piaget (1983). In short, constructivism states that knowledge and meaning are gained by ideas and experiences (Piaget, 1983). Similarly, Vygotsky's social development theory states that social interaction takes place before development (Vygotsky, 1978). His theory also explains how learning and consciousness are the results of socialization.

During Vygotsky's life, his work was unknown. Since he was Russian, his education was limited despite his high academic records. In 1962, his book "Thought and Language" was released and translated to English. His other writings were released also and his theory became significant to the field of education. Since the release of Vygotsky's work, researchers have compared it to Piaget's theory of development (Schunk, 2007, p. 249; Duncan, 1995). Schunk (2007) points out that Vygotsky's theory is rarely questioned for adequacy.

According to Daniels (2001), Vygotsky's theory breaks down into three categories including: the Zone of Proximal Development (ZPD), social learning preceding development, and More Knowledgeable Others (MKO). The Zone of Proximal Development refers to tasks a child cannot complete alone, but can complete with the assistance of an adult (Daniels, 2001). In his own words, ZPD, is "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978, p. 86). Vygotsky believed that this method encourages a child to achieve a higher level of achievement than usual. With the child exposed to challenges of a greater difficulty,

he/she is able to engage in dialogue with self or others, such as the teacher. Dolya (2010) agrees that this external monologue is internalized as thought. Children can perform at higher levels with help from a More Knowledgeable Other, which is any person that can help the child academically (Dolya, 2010). The interpretation of ZPD caused ongoing tensions between researchers Valsiner and Gergen and the idea of others. Within the two levels of ZPD, the top represents when the student cannot function without assistance and the bottom level represents when the student can function independently. Dolya (2010) also agrees with Vygotsky in that the teacher and others play an important role in student learning. The Zone of Proximal Development is described as an apprenticeship (Schunk, 2007, p. 248). Others term the participants as more able and less able (Luckin,1999).

The Vygotskian approach to teaching led to many critical discussions among various researchers. Hedegaard (2001) questioned Vygotsky's social approach because of his belief that school was a mere place to pass on knowledge and skills. He (2001) continued to express his thoughts about children not applying their facts to real-world situations. Although this may be true in some instances, *Social Interaction and the Development of Children's Understanding* by Winegar (1989) explains the influence of social interaction on problem-solving skills.

Vygotsky stated "that in order to understand the individual, one must first understand the social relations in which the individual exists" (Wertsch, 1985, p. 15). According to Vygotsky, socialization effects how humans think. His insight was that the social context of a child is critical to knowledge acquisition and mind processing. Areas such as a child's school building, housing community, and other surroundings greatly

affect the child's thought patterns. Also, Bodrova and Leong (1996) echoed Vygotsky's idea of cognition in an external context.

Alongside Vygotsky's concept of Zone of Proximal Development, he invented a concept called *scaffolding*. Vygotsky's defined a scaffold as the "role of teachers and others in supporting the learner's development and providing support structures to get to that next stage or level" (Raymond, 2000, p. 176). Basically, scaffolding involves a More Knowledgeable Other (MKO) providing some sort of support, or "scaffold" to help the learner. Shortly after being introduced to the scaffold, the learner may begin to use prior knowledge to understand new content. Scaffolding also involves introducing information on the higher end of the learner's ZPD (Olson & Pratt, 2000). Bransford, Brown, & Cocking (2000) explains scaffolding as the MKO helping the learner reach the high end of the ZPD.

Since scaffolds are temporary in nature, the MKO can withdraw them when the learner's capabilities increase. The goal of using scaffolding is for the learner to master the academic content individually (Hartman, 2002). When the learner's knowledge increases, the teacher can reduce the scaffolds. A quote by Vygotsky in Raymond (2000) says that "the system of knowledge itself becomes part of the scaffold or social support for the new learning" (Raymond, 2000, p.176). Examples of scaffolds include models and prompts of various types for learner assistance (Hartman, 2002). After the MKO introduces the scaffolds to the learner, he/she may engage in social learning with others (Hartman, 2002). With scaffolds like educational placemats, learners of various academic levels can interact with each other.

McKenzie (1999) agrees that scaffolding can be used to engage students in learning because it provides a tool for students to organize and focus. In "Scaffolding for Success" McKenzie (1999) describes scaffolding into eight characteristics. These characteristics describe scaffolding instructional techniques and results from scaffolding. According to McKenzie (1999), scaffolding:

1. Provides clear directions and explain just what students must do in order to meet the expectations for the learning activity;

2. Clarifies purpose and keeps purpose and motivation in the forefront;

3. Keeps students on task so that the learner can exercise great personal discretion within parameters but is not in danger of off road stranding;

4. Offers assessment to clarify expectations right from the beginning as students are shown rubrics and standards that define excellence;

5. Points out students to worthy sources by allowing students to put their energy into interpretation rather than wandering;

6. Reduces uncertainty, surprise, and disappointment with a clear goal to maximize learning and efficiency;

7. Delivers efficiency, yet still requires hard work centered on the inquiry that it seems like a potter and wheel; and

8. Creates momentum as searching for understanding inspires and provokes (McKenzie,1999).

In *Learning to Learn* Ngeow and Yoon (2001) explained a term called *problem-based learning* (PBL) which encourages children to develop learning practices. Scaffolded instruction is part of PBL. According to Ngeow and Yoon (2001) the More

Knowledgeable Other then, "…designs activities which offer just enough of a scaffold for students to overcome this gap in knowledge and skills" (Ngeow & Yoon, 2001, p. 2).

As explained in *Thought and Language*, Vygotsky and Hanfmann (1967) pointed out that children develop an inner speech. This is a result of internalizing information after communicating with a More Knowledgeable Other. Vygotsky believed that inner speech, also called *private speech* leads to cognitive growth (Vygotsky & Hanfmann, 1967). Recent research studies confirm that scaffolding is a productive learning method. In *Visual Tools for Constructing Knowledge,* Hyerle (1996) uses various visual prompts as scaffolds to assist learners in remembering content. This method proved to be beneficial for helping students to remember content.

In addition to the literature, research studies show that scaffolding proves beneficial. Chang, Chen, and Sung (2002) conducted a seven week research study with 126 fifth graders to see if there would be a difference between scores when scaffolding was used. Before the study began, the students were assigned to four random learning groups that included three levels of exposure to concept maps and one control group. Pre-tests and post-tests were given to test comprehension and summarization abilities. The four random learning groups were broken into map correction (most scaffolding), scaffold fading (moderate scaffolding), and map generation (least scaffolding). The test was administered at an elementary school in Taipei, Taiwan. There were sixty-six boys and sixty girls separated into groups containing 26, 32, 34, and 34 in the respective groups. The results of the study showed that the correction group (most scaffolding) scored higher on the post-test than the scaffold fading group, generation group, and the control group. The researchers point out that the map correction group excelled because

of the scaffolding. Although the scaffold fading (moderate group) had some inconsistent scores, the researchers argued that they could be a result of content difficulty and lack of time for training (Chang, Chen, & Sung, 2002). In conclusion, this research study showed how concept mapping (scaffolding) "…may serve as a useful graphic strategy for improving text learning" (Chang, Chen, & Sung, 2002, p. 21).

In Reeves (2004), the *90-90-90 Schools* research article claimed that low-income schools with a 90% or above minority population could be successful with appropriate instructional practices and strategies. Several key factors such as consistency, writing strategies, and collaboration of teacher ideas and assessments made these specific schools productive. This study also argued that "the key variable was not poverty, but teaching quality" (Reeves, 2004, pg. 194). He stated that there is a correlation between great classroom strategies, performance assessments, and student achievement.

Similar to Vygotsky's theory, *90-90-90 Schools* use collaboration and cross-disciplinary integration techniques, which involve social learning. Other characteristics of a 90-90-90 School are that above 90% of students receive free or reduced lunch, above 90% of students are from ethnic minorities, and above 90% achieved high academic standards. In alignment with the high academic standards, these schools display exemplary work throughout the school. "In short, the 90/90/90 Schools made it clear to the most casual observer that academic performance was highly prized" (Reeves, 2004, pg. 187). The culture of the school played a part in the student's achievement.

An accountability system was in place in Reeves (2004) study that mandated schools to identify areas where improvements were made. Since many of the students entered school being severely below grade level, the schools targeted a few goal areas

instead of a typical school plan that often includes many unfocused goals. In many cases a type of literary intervention was implemented, since deficiencies in writing and reading hinder all subject areas. Weekly assessments were conducted by classroom teachers to monitor student progress and multiple opportunities are provided to improve performance. Written response assessments allowed the teachers to obtain specific information about the student's ability and the students were able to demonstrate their thinking process. The papers were then exchanged and graded on a uniform basis by several teachers and sometimes the building principal. Once the assessments were evaluated, the students were provided with prompt feedback. This immediate feedback to students included precise details on student strengths and weaknesses to guide the student's progress. In return, the teacher's high expectations were eventually met by the students (Reeves, 2004).

The time schedules of most 90-90-90 Schools were altered to increase academic learning time in subjects at the elementary and secondary levels. School accountability plans and other action plans were flexible so that non-effective strategies could be changed as needed. Principals often reassigned teachers to different grade levels or subject areas according to their undergraduate areas of study and expertise. Other employees such as bus drivers, cafeteria workers, and janitorial staff were included in professional development opportunities so that the school could be consistent with its overall goals. "Leaders recognized that the student's day does not really begin in the classroom, but on the bus or perhaps during free breakfast. By committing their systems to consistency in the education and behavior of adults, these leaders ensure that every adult leader, from the bus driver to the food service employee to the classroom teacher is

regarded as a significant adult leader in the eyes of students" (Reeves, 2004, p. 199).

Music, art, physical education, and other elective classes were held accountable also.

The plan for success in these schools was collaboration between all building employees

and others that could impact the student's education. Ultimately, for a 90-90-90 School

to be successful, it must have effective teachers and leadership teams that are willing to

be accountable for student performance (Reeves, 2004).

Vygotsky's thinking ties greatly to a social and cultural background (Vygotsky &

Cole, 1978). Vygotsky stated, "Every function in the child's cultural development

appears twice: first, on the social level, and later, on the individual level" (Vygotsky &

Cole, 1978, pg. 57). From a developmental perspective, Vygotsky believed that culture

had a very important role on the development process. It is evident that the idea of

development and culture vary among researchers. Lamb (2005) stated that development

is complex because culture is complicated to understand. Also, Lamb (2005) agrees that

culture influences parent and child behavior and more. A study by Bradley and Corwyn

(2005), which used the HOME inventory, showed that culture effects parenting styles

worldwide.

Academic Learning Time and Academic Achievement

The amount of time students spend learning has continued to be a very important

topic for schools, teachers, and other stakeholders in education. Throughout the United

States, researchers are testing the hypothesis that increased learning time enhances

performance and the quality of education (Phelps, 2010). The interest in increasing

learning time is motivated by the belief that the current system was constructed to

accommodate farms and industries. Some believe that the 180-day calendar does not

meet the needs of twenty-first century students. The system does not allow teachers and students to cover enough information to increase academic performance (McMurrer, 2008).

Many aspects of education have changed over the years, therefore, schools should accommodate these changes. Even though the curriculum changes often, there have been very minimal changes in terms of time allocated for learning curriculum. There are also the advancements of technology in the education system which creates more demands for educators, in terms of time. Increasing learning time means adding to the length of a school day, week, or year (Al-Balhan, 2007). The objective of additional time is restructuring the school for greater focus on academic achievement. Programs and activities that increase learning time are effective because they give students more opportunities to learn. It is believed that 30 percent additional learning time could greatly change the academic achievement of a student (McMurrer, 2008).

This topic has prompted a lot of research to investigate whether there will be positive or negative effects of increasing academic learning time. Interest in this issue can be traced back to the work of John Carroll in his original model of learning in school (Carroll, 1963). The theory was based on the argument that "learning is a function of time engaged relative to time needed for learning" (Gettinger & Seibert, n.d, p. 1). One of the most popular investigations of the relationship between time spent in learning and academic achievement was the Beginning Teacher Evaluation Study (BTES) by Denham (1980). The most important finding from this research was that Academic Learning Time (ALT) is a major factor in academic achievement. Among the various factors that determine academic achievement, Academic Learning Time has been given special

importance by policy-makers in education due to the significance of the BTES results. Elements of ALT are seen as something that educators can control. Studies on effective teaching and learning have recognized evidence-based practices that are aimed at maximizing learning time for all learners. Since time is a crucial factor in learning, there are best practices that have been identified by teachers, for evaluating, extending and enhancing Academic Learning Time (McMurrer, 2008).

Phelps (2010) suggested that even without the evidence from academic research, it is apparent that the more time spent on learning, the more learning takes place. Likewise, academic studies have confirmed that a positive correlation exists between time and academic achievement. This relationship is however quite complicated (Phelps, 2010). This is because simply increasing learning time will not automatically result in increased academic achievement. Unfortunately, not all academic time allocated for instruction is actually spent on instruction. For example, a one hour class may include ten minutes of distributing worksheets and five minutes of student interruptions leaving only 45 minutes for instruction (Basye, Jones, Tripp & Tripp, 2008).

The importance of engaged time is revealed by the relatively high amount of research highlighting the need for increasing student engagement. Al-Balhan (2007) suggested that students are often not effectively engaged in a task or are not utilizing the class or learning time as productively as required. This study identified the teacher as important to make sure tasks were monitored and that learners were stimulated. Al-Balhan suggested that the teacher should also encourage students to use their abilities and skills in order to be productive. For the engagement time to be effective, it is important

for the learner to participate in effective tasks and at a high degree of success (Al-Balhan, 2007).

Basye, Jones, Tripp, and Tripp (2008) defined Academic Learning Time as the amount and quality of time a learner spends while performing appropriate academic tasks with a high rate of success. It is the period when the instructional activity is clearly aligned with the readiness of the student to learn. There are four main variables that contribute to Academic Learning Time. These four variables are: allocated time, time utilized for instruction, engaged time, and academic success and engagement. The "process by which allocated time is converted to productive learning time depends on school procedures, classroom practices, and individual differences between students" (Baker, Fabrega, Galindo & Mishook, 2005, p. 312).

Allocated time refers to the amount of time that educators plan to utilize for instructional purposes. Benson, Kielsmeier, Neal, Roehlkepartain, and Scales (2006) suggested that allocated time is the in-class opportunity for the learners to be involved in the learning process. Studies have recorded significant variation across classrooms and schools in the amount of allocated time. Despite the differences, teachers often allocate homework for additional learning time. For example, one teacher may allocate 30 minutes-worth of homework, while another teacher only allocates 10 minutes-worth. Variations in homework assignments and class structures means that the total allocated time for students will vary. The difference between the allocated time and the time required for learning varies with students in the classroom. Some believe that educators need to analyze learning differences in order to determine the amount of time required for each student to master the content. Since students learn at different rates and the

allocated time must reflect this (Benson, Kielsmeier, Neal, Roehlkepartain, and Scales 2006).

Instructional time refers to the proportion of the time allocated that is actually used in instructional activities. Researchers have constantly revealed the fact that a limited percentage of allocated time is spent for instructional purposes (Scales et al., 2006). This percentage is normally between 50 and 60 percent. There are various activities that take place in classrooms that may affect the amount of time that is allocated for instructional purposes. To get a true estimate of instructional time, a researcher must deduct activities and other distractions. The amount of time that is spent on other activities besides instructional ones is referred to as "lost time." Hollowood carried out direct observations on eight elementary classes (Gettinger & Seibert, n.d). He identified six causes of lost instructional time—learner interruptions; teacher interruptions; people visiting the class while in session; loudspeaker announcements; transitions, and other sources (Huyvaert, 1998).

Engagement time is the percentage of instructional time the students are engaged in learning (Huyvaert, 1998). This proof for engagement rate is paying attention, finishing written assignments, or working with the classmates on assignments (Goldman, Kosanovich, & Weinstein 2009). This time comprises of inactive responding, where the learners are inactively attending to a presentation or activity, and active responding, where learners are actively responding to a presentation or activity. In a class where students are provided with equal opportunities to learn, differences exist in their personal levels of engagement or participation. Pressley et al (1998) carried out observations in nine first-grade classes for educators who had been recognized as exceptional as far as

literacy instruction is concerned. They discovered that despite the fact that most learners were engaged 80-90 percent of the time, in a number of classrooms engagement level was as low as 50 percent (cited in Gettinger & Seibert, n.d).

   Engagement time is a significant variable in student learning. Nystrand and Gamaron (1991) have identified two kinds of learner engagement (cited in Huyvaert, 1998). They are called procedural engagement and substantive engagement. The first type, procedural engagement, comprises of observable behavior such as paying attention while the teacher is instructing and finishing assignments. When scholars talk of engagement time, they are actually referring to procedural engagement. The second kind of engagement, learner engagement, engages an individual to become receptive of the academic content. Even though procedural engagement is associated with academic achievement, learning is not achievable without substantive engagement (Nystrand & Gamaron, 1991). The difference between the two is significant in understanding Academic Learning Time (Al-Balhan, 2007). Academic Learning Time is dependent not only on learners' procedural engagement with their class work, but also on the characteristic and quality of their class work. When the learners are needed to be involved in activities that are not well related to their personal attributes, then Academic Learning Time is minimized due to the fact that substantive involvement is low. It is not beneficial for learners to use time for learning tasks that are too simple, too hard, or uninteresting. Academic achievement and productivity include the fourth significant factor of Academic Learning Time, which is the rate of academic success and engagement (Huyvaert, 1998).

The *rate of achievement and productivity* represents the proportion of engaged time, where the learners are involved in doing productive and pertinent instructional activities. These activities offer a balance of medium and high success. This happens with more tasks that are targeted at high levels of success and achievement. Studies reveal that students achieve a lot from academic learning time when they achieve a comparatively high level of engagement. Greenwood, Terry, Marquis and Walker, (1994) put this level at about 80 percent accuracy. Optimizing academic achievement and productivity are dependent on the instructor to match learning activities to personal student needs, abilities, and interests (Kosanovich, Weinstein & Goldman, 2009).

According to Kosanovich, Weinstein and Goldman (2009), the percentage of *engaged time* affects achievement more positively than the other types of time. In other words, time that the students are actually engaged determine their academic achievement. Academic Learning Time is multi-faceted. Best practices necessitate that instructors optimize instructional time and minimize lost time so that learners may have high engagement rates. When teachers allocate more time and ensure that this time is used effectively, it positively affects academic performance (Huyvaert, 1998).

In the book, *Time is of the Essence by* Huyvaert, (1998) one of the identified ways of increasing Academic Learning Time is increasing the scheduled time. Even though there are many ways Academic Learning Time can be increased, increasing scheduled time can prove to be effective. This can be achieved by increasing the time spent on student learning by affecting the school day or the school year. According to Rock and Thread (2009), an increase of scheduled time to learn academic content can help to

ensure improved academic performance, if the extra time is allocated and utilized effectively (Rock & Thread, 2009).

A school day consists of the beginning of school (when students arrive at school) until school ends(when students leave school). During the school day, there are various activities that take place. Each school day has a specific number of classes that last a specific period of time (Scales et al., 2006). There are also scheduled breaks that are used for eating, bathroom, and engaging in physical exercises such as sports and games. Schools include activities that are aimed at awakening and focusing the attention of the learner on learning activities (Rock & Thread, 2009).

Kirkland, Camp and Manning (2008) suggested that the United States government does not require a specific number of school days in a year. Each state sets the length of the school year. The U.S Department of Education estimates that schools in the United States spend an average of 180 days in a school year (Fisher, 2009). This estimate includes both private and public schools. It also includes elementary and secondary education levels. A report by the Education Commission of the States in 2004 stated the requirements of each school year per state. Thirty of the states required 180 school days in every school year. There were two states with longer than 180 school days and 11 with less than 180 days (Baker, Fabrega, Galindo & Mishook, 2005). Minnesota is one of few states that does not require a particular number of school days per year. Many nations in other parts of the world have more school days per year when compared to the United States. There are some that have as many as 220 school days per school year (Kirkland, Camp & Manning, 2008).

In the past decade, there have been minor changes in the average number of school days per school year. For most schools, the school days occur during a 9 to 10 month period. This period is mostly between "early fall and early summer" (Kirkland, Camp & Manning, 2008, p. 123). Approximately 86 percent of conventional public schools use this format when allocating their school days. Overall, there have been slight changes in the structure of the school day and school year. The average conventional public school added approximately four minutes. The average private school added approximately six minutes. The changes have also occurred where schools have added days in their school year (Rock & Thread, 2009). On average, learners in conventional secondary schools use approximately six hours and 45 minutes in every school day. The time spent in school is a little bit less for elementary school. This is approximately six hours and 36 minutes. The time is more for middle and secondary school learners approximated at 6 hours and 50 minutes. Conventional public schools tend to have shorter school days when compared to equivalent private schools (Fisher, 2009).

The summer vacation is a common term in the United States education system. It is a vacation during the summer period between school years when schools are not in session. During this time, the students and teachers are out of school for between six and 12 weeks. This period varies within states and districts. There has been support as well as criticism for this holiday. Supporters of summer vacation have argued that students were over-stimulated in the system and needed 48 weeks in a school year (Kirkland, Camp & Manning, 2008). Supporters of summer vacation state that the few weeks offered by the vacation are to relax. Some of the opponents of the long vacation have argued that schools in the United States spend fewer days per school year in school as

compared to schools in other countries. Researchers into the United States education systems have stated that having such a long vacation puts students in the U.S. at a disadvantage because in other competitive countries students do not have such a long time for vacation (Kirkland, Camp, & Manning, 2008).

There have been requests to re-shape the structure of school day and school year to increase learning time and ultimately academic performance. Herbert (2009) has been quoted in the New York Times pointing out the major flaws of America's public education system such as the drop-out rate and student illiteracy percentages. Herbert represents many of the supporters of the movement to change the education system in the United States to increase learning time for improved academic performance. Goldberg (2011) argued that increased learning time means using a longer school day, week, or year schedule to significantly increase the total number of school hours to include additional time for (a) instruction in core academic subjects, including English, reading or language arts, mathematics, science, foreign languages, civics and government, economics, arts, history, and geography; (b) instruction in other subjects and enrichment activities that contribute to a well-rounded education, for example, physical education, service learning, experiential and work-based learning opportunities that are provided by partnering, as appropriate, with other organizations; and (c) teachers to collaborate, plan, and engage in professional development within and across grades and subjects (Goldberg, 2011).

Changing the shape of a school day and a school year has been advocated by different education stakeholders. Rock and Thread (2009) recommended increasing the length of a school day and year seems to be a solution to increasing academic

achievement. This is supported by the argument that the current structure of school day and year is not conducive to improving academic achievement. Sometimes, when students are out of school for summer vacation, parents feel compelled to give them learning activities so they will not regress. Some parents even enroll their children in summer schools. This would not have to happen if the structure of the school year was re-shaped to increase learning time in school (Rock & Thread, 2009).

In the article, *Learning outside the Classroom: What Can Be Done in Lesson Time*?, Wood and Walker (2007) argued that learning is not confined to classrooms. This means that students do not only learn when they are seated in the classroom and there is a teacher instructing them. Many times, the best opportunities for learning occur outside the classroom. Whether before school, during meals in school, after school, or even during the weekend, there are great avenues to encourage innovative ways of learning outside the classroom. Often times, lunch or recess is a student's most favorite part of the school day. A very small percentage of students will admit to enjoying instruction time in the classroom. As a result, the education system should be made in such a way that every experience during the school day is an opportunity for learning.

The learning process can take place both with student awareness and without student awareness. Wood and Walker (2007) called this *incidental learning or non-conscious learning*. Through student awareness it can happen as a student is playing outside and recognizes something that the teacher has taught in the classroom. Without student awareness it may happen when a student encounters something during lunch or recess and remembers it in class when the teacher introduces the topic. The student may not be aware that such a topic exists in his or her subject when he/she learns it

incidentally (Wood & Walker, 2007). Learning outside the classroom, in areas like in the

playground, creates an engaging environment that encourages children to reach their

potential. These avenues for learning are effective especially due to the fact that students

learn as they do things they enjoy. They provide fun and interesting learning activities

(Wood & Walker, 2007). Additionally, when students learn through real life experiences,

they are in a better position to remember the academic content. For instance, when the

students are able to differentiate between a football and a baseball field on the

playground, it helps them remember the difference between the two fields in the

textbook. This is the same case as when they learn different kinds of food as they have

their meals in the cafeteria (McMurrer, 2008).

Study support tasks have explicit and direct connections to learning. They are a

"safe way of creating flexibility to the shape of the school day, without requiring major

change or disruption to teachers, pupils, staff, or parents" (Wood & Walker, 2007, p.

153). An example of a study (methodology) where students learned more when learning

time was increased is the Breakfast Club. This is a good example of the study support

task derived from the journal article, The *Impact of Breakfast Clubs on Pupil Attendance

and Punctuality* (Simpson, 2006). This study involved breakfast time mixed with

interesting learning activities and other tasks. To be able to accommodate the breakfast

club, the school day needed to be extended to begin earlier than the normal time. The

Breakfast Club was an effective avenue for promotion of health/nutritional eating and

academic content during informal learning sessions. The club provided at least one

additional task to breakfast. Also, the Breakfast Club has provided learning support as

well as a healthy way to start the school day, which is crucial for learning. The journal

give three models on how this learning methodology works. Each of these models has

been tested and proven to be effective (Simpson, 2006).

The first model is Tea and Toast, which is held in school. This model includes a

simple menu and it is conducted by volunteers, members of the community, teachers

and/or visiting tutors. The second model is Survey and Canteen, where the meal is

served from the kitchen in the school but a variety of meals is provided. The last model

is community focused. It is run by the members of the community in a community center

or hall. This club has changed the structure of the school day in different primary,

secondary, and special schools in the country. This has established a minor revolution in

how the students access school in the early session of the school day. This has created

what is known as a third space for learning and has had a positive effect on academic

achievement (Simpson, 2006).

Brain-based Learning and Brain-based Education

As defined by Jensen (2008), "Brain-based education is the engagement of

strategies based on principals derived from an understanding of the brain" (p. 4). Since

the brain serves to control and coordinate mental and physical actions in the body

(www.dictionary.com), it is very important to understand how the brain naturally learns

best (Jensen, 2008).

Recently, educators have become interested in the brain and how it affects

learning. Some schools and organizations have incorporated brain-based research and

brain-based learning strategies into their daily routines. Researchers have continued to

produce literature geared completely towards brain-based learning. Many educators have

abandoned traditional instructional techniques and have adopted brain-based strategies

which include learner participation and engaging lessons. A quote from an English Language Learner (ELL) teacher in Lombardi (2008) provided an innovative way to approach brain-compatible learning.

> Teaching around the wheel- using the full range of auditory, visual, and kinesthetic strategies-activity shifting, instructional intelligence, multiple intelligences, and an array of diverse teaching approaches all tap in to the best of brain-compatible learning and provide innovative ways to reach students (Lombardi, 2008, p. 219).

Despite the new and informative research on brain-based learning, the area is still being explored. Alferink and Valeri (2010) pointed out how difficult it is to understand how brain-based research can lead to misinterpretation of the information. The authors continue to explain how neuroscience is over-interpreted when weak evidence presents itself. Overall, brain-based data has attempted to fill in the gap of literature on this topic.

In *Teaching and the Human Brain*, Caine and Caine (1994) highlighted the importance of the left and right hemispheres of the brain when conducting activities. They go on to explain the past myth of associating the left and right hemispheres with certain brain functions. Throughout history, the two parts were thought to control specific tasks only. Caine and Caine (1994) argue that the right hemisphere processes information in whole, while the left hemisphere only processes information in parts. In this book, they support findings about how the parts and wholes interact within the brain. Also, they agree that the two hemispheres support each other. They believe that progress can be made when effective brain-based strategies are used being mindful of both hemispheres of the brain.

In an article titled *A Fresh Look at Brain-based Education*, Jensen (2008) opposed researcher Bruer's (1997a) beliefs of neuroscience being useless for educators. Bruer, a researcher for the James S. McDonnell Foundation, said that educators should focus on learning psychology instead of neuroscience. Jensen (2008) disagreed with Bruer because he contends that brain-based learning improves education by allowing teachers to make decisions that increase student achievement.

Brain development occurs during certain periods of a person's lifetime. Studies report that certain brain learning begins as early as two months of age. Research shows that babies begin observing their surroundings during this time. In Lindsey (1998-1999), a series of experiments were reviewed from the 1960's and 1970's to explore the learning windows for children. In these experiments, Hubel and Wiesel (citation) examined the brain development of kittens as it relates to sight. The study concluded that the kitten's brain develops sight during a certain time frame, similar to humans. Jorgenson (2003) argued against this research and states it has been enhanced with fictitious content. He states "these windows of opportunity have been embellished far beyond original research findings" (Jorgenson, 2003, p. 364). In relation to education, brain-based research must be adequately tested before all of its capabilities will be shown. Educators can search for new brain-based research in order to create an environment conducive to brain-based learning.

There is a gap in literature on the effectiveness of brain-based teaching practices. Current literature shows information on teaching practices, but there are not many studies done that test its effectiveness. Opinions and ideas are presented by many authors of

research journals and textbooks. Research studies that have formal statistical analysis would help fill the gap in educational literature.

In *Brain-based learning: A Synthesis of Research*, the National American Colleges and Teachers of Agriculture point out the need for agricultural teachers to use brain-based learning (NACTA, 2008). It was expressed that students would learn better if the academic content had meaning and real-word applications. Brain-based learning is not about rote memorization, but about making learning meaningful. In a journal article by Bucko (1997), the brain has a hundred billion neurons, and therefore is very capable of storing a large amount of information. He shared, "Brain-based learning may be the most important influence on the way we teach since the first school was founded" (Bucko, 1997, p. 20). He continues on to address implications for teachers and schools. One of Bucko's points involved the importance of technology in examining the brain's functions. He points out that neural imaging can tell us pertinent information also. Bucko (1997) promotes the use of brain-friendly techniques such as using meaning, repetition, patterning, and emotion.

Although there is a gap in literature in brain-based research testing with education, many researchers continue to support the brain-based movement. One can assume that authors such as Jensen and Dabney (2000) and Sousa (2003) make a significant amount of money from book sales, conferences, and other items or services sold to educational facilities on brain-based learning. It is in their best interest to point out the positive aspects of this research because it affects their monetary gain and career status. Some researchers argue against this misapplication of brain-based research, yet provide reasonable uses for it to advance education.

In *Brain-(not) Based Education: Dangers of Misunderstanding and Misapplication of Neuroscience*, Alferink and Farmer-Dougan (2010) claimed that incorporating neuroscience into the classroom "goes beyond existing data" and is "not supported by current evidence. The article continued on to critique four alleged neuroscience-based practices as follows:

1. "Right" vs. "Left" Brain Instruction,

2. The Brain and Critical Periods,

3. Brain-based Education, and

4. Brain-compatible teaching, Learning Styles, and Multiple Intelligences (Alferink and Farmer-Dougan, 2010, p. 43-48)

In summary, this article claimed that brain-based research is helpful for educators to realize best educational practices, but special care should be taken to make sure it is not misapplied (Alferink & Farmer-Dougan, 2010).

Similarly, Gatewood (1989) criticized the popularity of brain-based learning. He questioned the acceptance of brain research and its application to education. In his opinion, researchers do not know enough about the brain, therefore further studies should be conducted. In his article *Caution! Applying Brain Research to Education*, Gatewood (1989) argued that completely restructuring schools on account of this little amount of research is not advisable. Although he does not support implementing brain-based learning, he does not provide a data-driven reason for the claim.

According to Jones (1995), a gap exists between brain research and education. He points out how strategies in brain research and education contradict each other. For example, education encourages stress-free environments while brain research encourages

stress (eustress) to help students remember. Another example is that education

encourages explanations instead of memorizations while brain-research encourages

memorization by repetition (Jones, 1995). He also briefly highlighted three findings from

scientists regarding education: early learning, abstract reasoning and music, and healthy

diet.

Greenspan (2000) explained how a human's window of learning opportunity will

not occur again once it has passed. The window occurs in a person's early years of life.

Educational salespersons take advantage of this knowledge and use it in advertisements.

Bergen (2002) shared, "Catalogs for educational products now tout the links between the

products and specific areas of brain development, and parents are urged to buy many

products purporting to stimulate development of certain skills during early 'critical

periods' for children's brains" (p. 376). Although this tactic is common, brain-based

techniques prove beneficial to youth and adolescents (Bergen, 2002).

Assessing a student's learning style first is a idea of Dunn and Griggs (2000).

Their book, *Practical Approaches to Using Learning Styles in Higher Education* explains

about the unique learning styles of learners. They support the idea of getting to know a

person's learning style before beginning instruction. After the identification of the

learning style, the educator can apply appropriate teaching techniques and methods

towards the student. This consideration has been known to make the students

comfortable in the learning environment (Dunn & Griggs, 2000).

Morgan (1999) echoes other researchers about the developing neuroscience

trends. He points out that many educators have a desire to learn brain-based learning

techniques. In the book, educators were known to report brain-based studies on animals

with little knowledge of neuroscience. In the opinion of Chance (2001), brain-based education should lead to effective instructional techniques. He agrees that "Teachers try to change the brain every day. The more they know about how it learns, the more successful they can be" (Chance, 2001, p. 72).

Recently, according to Chance (2001), brain-based researchers have found the following things true about neuroscience as it relates to education:

1. An environment conducive to brain-based learning will help students. Provide games, challenges, and activities to challenge the brain;

2. The proper amount of sleep helps brain functions. It is a good idea to encourage students to get an adequate amount of sleep; and

3. Stress (bad stress) can affect the brain and destroy brain cells. Provide a less stressful classroom environment (Chance, 2001, p. 72).

According to Bruer (1997b) teachers that support brain-based education are generally open-minded. He states that brain-based educators do not practice old-fashioned teaching methods where the teachers present information for students to learn only to meet compliance. In fact, these teachers incorporate physical activities into the classroom instruction. In chapter 6 of Eric Jensen's book, "The Impact of Physical Movement on the Brain," Jensen (2008) detailed the importance of physical movement on the brain.

Exercise does several things for the brain. First, it enhances circulation so that individual neurons can get more oxygen and nutrients. This means a great deal when you're teaching content and you need the brain to be at its best. Second, it may spur the production of nerve growth factor, a hormone that enhances brain

function. Third, gross motor repetitive movements can stimulate the production

of dopamine, a mood-enhancing neurotransmitter. Finally, when done in

sufficient amounts, we know that exercise enhances the production of new cells in

the brain. (Jensen, 2008, p. 38)

Likewise, Jensen (2008) shared the benefits of engaging students by using social activities such as games. According to Jensen (2008), educators should be mindful of curriculum that considers the brain. In Figure 21.2 on page 203, Jensen (2008) showed the five things to consider when designing curriculum with the brain in mind: information literacy, scientific inquiry, artistic expression, social fluency, and personal development (Jensen, 2008). Other educators agree that "games can provide an active, motivating way for students to review what they've learned, but their effectiveness is enhanced if the students participate in the design or construction of the game" (Wolfe, 2001, p. 187). In the opinion of brain-based theorists, activities help young learners in particular because they include movement. Blakemore (2003) agrees and states "Writing or talking about an idea often provides enough muscle movement, but some people think best while they are swimming, running, or shaving, all of which involve movement" (p. 22). Jensen and Dabney (2000) also agree that movement and physical exercise help to stimulate the brain.

In an article by Prigge (2002), she suggested using laughter in the classroom as a brain-based approach. Prigge claimed that the body reacts biochemically to humor. Also, humor helps to reduce stress and create a better atmosphere. In addition to humor, Prigge recommended allowing movement and activities for oxygen flow to the brain. Prigge also recommended activities with manipulatives and engaging activities.

In *Understanding a Brain-based Approach to Learning and Teaching*, Caine and Caine (1990) argued that the most complicated part of brain-based learning is understanding the capabilities of the human brain. As pointed out in this article, "this information requires a major shift in our definitions of testing and grading and in the organizational structure of schools" (Caine & Caine, 1990, pg. 66). This article pinpointed the following 12 principles for learning that can work as a theoretical foundation of brain-based learning:

1. The brain is a parallel processor,

2. Learning Engages the Entire Physiology,

3. The search for meaning is innate,

4. The search for meaning occurs through 'patterning';

5. Emotions are critical to patterning;

6. Every brain simultaneously perceives and creates parts and wholes;

7. Learning involves both focused attention and peripheral perception;

8. Learning always involves conscious and unconscious processes;

9. We have two types of memory: A spatial memory system and a set of systems for rote learning;

10. The brain understands and remembers best when facts and skills are embedded in natural spatial memory;

11. Learning is enhanced by challenge and inhibited by threat; and

12. Each brain is unique (Caine & Caine, 1990, pg. 66-69).

Brain-based educators largely support a constructivist model for students to become actively engaged in learning (Bruer, 1997b). In *Perspectives on Learning*,

Vygotsky's theory of social learning is mentioned as a highly compatible brain-based theory (Phillips & Soltis, 1998). In Bruer, (1997a), he accuses brain-based learning of not being beneficial to teachers, but he adds that it is very fascinating. In addition to Bruer (1997a), Blakemore (2003) realizes that brain-based education still needs to expand in research. "Human understanding of the brain is in its infancy, and much research needs to be done" (Blakemore, 2003, p. 22). Also, Davis (2000) realizes that brain-based research hasn't had many studies done in this area. Bruer (1997b) echoes this belief that neuroscientists have just begun exploring this field of study.

As brain-based learning pertains to special education, Levine and Barringer (2008) point out the emotional aspect of learning when students are special education students or slow learners. "A student's inability to keep pace with the demands of the classroom can produce feelings of inadequacy, performance anxiety, depleted motivation, and even behavioral maladjustment" (Levine and Barringer, 2008, pg. 9). With slow learners, brain-based learning has proved beneficial because it takes into account a student's emotions and brain differences. In this journal article, difficulties with learning are pointed out to be neurodevelopmental dysfunctions (Levine & Barringer, 2008). Since the students in this article are have learning difficulties, their teacher can benefit from using brain-based practices. In alignment with brain-based education's consideration of emotions, the article advises to use a positive approach while helping children. "In helping children who are delayed in learning, it especially important to diagnose and manage their strengths because positive findings sometimes can be used to help bypass obstructive dysfunctions" (Levine & Barringer, 2008, pg. 11).

In Jensen's book (1996), *Completing the Puzzle: The Brain-based Approach*, he encourages giving the students choices when giving assignments. This supposedly benefits the brain because it reduces stress and increases endorphin release. Without choices the brain may release noradrenaline, which may lead to decreased learning. Jensen (1996) recommends creating classrooms that are intellectually stimulating and comfortable for the students. In relation to physical needs of the brain, students should be well nourished and hydrated (Hruby, 1999).

<center>Incidental Learning with Elementary Students</center>

Incidental learning refers to the unintentional or tacit learning that results from other activities. As a learning process, incidental learning takes place through repetition, observation, social interaction activities, and problem solving situations. Learning under these conditions is considered to be made of assumptions, beliefs and values, hidden agenda, trial and error, and involvement which can be inferred from events (Bender & Larkin, 2009). This research study essentially examines the case of incidental learning among elementary students in relation to observation and social interaction processes in a school cafeteria. Underlying Bender and Larkin's arguments, it is evident that educators are able to analyze how learning from visual aids in a school cafeteria can affect the students and how incidental learning can help the students in terms of improved competence, attitude change, and growth in interpersonal skills, raised self-awareness, and many other desirable impacts (Marsick & O'Neil, 2007).

The study of incidental learning is well established. Brophy (2010) states that primary producers of research on incidental learning are mainly from psychologists and educators. Most of these studies have concentrated on learning from observation and

social interactions; some studies contend that the recall of incidental information among elementary students is greater with pictures than words. When considering informal and incidental learning among elementary students, it is important to note that Marsick and Watkins (1990) state that even though informal learning and incidental learning seem to be interconnected, they are not necessarily the same. Marsick and Watkins (1990) define incidental learning as a by-product of some other activities such as sensing the organizational culture or a case of trial and error experimentation.

In order to understand how incidental learning affects elementary students, it is important to note that incidental learning is unplanned. In most cases of incidental learning, a person will go through a learning experience without any previous intention of gaining something out of the experience. Even though it is unintentional, incidental learning affects the unconscious learning of a person by visual memory.

Another area where incidental learning affects the students at the elementary level is language or vocabulary learning development. This is because through observation and social interaction the students develop a visual association with the placemats placed on the cafeteria tables. At one point, they are able to associate the pictures and words written on the placemats with their existing knowledge on the subject. Furthermore, considering that incidental learning may occur outside classroom, it may also tie into social learning. Cafeterias provide a conducive learning environment because it is a place where social interaction can take place. This environment presents an opportunity for students to build relationships among other students from the classroom (Marsick & O'Neil, 2007). In contrast to non-traditional incidental learning, Boucher and Wiseman

(2011) assert that meanings of words can be acquired through normal reading of texts, with no emphasis on vocabulary or visual learning outside the classroom.

A series of studies have confirmed that incidental learning can help children in positive ways. Some of the effective ways in which incidental learning can help students is though improving their basic recall, especially in vocabulary, pictures, and mathematical concepts. In addition to basic recall, research has verified that children in elementary schools are able to learn the words' meanings incidentally from the context during normal reading and that this forms the main source of vocabulary growth (Boucher & Wiseman, 2011; Jonson, Cappelloni & Niesyn, 2011). Considering that the cafeteria tables for elementary students are supervised by their teacher, who monitors student behavior, there may be greater opportunities for them to undergo incidental learning through oral language (Brophy, 2010). The existing empirical evidence indicates that young children who are encouraged to hear and experiment with language are more likely to achieve early reading success. Children who have limited experiences with language often have trouble learning to read and remain at risk for learning difficulties (Greenwood, 2010).

Another impact of informal and incidental learning is on the growth of interpersonal skills. Through social interaction, students are likely to develop social awareness, self-awareness, and certain social skills such as good listening habits, elaborate observational styles, and general interaction with other students (Boucher & Wiseman, 2011). Incidental learning in the form of observing a visual aid placed in the cafeteria is likely to change the student's behavior and social interaction with other students. Some authors acknowledge that unintended learning occurs outside the

educational context and provides a motivational and enjoyable opportunity for students to interact with each other, therefore impacting their interpersonal skills (Brophy, 2010).

Furthermore, in the workplace, most learning occurs in the course of work practices. Incidental learning about academic concepts through observation and social interaction with the others in the cafeteria can help the students to acquire mutual problem solving and coaching skills in addition to formal training (Marsick & Watkins, 1990). As it is noted, incidental learning appears to be a socialization process. This makes it easy for educators to create incidental learning outcomes. Teachers can encourage the students to develop critical reflection skills and facilitate activities in non-traditional learning areas of the school. These areas may be socially interactive areas that embed informal learning and incidental learning experiences (Greenwood, 2010).

Incidental learning can also help in the intellectual development of an elementary student. It is noted that much of the learning happens informally and incidentally and occurs beyond explicit teaching or in the classroom. Many young people will try to apply some of the learnt experiences in their small-group interactions, peer stories, and even in classroom discussions as they proceed with their education (Brophy, 2010). In brief, incidental learning usually plays an important role in the student's overall experience as he or she advances in education and in their future workplace (Brophy, 2010).

With incidental learning, students encompass a wide range of activities where they can acquire knowledge through interacting with the environment around them without having a formal objective or structure. Boucher and Wiseman (2011) agree that incidental learning has some shortcomings including the inability to measure the knowledge attained through it due to its informal nature. Also, elementary students may

lack the ability to completely self-direct their learning. In conclusion, students can use the cafeteria environment to make observations, complete tasks, and interact with others and in return to unknowingly acquire knowledge.

<div align="center">Visual Learning with Visual Learning Tools</div>

Scientific research goes to support a higher effectiveness of visual learning as compared to other methods such as kinesthetic learning or audio learning. As stated in Jensen, "Between 80 and 90 percent of all information that is absorbed by our brains is visual" (Jensen, 2008, p. 55). According to Mayer and Sims (1994), studies on the use of visual learning strategies have been conducted within four key areas. The first is a survey of learning theories which use visual/graphic organizers. This includes theories such as cognitive load theory, schema theory, and dual coding theory (Mayer and Sims, 1994). The second issue that is addressed is the benefits of using visual learning strategies in the development of literacy. In this study Mayer and Sims (1994) also considers how visual organizers are used in the development of learning and thinking skills. This is with respect to issues such as retention, problem solving, critical thinking, as well as note taking. Finally, another consideration is the use of visual organizers for other kinds of classroom activities.

In Paivio (1991), more than two-thirds of students at all levels have greatly benefited from the use of visual learning in mastering their vocabulary skills. Further, it was also found that students who focused more on visual learning strategies improved their writing skills at a faster rate compared to those who used other methods. Paivio (1986) considered visual tools as falling under three categories, which also corresponded with their functionalities. The three purposes are categorized as: task-specific organizers,

thinking process maps, and brainstorming webs. Under each of these categories lie graphic (visual) organizers which are unique to each category. For the task-specific organizers for instance, there are life cycles as applied in science, decision trees as applied in mathematics, and text structures as applied in reading. Under the thinking process maps are thinking maps, diagrams for systems thinking, and concept maps (Paivio, 1986). Paivio (1986) considers graphic (visual) organizers as being comprised of all of the above. Throughout this study the term graphic organizers is used interchangeably with the term visual organizers.

According to research conducted by Jowett and Linton (1989), students who used graphic organizers such as site maps were found to significantly improve their higher order thinking skills as well as their critical thinking when compared with those who used other learning methods. Further, Danan (1992), and Kleinman and Dwyer (1999) found that students' retention and recall abilities were improved with the use of visual learning strategies. This was true even of students with learning disabilities. When follow-ups were done at various intervals, it was found that those who learned through visual methods retained and recalled events better. As a matter of fact, the use of graphic organizers was found to improve students' ability to transfer recall and retention skills to situations completely new to them (Mayer, 2001). In a study of eight senior high school students, Benson (1997) found that visual learning was a great aid in developing necessary skills. The students in this study had disabilities in learning social studies, but were able to improve with visual aids.

According to Benson (1997), the words of the great philosopher Aristotle are true; thinking is made possible by images. Benson (1997) maintains that this has played an

important role in the shaping of education, especially in the contemporary society.

Nevertheless, Benson (1997) concludes that there still are a lot of teachers who are either

unaware or unwilling to promote visual learning tools in their classrooms. This is seen

particularly with language teachers, who seem to focus too much on the spoken or written

word.

According to Paivio (1991), the cognitive process, in general, consists of interplay

of both visual and verbal elements. The use of both elements is the key to information

processing. This has particularly gained recognition from individuals who make use of

multimedia in education. Mayer (1995) suggests that as childhood educators get more

enlightened on the significance of visual learning aids, they incorporate them to help their

young students. Educators across the world are recognizing the need for effective and

appropriate employment of visual learning aids with students of all levels. Mayer (1995)

further argues that as student's get older, their ability to learn through visual aids gets

better and more visual learning aids can be incorporated.

In Mayer (2001), there is a strong link existing between verbal and non-verbal

codes. He understands verbal codes to mean verbal language that symbolizes both

concrete and abstract experiences. The non-verbal codes are concerned more with non-

linguistic language. This kind of information is of great importance in education because

it describes how learning enables retention, manipulation, and transformation of the

learning world either mentally or through imagination. The definition offered by Mayer

(2001) of multimedia instructional messages (MIM) captures and actually sums up the

whole idea of visual learning. He says that MIM is nothing more than presentations that

encompass both pictures and words. Mayer understands images as referring to both

dynamic and static graphics. Graphic organizers are of great importance because they aid in the processing and storage of information. Paivio (1986) observed that visual organizers had the effect of enhancing nonlinguistic representation development in students and therefore strengthened their development in academic content.

Paivio (1986) introduces an interesting understanding of visual learning. For him, visual and verbal systems, as two distinct levels of processing, can actually take place. In order to demonstrate this further, he offers the example of a cat. Whenever the word 'cat' is mentioned, the verbal memory code is activated at one level, and at another level the picture of a cat comes into action in the visual system. Paivio (1986) considers this representational processing. Further, he states that referential processing comes in after the representational processing, and serves to cross-activate the verbal and non-verbal codes. Continuing with the example of the cat, the mention of the word 'cat' necessarily invokes the visual system representation of the same, and the presentation of a picture of a cat automatically comes to mind. For that reason, Paivio (1991) considered visual aids as a necessary for learning, and states that learning would be totally impossible without them.

An additional thought regarding the interaction of the two systems is offered by Rieber (1994), who argues that verbal and visual do not always relate. He says this is because images have the ability to bring forth verbal labels. For that reason, he brings in the idea of associative processing, where additional information is activated within each of the systems. He says that there are several instances where visual information is transformed into verbal forms and stored in the long term memory (Rieber, 1994). He further states that linguistic representation is better generated in students who made use

of graphic organizers compared to those who used other methods of learning. For this reason, learning should be designed in a way that makes it possible for these different processing methods to interact. According to Horn (1998), the use of visual learning enables students to increase knowledge, but this could benefit from the combination of visual basics and words. Horn (1998) reports that words were incorporated in medical illustrations, diagramming, and engineering over the past 50 years.

The dual coding theory developed by Paivio (1986) is one that has attracted great interest from many educators due to its many learning implications. This theory supports the idea of utilization of visual aids leading to positively enhanced learning. Danan (1992) adds to this debate in his argument that teachers who use various visual learning aids stand a greater chance of improving their students' interaction and motivation in both academic and non-academic activities. Visual aids are also considered helpful to the teachers because they offer practical solutions to many problems encountered in the teaching process.

Mayer and Sims (1994), argues that in order to reap the most out of learning activities, educators should incorporate joint usage of visual and verbal aids. The popular adage that pictures are worth thousands of words support the understanding of why visual-verbal language is central to efficient communication and learning. Many theorists (Mayer 2001, and Chandler & Sweller, 1991) have indicated that students make use of 'stand-alone' diagrams that are visual-verbal integrated; studies have shown an increase in performance from about 23 percent to about 90 percent. Stand-alone diagrams are considered as those which possess all the elements and verbal basics that are needed for full understanding without necessitating other texts from elsewhere.

Campbell and Stanley (1993) conducted a study on the significance of application of visual learning in the study of mathematics. In order to facilitate the study, students were required to participate using both virtual and physical manipulatives. Students were allowed to compare their performance during the analysis. The first group was required to participate in lessons on fractions where they used physical manipulatives, while the second one was to participate in lessons using virtual manipulatives. Phase two required them to do the opposite. The whole test had three sections, and the first one was inclusive of items that were dual coded and presented through both numeric and pictorial representation. Part two consisted of items that were single coded with only numeric representation. The third part had word problems that required drawing of pictures while representing the problems and explaining the possible solutions in a few sentences. As a result, students who used pictures performed much better than those without pictures.

Generally speaking, there exists a very wide range of aids in visual learning. The most notable however are pictures, perhaps due to their simplicity and popularity. Pictures have been found to have excellent effectiveness in terms of producing the desired results. When teaching young children, pictures play a key role in helping them associate with new words. Not every word can have a pictorial representation, because some words are rather abstract and lacks real representation in the world (Anderson and Shifrin, 1980). Nevertheless, visual memory is considered to be retained more than any other kind of learning in human beings. Anderson and Shifrin (1980) argue that this is the very reason why dictionaries are often inclusive of pictures in the explanation of words.

Diagrams, charts, and maps are very common tools in the process of visual learning. In a research on the effects specific visual skills had on learning, Kleinman and Dwyer (1999) established that color graphics provided better tools for study and were better understood than graphics presented in black and white. A study that was earlier conducted by Heinich et al. (1999) also agreed with that of Kleinman and Dwyer (1999) that color graphics were better than black and white. However, Heinich et al. (1999) found no significant difference in the overall achieved learning.

Another type of visual aid that is commonly applied in education is film. Obviously, a great percentage of students worldwide watch films of some sort for leisure. In addition, film serves as an excellent tool and learning aid. Educators have found that film strips, slides, and motion picture films offer plenty of learning possibilities. A study by Jowett and Linton (1989) established the fact that films can be re-played as many times as needed and they can be useful for long-term memory of phrases and words. While studying the effects of film subtitles in a second language, Danan (1992) agreed that it had an effect on improving vocabulary. This study was done within the context of dual coding theory, due to its effect on both visual and verbal systems.

According to Doyle (1999), visual organizers are rooted in the schema theory. This simply refers to inter-linked nature of knowledge, both new and old. In other words, when new knowledge is acquired, it must be linked with the already existing knowledge for learning to take place. As stated by Doyle (1999) teachers have the duty of presenting materials in such a way that students are able to link the knowledge they already possess to the new knowledge. This leads the students to develop their own schema, which is necessary for understanding the concepts. The emphasis here is on the significance of

prior knowledge activation in the learning process. Comprehension according to Campbell and Stanley (1993) is possible only where interaction between old and new knowledge takes place.

According to theorists (Mayer and Sims, 1994; Paivio, 1986, and Benson, 1997), the amount of mental resources required to process any kind of information is referred to as cognitive load. This theory claims that only so much information can be acquired by the working memory at one time, and that any attempt to go beyond that limit would lead to loss of the information. Quite a number of researchers (Mayer 2001; Danan, 1992, and Chandler and Sweller, 1991) have agreed that instructional design can greatly benefit from the use of visual learning tools for the reduction of the cognitive load. They recognize a number of instructional strategies and their impact on the cognitive load. The two strategies are called modality effect and split attention effect. These strategies were found to have the impact of reducing the cognitive load. In one study, geometry students advanced in achievement when visual diagrams were accompanied by audio explanations. In the same study, it was found that with diverse information sources students were unable to deeply process information due to working memory overload (Paivio, 1999). A study by Horn (1998) established that the format of presentation of study content affected the reasoning abilities of students. Students that used pictorial materials were recorded with better reaction times, as well as a greater understanding.

According to a quasi-experimental study conducted by Brookbank et al. (1999) vocabulary skills of both elementary and junior high school students had been improved by the application of graphic organizers. This study was conducted with the assistance of teachers who were preparing for their masters dissertations over a period of 16 weeks.

Over this period, the teachers introduced their students to various visual organizers and instructed them on how to understand and clarify concepts; demonstrate details, ideas, as well as their relation; how to make analogies; and how to show order and sequences. In order to monitor the differences, Brookbank et al (1999) used pre and post-observational checklists. They established that over 80 percent of students at every level were enabled to develop a mastery of vocabulary.

Mayer (1994) and Gallick-Jackson (1997), conducted research in an attempt to determine what effect visual organizers had on writing skills. Their quasi-experimental studies involved 2nd and 3rd grade students with two teachers who were conducting their master's projects. The intention was to establish whether the student's creative, narrative, and composition writing skills could be improved. For that matter, the experiments integrated graphic organizers, word processing, and art in the process of writing. The classes were divided into two, so that one group was instructed using of graphic organizers, and the other without. These experiments went on over a 12 week period, and the pre and post-tests results show that the students with graphic organizers excelled more in their creative, narrative and composition writing skills than those who were instructed without them. It was further established that once students were introduced to visual organizers, they preferred that mode of instruction over others.

Brookbank et al. (1999) and Sinatra et al. (1984) carried out research on the effects of the use of visual organizers for the improvement of reading comprehension for grades 2 through 8 with learning disabled students. During one of the researches (Sinatra et al., 1984), a pre-reading strategy was employed, where mapping was used and compared to the approach of verbal readiness. This twenty-seven student study

attempted to improve comprehension in reading. After the tests, the scores revealed that those students who used the approach of mapping had higher academic achievement than students using verbal readiness.

A further research conducted by Brookbank et al (1999) with the same intention as that of Sinatra et al. (1984), revealed that the students generally made remarkable gains on the tests taken. This study was of students in the first, second, fifth, and seventh grades. Brookbank et al. (1999) and Sinatra et al. (1984) discovered that semantic mapping was actually an extremely useful way of enhancing learning. In particular, they recorded benefits in the following areas for both students and teachers:

1. Students are encouraged and motivated to reflect on and track their reading.

2. Students are also enabled to develop summaries that are visually coherent.

3. Teachers are able to come up with reading lessons that are more focused and purposeful.

4. Visual organizers also provided a structure on the basis of which pre-reading experiences are guided.

5. Teachers are enabled to organize the effort of readers toward pre-determined comprehension objectives.

A study by Troyer (1994), established that graphic organizers provided a much better strategy for effective comprehension reading as compared to others such as question-answer or mental models. Basically, Troyer (1994) found that more students were at home with the use of visual organizers for learning than with other methods, such as kinesthetic or audio. The reason why his study is considered significant is that it involved more than 173 students of various grade levels. Students were classified on the

basis of three conditions: control read/answer, graphic organizer, and mental modeling groups. In each of the groups, instructions were based on varying text organizational patterns, comparison, collection, and attribution. After the instructions, students in each of the groups were given tests, and students in the graphic organizer group advanced more than the other two groups.

According to several theorists (Silverman 2002; Golon, 2006, & Sousa, 2003), more than 60% of the most gifted learners are visual-spatial learners whose thought processes are comprised of images as opposed to words. These learners achieve more by watching and doing than receiving oral directions. Golon (2006) maintains that most of the visual-spatial learners are today's inventors, artists, architects, surgeons, engineers, computer geniuses, pilots, musicians, creators, as well as visionaries.

Silverman (2002) maintains that for these students, optimal learning occurs only when the use of the right hemisphere is unrestricted. Silverman notes that the right hemisphere includes imagery, humor, and creative thinking. However, Sousa (2006) finds that most of the 21st century schools are busy suppressing the use of the right hemisphere of many (over 60%) visual-spatial learners. Sousa concludes that most schools are purely left hemisphere organizations and are known for their emphasis on auditory-sequential learning, in a step by step manner, where students are required to think and learn in words. Sousa (2006) further maintains that especially at the secondary level, most of the students who are visual-spatial learners are not being taught how the student learns best. With more than two thirds of students preferring the visual-spatial learning style, the preference by schools to use the auditory-sequential style is rather disadvantageous. In turn, this makes many students struggle in order to be successful.

Golon (2006) argues scientific evidence stands to prove that between 75 and 80 percent of the gifted individuals in society are visual-spatial learners. He further adds that in some of the schools that he was employed, over 98 percent of the students were actually visual-spatial learners, and over 90 percent of students who were placed in special education classes also fell in the category of visual-spatial learners. Golon (2006) also felt that out of the studies conducted in Arizona, over 80 percent were actually in the visual-spatial learners' category and preferred it. Nevertheless, he also noted with concern the gearing of schools towards left-hemispheric learning. Left-hemispheric learning takes one step at a time; therefore students are required to master an area before being allowed to move up the ladder of academics. He also noted that in the higher grades, teaching occurred in a strictly auditory fashion, unlike in the lower grades where hands-on learning was incorporated. This is a major concern, according to Ritchie and Volkl (2000), because visual aids such as graphs, maps, and posters, help move students away from left hemispheric learning. Golon (2006) says that in most cases, whenever visual-spatial students are presented with introductory material for learning, they are often required to assimilate it in sequential fashion, which requires them to use their weaker (left) hemisphere. He says this can be compared to a person whose dominant arm is broken and forced to take notes with the weaker hand, and then blame them for a poor handwriting. Nevertheless, Gordon says that with continued practice, it is possible for that person to produce writing that is legible, but would never at any point attain the excellence of the dominant arm. Doyle (1999) agrees with this argument when he observes that almost every culture bears prejudices against the use of the left hand, which is directed by the right hemisphere of the mind. Silverman (2002) says that while the

right hemisphere is acknowledged as being in charge of the regulation of attention functions of the brain, failure to activate and engage the right hemisphere leads to low attention and poor learning in students. Silverman (2002) introduces very interesting observations that whether a student uses the visual-spatial style or not, they must necessarily use the right hemispheres in order to learn.

The use of eidetic (photographic) memory has been seriously contested, and not as many studies have been conducted to certify its existence. According to Kleinman and Dwyer (1999), there is strong evidence that eidetic memory exists, but there is very little understanding this concept. They maintain that even where it exists, it is found in less than ten percent of the entire human population, but few scientific methods of determining its presence exist. Horn (1998) maintains that this memory is quite often found in children but is easily lost before adulthood, and its rarity is the main reason why many do not find the claims of its existence credible. Horn (1998) and Silverman (2002) maintains that it is not clear yet, whether possessing this kind of memory is a good thing or not, especially due to the fact that one is likely to harbor too much information and be overwhelmed, thereby reducing the ability to recall. As far as visual learning is concerned, the use of eidetic memory has received almost no research at all that is worth mentioning.

<center>Ability Grouping and Student Tracking Methods</center>

Some schools group their students according to their abilities and academic levels. Test scores are used to determine the ability of learners and those of the same proficiency are grouped together. Students begin to associate with those from their groups during classes. Ability grouping was started in primary schools in the United Kingdom, but later

was so popular that it became the main organizational form in both primary and secondary schools (Ireson & Hallam, 2001). To be able to understand the meaning of ability grouping, there is a need to understand the various types of ability groupings that exist. According to Sears and Sorensen (2001), there are four types of ability grouping: setting, streaming, mixed ability, and within-class grouping. Streaming, setting, and within-class groupings are mostly used by teachers to reduce heterogeneity among learners. Pupils of the same ability are classed together although mixed ability groupings encourage heterogeneity. For the purpose of this study, ability grouping addressed is based on the academic ability and academic level of the students. In this case, students are grouped according to their previous academic performance in the classroom and on academic assessments.

Ability grouping has various effects on students. Ability groups are advantageous to the students because groups give them an opportunity to be instructed at different paces. There exist differences in academic performance between students, so their learning pace may be different. High ability learners learn concepts very fast compared to the low ability students (Slavin, 1996). Slavin (1996) continues to argue that the problem of instructional pace among learners is solved by these groups as learners of the same ability are grouped together. This enables them to grasp concepts at the same time. When learners are grouped by ability, the low ability learners find it easy to engage in learning without fear of criticism from higher-performing peers. The low ability students feel inferior to the high ability students and this may hinder student participation in class-work. In ability groups, all learners have a better chance of getting the instructor's

attention. This is because in mixed ability groups, teachers sometimes concentrate more on the high performers at the expense of other students.

Ability grouping also has a negative impact on the low ability learners in that it badly affects their self-esteem, self-confidence, and their attitudes towards school and schoolwork (Ireson & Hallam, 2001). Low ability students feel embarrassed and this might badly affect their self-esteem as they go on with school years. The placement of students in different classes is a constant reminder of their performance in class and this makes the low performers feel inferior to their high ability counterparts. This could end up affecting them in other aspects of life. Students who are constantly in the lower groups are most likely to view themselves as inferior and this might lead to them having a negative attitude towards school and school work. Further, it could lead to school drop-outs by the low ability students or animosity among students. The low ability group may feel inferior the high ability group, which could possibly bring about serious divisions within the school.

Also, the self-image of learners is greatly affected by ability groups. Low ability students have lower self-esteem as compared to the high ability students and this results in serious differential effects among the students of different groups (Sears & Sorensen, 2001). Teacher's attitudes are also a great determinant of the way students look at themselves. Students look to teachers as their role models. Therefore, any form of criticism from the teachers is taken seriously by the students. Some teachers tend to favor the high ability students than those of low ability; this makes these students devalue themselves. The behavior of teachers towards these students may drive them from school and such students could end up involving in negative behaviors as a way of settling their

disappointments. Ireson and Hallam (2001) argue that the perception of low ability students is greatly influenced by the teachers' behavior and attitudes towards them. There have been various propositions for equal treatment of students by teachers regardless of their academic ability and level; it will ensure there is no lack of self-esteem and bad self-image among students (Bryson & Bentley, 1980).

The question of ability groups increasing learning has been greatly debated by scholars. Some feel that it is advantageous and helps students learn while others argue that it is detrimental to learning. According to Wheelock (1994), ability groups do not promote student learning and they hinder the academic achievement of all student levels. Wheelock then proposes alternatives to ability groups and states the purpose for the need to use these alternatives in elementary school. Alternatives to ability groups are also suggested by Slavin (1996) since it is the only way teachers in elementary school can avoid making decisions that could end up causing negative effects on the students' self-esteem. Alternatives to ability groups include cooperative and mastery learning. Mastery learning involves the teaching of several lessons and then testing the understanding of the concept taught on the learners. Those found to have difficulties with the taught concept are given additional tutorials separately to make sure they understand. Cooperative learning refers to a method of instruction in which learners are grouped into small groups of mixed abilities and taught from these groups.

According to Sears and Sorensen (2001), ability groups do not help student learning since these groupings are not always done objectively and they are sometimes inconsistent. Ability groups should allow student mobility from one ability group to another, therefore requires a good system to regularly check student performance on tests.

Very few schools have effective systems of this nature, so some groups are not effectively checked. As a result, student learning is weakened by the ability groups rather than strengthened. Other studies argue that ability grouping significantly helps students to learn. Students in the higher ability groups are found to learn more and attain high achievement, but the lower groups students achieve very little (Blau, 2004).

The topic on ability groups has attracted a lot of controversy among different scholars. Some agree with ability grouping and some argue against its application in elementary schools. Ability grouping has been found to be very beneficial to high ability group students but detrimental to low ability students. The supporters of ability groups argue that if adjustments are made on the method of grouping, then ability groups would be an effective method to increase achievement among students. Those opposed to ability groupings, however, suggest several alternatives to it that are less detrimental and do not affect students negatively (Blau, 2004). There is a need for teachers to carefully analyze the various types of ability groups and choose the one that is most appropriate for their students because certain learning strategies are effective for a certain audiences.

<div align="center">Gender and Mathematics Achievement</div>

Gender roles are clearly important in today's society. When children are young, parents buy toys, clothes, and other items according to a child's gender. Stereotypical careers are mentioned for boys such as a doctor, lawyer, engineer, or even President of the United States. In contrast, parents may mention careers for girls, but assume that one day they will grow into the role of a wife and mother. Society has certain expectations for boys that differ from the expectations for girls. These expectations generate varying patterns of behavior and reactions according to the child's sex (Franzosa, 1993).

In the past, television programs like *Sesame Street* were used as a tool to implement early learning. Mainly, the focus was male dominated and encouraged boys to consider themselves "important" at an early age (Frazier & Sadker, 1973). Males and females are so different considering their gender roles. Often men are dominating and women are passive. These behaviors, dominance and passiveness, were encourage from childhood experiences and treatment of the genders by society. In relation to math achievement, traditional toys for both sexes show that boys are exposed to more math at a young age than girls. Typical boy toys include trucks, building blocks, and toy airplanes, which can be related to math concepts. Girl toys such as dolls and fashion accessories cannot be related to math concepts so easily. Throughout history, men have received dominate tasks and considered in an authority position, while women's task included housework, cooking, and raising children.

Schools differentiate between students based on their gender, including organizational procedures and behavior expectations. Compared to males, females have not been encouraged to think they can achieve highly in math. James (2007) recognized years ago, the standard for mathematics has been set using male performance as a standard in evaluating the results of math tests. Female math students, on the whole or as a group, were negatively affected by this standard. In summary, math was considered a male dominating subject (James, 2007).

The theory that boys perform better than girls on the hardest task and girls perform better on the easiest task is supported in research by Antoniou and Kyriakides (2009) in their study of four different groups of primary school students. The study pointed out the need for an assessment policy to be developed and the correlation

between complexities of work for each gender should be categorized separately. Separating the work may result in closing the aptitude gap between the genders. The awareness of this fact is an asset in developing a teaching tool for educators to reach their female students. Instructional methods of teaching math to boys and girls resulted in the gender difference and confidence of boys being higher than girls.

The idea of teaching girls in a different manner than boys does not imply that some girls will not excel in math. Educators ultimately produce the confidence in the student that is needed to achieve the necessary fundamentals of mathematics. As stated in the article *Gender Difference and the Teaching of Mathematics*, cognitive gender differences are considered by community college instructors (James, 2007). The article states that community college attendance is high because the mathematics requirements are low. Overall, many students consider the mathematics in a four year institution to be too complicated (James, 2007). The instructor really has to understand the cognitive differences in gender while preparing lessons for the students. As stated in this article, the ability to recognize and solve mathematical equations in males was construed with the way teachers interact with males. Often times, the teacher, who developed math problems of high male engagement, caused the male student to perform better as an independent thinker. On the other hand, the girls were not persuaded or engaged by math problems, therefore males dominated in math achievement (Dessart & Suydam 1983).

Studies were done where students were split into same-sex groups with a teacher of the same sex. The interaction with the teacher of the same gender significantly improved student self-esteem, especially with female students. Practical evidence indicated that same gender teachers were influential in student achievement. The same

sex teacher facilitated a better class interaction, resulting in improved performances of each same sex teacher's class. Research shows that student-confidence is needed to excel in education. Without equal gender confidence and achievement in females, society will continue to lose females as a portion of its work force.

The stereotyping in *I'm Glad I'm a Boy! I'm Glad I'm a Girl!* Darrow (1970) depicts boys as doctors, girls as nurses, boys as inventors, girls as using the inventions, boys as Presidents, and girls as first ladies. These assumptions have slightly changed in today's society. Today, gender does not limit the outcome of males or females as it did in the past. Our society has made tremendous progress in educating and welcoming both genders into many careers.   The Programme for International Student Assessment (PISA) 2006 still concludes that boys in most of their participating countries out score girls on math exams. Weist (2008) associates this truth with girls underperformance in math and a reduction of girls receiving scholarships and acquiring math-oriented occupations.

Specialized math camps aim to lower the gap between students in math and reduce the stereotyping of math-related careers. Students can receive help through specialized camps and increase their capabilities while reinforcing the skills needed to perform well in math. Out of school programs geared to developing mathematic skills could also be a tool used to enhance female math performance. Feasible solutions are greatly needed as we continue to diminish the gender gap in mathematics.

The United States of America, Germany, and the Netherlands share similar negative aspects of female mathematic abilities. In the article, *Making Gender Matter,* Eriksson and Lindholm (2007) reveals how citizens in Sweden deal with their small

gender gap in math. When gender was linked to the 186 participants, the men's test was superior to those of the women. The same study recognized that when stereotyping was removed, women fared as well as men on their performance. The results declared that individual differences and cultural context may impact the poor performance of females. In the International Journal of Education Development article *Equality or Equity: Gender awareness Issues in Secondary Schools in Pakistan,* Halai (2011) shows similar results of previous studies in disadvantaged schools in rural Pakistan.

Teaching boys and girls in separate classrooms may help the individual sexes. Some studies show that gender separated classes produce better functioning capabilities, since the issues of gender differences are not present. The development of intervention skills in teaching will enhance education in school and reduce male dominate forces in math education. The Beaudry & Campbell (1998) study concluded that the mathematical gap of elementary school boys and girls has no difference at all. This study agreed that when the students reach junior high school, the gap begins. As a result, when students reach high school and advance classes, the gap begins to widen.

Why does the gap exist between boy and girls and men and women in some countries, but not in others? Else-Quest, Hyde, & Linn (2010) states that analyzing the achievements and attitudes of women who have careers in math, engineering, and science technology, are related to culture. However, the Trends in International Mathematics and Science Study and the Programme for International Student Assessment Meta-analysis agree with the correlation of gender differences in math and science. Even when both genders perform similarly, the study equated males with a higher aptitude in math. *Cross-National Patterns of Gender Differences in Mathematics: A Meta-Analysis* reveals

that the most powerful indicators of gender gaps across nations is female enrollment, research jobs, and parliamentary representation (Else-Quest, Hyde & Linn, 2010). Despite the results of the cultural difference study, many women have defied the mathematical odds of successfully entering into these mathematical fields. Although women have become successful in math, the area still remains male-dominated. As of 2009, no women had won the Fields Medal, which is like the 'Nobel Prize' of mathematics (Hyde and Mertz, 2009). The cross-cultural samples have related inequalities in the size of the gender gap in math to women in the workforce. Environmental and social cultural settings are believed to impact math skills and gender gaps.

The importance of gender research and math achievement relates crucially to our role in society; careers in math, science, technology and engineering. This research brings about new knowledge of how to close the gender gap. The more we cultivate mathematically inclined youth, male or female, the better our future and economy will become. Not allowing females to seek full capacity when they show high mathematical aptitude deters the economic impact these females have to enhance our society.

The gap in mathematical achievement has been studied for several decades. Although most research shows that males have higher math achievement than females, progress has been made to decrease the gender gap. Since the early 70's, solutions have been proposed to close the gap and get females more involved in math-related fields. Preparations have been made to improve the testing of females so they can excel when entering math, science, and technology fields. Education research and evaluation uses new qualities to collate the information used to measure the results of gender differences

and difficulty interactions. Such processes as the Meta- Analytical, DIF (differential item

functions) and SES (socioeconomic status) are just some of the data researchers use as a

variable resource to accurately measure and resolve mathematic gender differences.

CHAPTER III

METHODOLOGY

This study examined the differences between researcher-made pre-tests and post-tests when participants were exposed to educational placemats in a school cafeteria. This quantitative study considered academic achievement as it related to Vygotsky's social learning theory, academic learning time, incidental learning, brain-based learning, visual learning, ability grouping, and gender and mathematics achievement. This study was unique because it was the only known study that investigated learning mathematical concepts in the school cafeteria using educational placemats. This study took place in the Fall of the 2011-2012 school year. In this chapter, the following topics will be described in greater detail: research design, participants, ethical protection of participants, instrumentation, data collection, and data analysis.

Research Design

For this study, an A-B, A-B design research study was set up in an elementary school cafeteria in Mississippi. Prior to the study, the researcher introduced all teachers to the study by an informal, verbal introduction during a regularly scheduled faculty meeting. Also, the researcher verbally introduced herself and the research study to the students.

This A-B, A-B design consists of students taking a pre-test before educational placemats are placed on the cafeteria tables and a post-test after the placemats have been on the table for four days. This study occurred four times using a different set of coordinating pre-tests, post-tests, and placemats. For research purposes, two of the four placemats served as control and did not relate to their pre-tests and post-tests. Statistics

software (SPSS) will be used to measure the difference in student academic achievement after exposure to the cafeteria placemats. Also, gender differences and ability grouping were analyzed using SPSS statistics software.

After returning parent permission and student assent forms, eligible 3rd grade students were selected to participate in the study. The pre-tests and post-tests were administered in the classroom. The researcher and the classroom teacher explained the written directions at the top of the test before distributing them to the students to complete. Students were instructed to put their ID number, class letter, and gender at the top of all pre-tests and post-tests. All three classrooms were administered the pre-tests and post-tests simultaneously with the teacher present and the researcher monitoring between classes as needed.

Figure 1. Cafeteria Table. Illustration by www.tablesnchairs.com. Copyright 2001 by Tablesnchairs, LLC. Adapted with permission from the author.

In the cafeteria, placemats were placed on the top of the cafeteria table without any type of adhesive. The cafeteria tables contained circular seats attached as a unit, as shown in the picture above (see Figure 1). Students spent approximately 20-25 minutes in the cafeteria for lunch each day. For this research study, students were not exposed to educational placemats during breakfast. During lunch, every child sat at the cafeteria table whether he or she brought lunch or not. Also, the students in this study were

supervised by their teacher during lunch; students sat with their general classroom teacher or substitute teacher for the day during lunch time.

Participants

The participants in this study were third grade students from an elementary school in the Hattiesburg Public School District in Hattiesburg, Mississippi. All students in the third grade were invited to participate in the research study. There were 57 students in the third grade at this school. The students were divided into three classrooms of approximately 16 students each. The students were ability grouped according to academic performance and student needs. Each classroom had one certified general education teacher and no teacher assistants. One special education inclusion teacher visited the low ability group to provide assistance as needed.

Based on enrollment demographics, this school has predominately minority students with low to moderate socio-economic statuses. For this particular study, there were 100% of the students were African American. This school is one of six elementary schools in the district. The enrollment so far contained approximately 450 kindergarten through 6th grade students. The school had approximately 28 certified teachers and approximately a 15:1 student/teacher ratio. Also, this school received Title 1 funding, but is not in school improvement for academic performance.

Before the study began, the researcher obtained verbal and written permission from the school's principal and written permission from the superintendent and school district (Appendix A). Participants were recruited for the study by verbal explanation of the study by the researcher. Consent and assent forms were sent home with the students at the end of a regularly scheduled school day. Participants were subject to obtaining

parent or guardian permission (Appendix B) and self-assent (Appendix C). For reliability

purposes, at least 30 students were expected to participate.

Ethical Protection of Participants

This study will be administered under the ethical guidelines of the school district

and the Institutional Review Board (IRB) of The University of Southern Mississippi

(Appendix D). After obtaining parental permission and student assent, procedural

safeguards will be followed using the guidelines from the school district and the

Institutional Review Board (IRB) of The University of Southern Mississippi.

Instrumentation

Researcher-made pre-tests and post-tests were used as the instruments in this

study. These pre-tests and post-tests were created especially for this research study. The

pre-tests and post-tests measured the difference, if any, after students were exposed to

content on the educational placemats. The pre-tests and post-tests for each math concept

were identical in content, but had a different arrangement of the questions. The pre-tests

and post-tests consisted of 10 question, black ink on colored paper, multiple choice

assessments. Directions were printed at the top of the tests. Also, a box indicating

gender choices was available at the top of the test. Students wrote their ID number and

circled their class letter and gender on the pre-tests and post-tests for identification

purposes. A panel of experts reviewed the instrument for reliability and validity before it

was pilot-tested on a group of beginning fourth grade students.

The researcher created the pre-tests, post-tests, and educational placemats using

Microsoft Word computer software and researcher-drawn cartoon figures. After the pre-

tests, post-tests, and placemats were designed, the researcher took them to a local print

shop to be printed and laminated. The placemats were made from 11" x 17" twenty pound colored bond paper and were laminated using five mil lamination thickness. The pre-tests and post-tests were made on 8.5" x 11" 20 lb colored paper without lamination.

Before the research study began, the researcher randomly selected two of four mathematical concepts of equal difficulty to be used during the intervention phases. The intervention phase included a pre-test, post-test, and educational placemat that correspond. The non-intervention phase included a pre-test, post-test, and non-related educational placemat that served as a control. The four math concepts were not taught previously or during the research study. A panel of experts, which consisted of three certified education professionals, reviewed the researcher-made assessments for content validity and reliability. Before the study was conducted, it was pilot-tested on a group of beginning 4th grade students at an elementary school within the same school district.

Data Collection

Pre-tests and post-tests were administered by the researcher with assistance from the classroom teacher. All testing took place in the classroom settings and used standardized directions. Prior to the testing, directions were reviewed to make sure all participants understand the procedures. This is a common practice for elementary students of this grade level. The instruments took approximately 15 minutes to administer, but additional time was provided for participants who were not finished. Since there were not any incomplete or missing pre-tests or post-tests, all tests were used for data analysis.

Data Analysis

The researcher manually graded the pre-tests and post-tests when the entire study was complete. Also, the researcher entered the student's pre-test/post-test scores, gender, and ability group into SPSS statistical software for analysis. The study used SPSS to conduct a mixed model ANOVA for each pre-test and post-test and for all the tests collectively. The ANOVA statistical test showed the difference between researcher-made pre-tests and post-tests when participants were exposed to educational placemats in a school cafeteria. The analysis included the independent variables of gender and ability grouping on academic achievement.

Chapter IV

ANALYSIS OF DATA

Introduction

The purpose of this study was to see how achievement levels of third grade

students differed after being exposed to educational placemats in the school cafeteria.

The data set for this research study was entered into SPSS software for analysis. Overall,

the sample had 49 participants with no missing data. The data set includes: participant

identification number, participant gender, participant ability group ranking, and

participant pre-test and post-tests scores from the study under four conditions.

Descriptive Data

The participants in this study included 49 third grade students who had been

divided into three ability grouped classrooms. This group of third grade students ranged

from 8-9 years old. Each classroom had approximately 16 students in each room with

one (1) certified teacher. The high ability group had a total of 20 students; there were 11

boys and nine girls. In the middle ability group there were 14 students; there were 10

boys and four girls. The low ability group had 15 students; there were 10 boys and 5

girls. All third grade students were invited to participate in the study. One hundred

percent (100%) of the students were African American. The gender breakdown of the

sample included 31 male participants (63%) and 18 female participants (36%). Over

90% of the students in this study received free or reduced lunch, which is an indicator of

a low socioeconomic status. Also, it is important to note that students did not change

ability groups during the study.

The means and standard deviations for each of the pre-test and post-test were as follows: The mean of the math pre-tests were 64.39 and the standard deviation was 19.91. The mean of the math post-tests were 69.08 and the standard deviation was 21.50. The mean of the control pre-tests were 44.59 and the standard deviation was 22.31. The mean of the control post-tests were 43.27 and the standard deviation was 23.53.

<div align="center">Tests of Hypotheses</div>

Scores on the researcher-made pre-tests and post-tests were used to test the hypotheses of this study. The researcher manually graded all pre-tests and post-tests when the study concluded and entered the data into SPSS software to conduct a mixed model analysis of variance (ANOVA). For purposes of this research, SPSS software was used to test hypotheses one, two and three. The independent variables for this study, time of test (pre-test and post-test), gender (boy or girl), and ability grouping (high, medium, or low), were analyzed to test for any differences following the use of the educational placemats in the cafeteria. All differences were evaluated at the .05 level of significance. Before the study, it was assumed that the independent variables may significantly influence the test scores. The results of the pre-tests and post-tests are as follows:

Hypothesis 1

The differences between math pre-test and post-test averages will be significantly greater after students have been exposed to educational placemats for four days each. Overall, the averages for math and control intervention phases did differ. The overall math averages were 64.39 for the pre-tests and 69.08 for the post-tests. For the control intervention phase, overall averages were 44.59 for the pre-tests and 43.27 for the post-tests. The pre-test and post-test results from the individual placemats are as follows:

1. For the fractions placemat, a math placemat, the results indicate that there was not a significant difference in the direction hypothesized, $F(1,48) = .676$, p= .415.

2. For the solar system placemat, a control placemat, the results indicate that there was not a significant difference, $F(1,48) = .620$, p= .435.

3. For the shapes placemat, a math placemat, the results indicate that there was a significant difference in the direction hypothesized, $F(1,48) = 8.027$, p= .007.

4. For the parts of speech placemat, a control placemat, the results indicate that there was not a significant difference, $F(1,48) = .053$, p= .819.

When both math pre-tests and post-tests were combined, the results were significant, $F(1,48) = 11.592$, p= .001. Since the hypothesis predicted a significant difference, Hypothesis 1 was supported. In comparison, both control pre-test and post-test conditions were combined and the results were not significant $F(1,48) = .488$, p= .488. The researcher's hypothesis was supported because the math pre-tests and post-tests were overall significantly different, while the overall control pre-tests and post-tests were not significantly different.

Hypothesis 2

The differences between non-control pre-test and post-test averages for male students will be significantly greater than female students after all students have been exposed to educational placemats for 4 days each.

The research findings show that the averages for math pre-tests and post-tests did differ. The 31 boys averaged 61.45 on the math pre-tests and 66.45 on the math post-tests. In comparison, the 18 girls averaged 69.44 on the math pre-test and 73.611 on the math post-test. The math pre-test and post-test comparison for gender showed that the

pre-test was significantly different than the post-test, $F(1,47) =10.08$, p =.003. Whereas the girls had higher pre-tests and post-tests than the boys, this interaction of pre-tests, post-tests, and gender was not significant, $F(1,47) = .083$, p = .774, therefore the hypothesis was not supported.

For the control intervention phase, overall averages were 44.35 for the boys' pre-test and 42.26 for the boys' post-tests. The girls scored 45 points on both the control pre-test and post-test. There was not a significant pre-test/post-test difference on control placemats. With control placemats, a comparison of pre-tests and post-tests by gender showed that there was not a significant interaction according to the student's sex, $F(1,47) = .279$, p= .600.

Hypothesis 3

The pre-test and post-test averages will be different for the three ability groups after all students have been exposed to educational placemats for four days each.

When both math pre-tests and post-tests were combined, the results showed the post-tests were significantly higher than the pre-tests, $F(1,46) = 11.815$, p= .001. Considering the pre-tests, post-tests, and differences for the groups, there was no significant interaction, $F(1,46) =1.96$, p = .153. Since the hypothesis predicted a significant interaction, the researcher's hypothesis was not supported.

<center>Summary</center>

Two of the hypotheses proposed a significant interaction of condition (pre-test and post-test) by either gender or ability group. Neither of these interactions was significant for the math placemats. However, after being exposed to math placemats, post-test scores were significantly higher than the pre-test scores across genders and

groups. In contrast, after exposure to the control placemats, post-test scores across genders and groups were lower than pre-test scores. These control pre-test and post-test scores did not differ significantly.

CHAPTER V

SUMMARY

The purpose of this study was to see how achievement levels of third grade

students differed after being exposed to educational placemats in the school cafeteria

for 4 days each (four different placemats). For research purposes, two of the

placemats were control and not related to their pre-tests and post-tests. This chapter

presents a summary of the procedures, significant findings, conclusions, and

recommendations. The recommendations are referred to the role of a school

administrator as a leader in school culture, design, and curriculum. Major findings of

the research are presented to offer guidance for further research study.

Summary of Major Findings

The pre-tests and post-tests were analyzed as stated in Chapter IV. The math pre-

tests (64.39 average) and math post-tests (69.08 average) were higher than the control

pre-tests (44.59 average) and post-tests (43.27 average). When the math pre-tests and

post-tests were combined, the difference was significant. In comparison, when both

control pre-test and post-test conditions were combined, the results were not

significant. Since math post-tests were significantly higher than math pre-tests,

Hypothesis 1 was supported. Also, girls scored significantly higher than boys,

therefore, Hypothesis 2 was not supported. With the ability groups, there was no

significant interaction among the three ability group levels and pre-tests and post-

tests, therefore, Hypothesis 3 was not supported. Participant scores increased during

the math placemat intervention, but decreased during the control intervention

placemat.

Discussion

Prior to the study, the researcher observed a typical day in the school cafeteria where the research study took place. The researcher noticed how many students left the lunch table with crumbs, trash, and other food items. Once the research study began, the researcher noticed that most of the student's behavior had changed in regards to the placemats. The students were observed cleaning the placemats without prompting from teachers or others. Several students made a special effort to clean their placemats before leaving the cafeteria. The researcher linked this change in behavior and cafeteria cleanliness to the participants' sense of value for the placemats.

Since 3rd grade students were the only grade level participating in the study, other students in the cafeteria were observed taking interest in the placemats. Other teachers, secretaries, and staff members-including cafeteria staff-became interested in the placemats. For this particular study, the four days of research for each placemat took place on Tuesdays, Wednesdays, Thursdays and Fridays of each week. Although students were explained the schedule and process of the study, many inquired about using the placemats on Mondays. The researcher noticed that several students picked up their placemat and began studying it after they finished their meal. Students from the high, middle, and low ability groups asked to volunteer with collecting and cleaning the placemats after the lunch period ended. When the study concluded, one of the 3rd grade teachers asked if she could have the placemats for further use. She wanted to use the placemats teaching method to increase student achievement.

Conclusions and Implications

The educational placemats in the cafeteria are an example of a scaffold, or temporary support for a learner. Lev Vygotsky defined a scaffold as teachers and others, called More Knowledgeable Others, supporting a learner's development by providing support structures (Raymond, 2000, p. 176). Also, McKenzie (1999) adds that scaffolding reduces uncertainty, surprise, or disappointment. In this study, participants were not surprised with the placemats. In alignment with the scaffold learning technique, participants were introduced to the study beforehand. Also, since the cafeteria is a social setting, the differences in pre-tests and post-tests can be related to Vygotsky's social learning theory; it states that social interaction precedes development.

In the book, Time is of the Essence, Huyvaert (1998) identifies various ways to increase student achievement by increasing academic learning time (ALT). Since the educational placemats were in the cafeteria, the students' academic learning time and exposure to academic content increased. In this study, time as an independent variable made a difference in pre-test, post-test scores. Wood and Walker (2007) argue that academic learning time does not have to be confined to a classroom. Further, this article states that some of the best opportunities for learning may be outside the classroom.

In consideration of how the brain learns, Jensen (2008) points out ways the brain learns best. Brain-based research shows various techniques where memory and learning can take place at a higher level. The cafeteria placemats may have engaged the student's brain because they are non-traditional learning aides. The observed excitement and student engagement regarding the educational placemats suggest that they were something of interest to the students. According to Bucko (1997), brain-friendly

techniques involve meaning, repetition, patterning, and emotion. Since the student's behavior patterns changed after being exposed to the educational placemats, one can assume the placemats affected the patterning and emotions.

Although students were expecting placemat exposure as part of this research study, incidental learning may have taken place also. During the study, many students were observed picking up the placemats, pointing to the placemats, or reading the placemats. Others sat at the cafeteria table and ate their lunch without extensive attention to the placemats. According to the literature review on incidental learning, unconscious learning may take place as a result of auditory or visual memory. In other words, the students that did not extensively read the placemats were still getting auditory and visual exposure from surrounding students at the cafeteria table, as a result of socialization.

Eric Jensen states "between 80 and 90 percent of all information that is absorbed by our brains is visual" (Jensen, 2008, p. 55). Since the educational placemats are visual learning tools, one can assume that they were more beneficial than an auditory aide. The literature review pointed out that students who use visual aids improve more than no visual aides, auditory aides alone, and other types of learning techniques. Also, posters, graphic organizers, checklists, and other types of visual aides were found beneficial. Mixing visual learning aides with other types of learning techniques, such as verbal, was found to increase student learning. Also, previous research states that a larger percentage of learners are visual and visual spatial learners. Kleinman and Dwyer (1999) pointed out how using color on learning aides holds attention and interest longer than black and white learning aides. For this particular research study, all placemats were printed on color

paper with black ink. If placemats were printed using multiple colors, the student's may have been attracted to look at the placemats more often.

Many research findings point out the various effects of ability groupings on student academic performance. During this study, students sat at the cafeteria table with their ability grouped class and their teacher. There were advantages and disadvantages to the ability grouping, in relation to this study. Advantages include being instructed at an appropriate pace in the classroom for the ability group. Disadvantages include the fact that ability grouped students did not have More Knowledgeable Others (MKO) at the cafeteria table with them. For example, the low ability group may have difficulties reading or understanding the placemats; but since all students were approximately the same academic level, they could not help one another effectively. Wheelock (1994) states that ability groups do not help student learning because they are inconsistent, lack adequate performance checks, and create stigmas. In this placemats study, the low ability group had lower pre-test and post-test averages for non-control testing than any other ability group. The high and middle ability groups had greater differences from the placemats, however, the low ability group did not show as much growth (almost flat-line for pre-test and post-test for non-control) as the other ability groups.

The researcher hypothesized that males would out-perform females during this research study. Actually, the findings showed the opposite. Females in this study outperformed males by having higher pre-test and post-test averages. Considering that there were only 18 girls compared to the 31 boys in the study, there were many boys in the low ability group. Even though research has historically viewed mathematics as a male-dominating subject, the gender gap is closing. Beaudry & Campbell (1998) stated

that the math gap for elementary school students has no significant difference. For this participant sample, there were no known stereotypes, bias, or differences in instruction according to gender.

<div align="center">Limitations</div>

The following limitations occurred during the study:

1. This study was limited to 3rd grade students, gender, and ability groupings. If additional variables were examined, it would provide additional data.

2. This study was limited to one elementary school in one geographical area in Mississippi. If other geographical areas and school levels were examined, both in the U.S. and overseas, it would provide additional data.

3. This study was limited to researcher-made pre-tests and post-tests. If additional types of tests were administered, it would provide additional data.

4. This study's instruments included mathematical concepts. If additional subject areas were tested, it would provide additional data.

5. This study's data was collected in the Fall of the 2011-2012 school year.

6. This study's participants were African Americans from low socioeconomic backgrounds. If additional races and socioeconomic backgrounds were tested, it would provide additional data.

7. The placemats were limited to being put out on Tuesday's, Wednesday's, Thursday's, and Friday's of each week for 4 weeks. If a different time frame was used, it would provide additional data.

<div align="center">Recommendations for Researchers</div>

The following recommendations are for further research:

1. A replication of this study should be done with a larger sample size.

2. A replication of this study should be done using various grade levels of participants.

3. A replication of this study should be done using various educational topics.

4. A replication of this study should include other cities, states, and other countries.

5. A replication of this study should include additional independent variables.

6. A replication of this study should include different or additional methods for testing participants.

7. A replication of this study should include participants of other races and socioeconomic backgrounds.

8. A replication of this study should include a longer time frame for placemat exposure.

Recommendations for Practice

School administrators should consider providing opportunities for students to learn outside the classroom on their school campus. Since social learning, incidental learning, and visual learning can take place outside the classroom, administrators should explore other areas of their school campuses where students can increase academic achievement. Students may be able to learn academic content outside the classroom in other areas such as the bus-stop, school bus, bathrooms, hallways, playgrounds, other school areas. Students may also be able to learn academic content on clothing of other students and staff members.

The Bus-stop: The First Area for Learning

School officials should consider creating visual, incidental, and social learning opportunities for students to learn at the bus-stop. Traditionally, students in America stand at the bus-stop for a varied amount of time, approximately 10-15 minutes, awaiting the school bus. This time can be turned into a learning opportunity if the bus-stop bench and/or surrounding area included academic content in the form of a visual aide. This is similar to the advertisements that businesses use to sell their services and products. Also, schools can use in-ground signage and folders allocated for students to study at the bus-stop. Since students can learn socially or independently at the bus-stop, schools could provide an incentive or reward for students that bring their folders on a daily basis. Walking and car-riding students can benefit from the study folder also. Since they do not ride the school bus, they could benefit from signage near the parent drop-off area.

The School Bus: A Yellow Classroom

Why are students not learning on the school bus? For many years, students have been transported to and from school by school buses. School districts across America spend millions of dollars to provide a variety of transportation for students. However, this transportation process could also have an educational benefit if students were exposed to academic content while riding on the school bus.

The interior and exterior of a traditional school bus in America is basically the same in all areas of the country. Most school busses have a bright yellow exterior and a uniform interior which includes the bus-driver's area and large bus seats for students. The large backs of the bus seats could potentially be an area for providing educational content as visual aides. Also, television screens can be mounted on school buses, if funds

are available. Learning programs, as auditory and visual aides, could play while a student is riding to and from school. An effective administrator could collaborate with the bus-drivers, transportation directors, and academic coaches to monitor the academic content so that it reflects the academic level of students on that bus route. For example, a bus route with high school students only should display high school level academic content on the television screens and interior of the school bus.

In consideration of the school's budget, a low-budget way to use this method is to attach small posters or cards, with academic content, above each window on the interior of the bus. In considering the larger context of academic content, school buses should include academic content on the exterior of the bus similar to how city buses advertise on their exteriors. In relation to student learning, parents and other stakeholders could be exposed to academic content from the exterior of the school bus. In consideration of Vygotsky's social learning theory, specific bus routes could have assigned bus seats with specific study content and study partners to maximize the social learning opportunity.

<div align="center">Sidewalks, Hallways, and Floors: Walk and Learn</div>

Naturally, most students look at the floors and walls when they are walking on the school campus. Sidewalks and flooring should include academic content as visual aides for students. Sidewalks are a great opportunity to expose students and stakeholders to basic academic content such as polygons, lines and angles, and multiplication facts. Language content such as parts of speech can be utilized also. Some schools display student work examples in their hallways, but not academic content for students to learn as they are walking. Since flooring and tiles with academic content are expensive to create

and install, the floor's base molding should be considered as an area to include academic content.

<div align="center">The Cafeteria: Academics for Breakfast and Lunch</div>

The findings of this research study suggest that academic content exposure in the school cafeteria can make a difference. A school administrator can collaborate with the cafeteria staff, cafeteria staff manager, and academic coaches to create methods for students to learn in the serving line. Educational food trays and placemats could serve as visual aides for exposing students to academic content. Also, cafeteria tables, chairs, and garbage cans in the cafeteria can include academic content as pictures or words. Television monitors could be added to display academic content while students are eating. Some students spend up to 25 minutes or more in the cafeteria eating breakfast and lunch. That is an approximate total of 50 minutes or more spent in the cafeteria on a daily basis. The school principal can create a plan to turn this missed learning opportunity into a method for academic exposure outside the classroom. With a good plan, the cafeteria staff can be extremely helpful in keeping the placemats clean, turning the television monitors on, and coordinating the displayed content.

<div align="center">The Bathroom: An Independent Study</div>

Just as in the cafeteria, students can be exposed to academic content in the bathrooms also. Inside and outside the bathroom stalls could be great areas to add learning posters. Television monitors that are mounted high in the bathroom can constantly flash academic content during school hours. The sink and mirror areas could also be great places to add academic posters. Also, the paper-towel, toilet paper, and soap dispensers could be used to display academic content. The school's principal or

assistant principal can request that the janitors assist in monitoring the areas of the bathroom just as the cafeteria staff monitors the cafeteria.

The Playground: A Fun Place to Learn

Playground equipment is a perfect place to include visual aides. Students can be exposed to learning while playing. Visual learning will take place when the student sees the material on the playground. Also, a physical education coach can include learning games with physical activity. Instead of playing a game such as baseball or tag, students can match words with polygon shapes as they complete a race. On the sidewalk of the playground, learning games can be set up there for social learning of students. The school's principal and/or assistant principal can supervise the addition of academic to swing-sets, slides, see-saws, and other playground equipment in a safe and effective manner.

Other Places to Learn

The computer lab, football stadiums, gyms, tennis courts, and swimming pool areas can use this method to increase student exposure to academic content. In consideration of the school's goal for academic achievement out of the classroom, extra-curricular activities should use this method also. The classroom is an obvious place that academic content should be displayed. Using this method includes examining the school and community's culture. Schools that have a culture receptive of learning will most likely be receptive of using non-traditional learning methods.

Clothing for Faculty, Staff, and Students

Medical doctors, firefighters, and military personnel wear clothing that reflect their overall career goal. This method includes re-designing school staff and student

clothing to reflect the school's overall goal of increasing student achievement in a safe and efficient manner. Students, teachers, and staff can benefit from wearing clothing with academic content on the exterior of the clothing. Student uniforms could have multiplication facts, polygons, lines/angles, vocabulary words, and other knowledge content that can be learned by visual learning and repetition.

Another alternative for schools with low budgets is to use embroidery, adhesive tags, and pin-on tags. Stakeholders should have academic content on their visitor's name tags. Also, cafeteria staff, janitorial staff, crossing guards, and maintenance crews could all wear clothing with academic content also. This method of including academic content on school clothing expand to include cheerleader uniforms, football jerseys, choir robes, and other extra-curricular clothing. As role models, the school's district and school administration personnel could also wear this academic clothing.

A school administrator should consider the political, legal, and social aspects of placing learning opportunities outside the classroom. Also, the administrator should keep safety in mind and use these methods carefully and safely. They can ensure that teachers and other staff members do not place academic content in places where it will block safety exits, fire extinguishers, or other important areas.

APPENDIX A

PARENT PERMISSION LETTER

PARENT PERMISSION LETTER

Dear Parent (or Guardian),

My name is Keshia L. Gaines and I am a Ph.D. student from the University of Southern Mississippi. I am looking at how students learn in the school cafeteria after being exposed to educational placemats for 4 days each (4 different placemats). I would like to invite your child to participate in this research study about learning inside the school cafeteria. The purpose of this study is to provide research findings about learning outside the classroom and the differences in scores between boys and girls.

Beginning in late August and continuing through September, your child will receive an educational placemat to use in the school cafeteria. Also, your child will take pre-tests and post-tests with every placemat. The tests will occur in your child's math classroom and will include math content. Your child's name will not be associated with the research findings. There are no known risks from this study and your child may benefit from learning academic content. At the completion of the study, all of your child's data will be destroyed. Participation in this research study is voluntary and students may withdraw from this study at any time without penalty or prejudice.

If you would like additional information concerning this study, please contact me by phone at (228)861-6235. Thank you for your consideration.

I have been fully informed of the above-described research study and the benefits and risks that are involved in participating in this study. I have received a copy of this entire document.

_____

Name of child (Print)

_____   _____

Signature of Parent   Date

____ YES, I would like my child to participate

____ NO, I would not like my child to participate

"This project has been reviewed by the Human Subjects Protection Review Committee, which ensures that research projects involving human subjects follow federal regulations. Any questions or concerns about rights as a research subject should be directed to the chair of the Institutional Review Board, The University of Southern Mississippi, 118 College Drive #5147, Hattiesburg, MS 39406-0001, (601) 266-6820.

APPENDIX B

STUDENT ASSENT FORM

STUDENT LETTER

Dear 3rd Grade Student,

My name is Keshia L. Gaines. I would like to find out about students learning in the school cafeteria. I also would like to learn about differences in scores from boys and girls. I am asking you and a lot of other students to help me learn about it.

If you agree to be in this activity, I will ask you to take some very short math tests in your math classroom. Also, I would like you to put a small poster under your lunch tray in the cafeteria. From late August through September, you will get 4 different posters to use. This can be fun to do!

The math tests have 10 questions on them. Your score will not affect your school grade. All you have to do is try as hard as you can on all tests for this study. Your teachers, parents, and other children will not know your scores. Your scores will be to help me with my school project.

This study has no known risks and you may learn from the posters in the cafeteria. At the end of the study, I will get rid of all test scores. It is your choice to be in this study and you may quit this study at any time without getting in trouble.

Thank you,

Keshia L. Gaines
Keshia L. Gaines

_____

The study on learning in the cafeteria has been explained to me and any questions I had have been answered. I was given a copy of this letter.

_____

Student's Name (Sign here)

___ YES, I would like to be in the study.
___ NO, I would not like to be in the study.

"This project has been reviewed by the Human Subjects Protection Review Committee, which ensures that research projects involving human subjects follow federal regulations. Any questions or concerns about rights as a research subject should be directed to the chair of the Institutional Review Board, The University of Southern Mississippi, 118 College Drive #5147, Hattiesburg, MS 39406-0001, (601) 266-6820.

APPENDIX C

SUPERINTENDENT AND SCHOOL DISTRICT APPROVAL

Hattiesburg Public School District
Post Office Box 1569
301 Mamie Street
Hattiesburg, MS 39403-1569

Established 1885

Mr. James Bacchus, Superintendent

July 20, 2011

Keshia L. Gaines
3106 McClain Dr.
Hattiesburg, MS 39401

Dear Ms. Gaines:

Your proposal, " **A Quantitative of Learning in the School Cafeteria**" for students in 3rd grade only is approved as submitted and may be coordinated with the principals on the attached list.

Participation from each school will be at the individual principals' discretion and is subject to their prioritization of learning activities.

Your proposal states that this project/activity will be conducted two (2) times a week for four (4) weeks. There will also be a 20-minutes quiz (pre-test & post-test). The purpose of your study is to analyze how academic achievement differs after students are exposed to educational placemats in the school cafeteria.

We appreciate the opportunity to work with you and trust that this will be a mutually beneficial endeavor.

Sincerely,

Alan Oubre, Ph.D
Executive Director of Student Support

cc: Principals K-6
    Dr. Edna Thomas, Assistant Supt. Academics/C&I
    Dr. Teresa Poole, Exe. Director School Operations

APPENDIX D

IRB APPROVAL LETTER

THE UNIVERSITY OF SOUTHERN MISSISSIPPI.

INSTITUTIONAL REVIEW BOARD
118 College Drive #5147 | Hattiesburg, MS 39406-0001
Phone: 601.266.6820 | Fax: 601.266.4377 | www.usm.edu/irb

NOTICE OF COMMITTEE ACTION

The project has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services (45 CFR Part 46), and university guidelines to ensure adherence to the following criteria:

- The risks to subjects are minimized.
- The risks to subjects are reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- **Where appropriate, the research plan makes adequate provisions for** monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered regarding risks to subjects must be reported immediately, but not later than 10 days following the event. This should be reported to the IRB Office via the "Adverse Effect Report Form".
- If approved, the maximum period of approval is limited to twelve months.
  Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: **11080401**
PROJECT TITLE: **A Quantitative Study of Learning in the School Cafeteria using Educational Placemats**
PROJECT TYPE: **Dissertation**
RESEARCHER/S: **Keshia L. Gaines**
COLLEGE/DIVISION: **College of Education & Psychology**
DEPARTMENT: **Educational Leadership**
FUNDING AGENCY: **N/A**
IRB COMMITTEE ACTION: **Expedited Review Approval**
PERIOD OF PROJECT APPROVAL: **08/11/2011 to 08/10/2012**

Lawrence A. Hosman   8-16-2011
Lawrence A. Hosman, Ph.D.   Date
Institutional Review Board Chair

APPENDIX E

FRACTIONS PRE-TEST 1-5

FRACTIONS PRE-TEST   ID# _____ A B C
                                      CIRCLE: Boy or Girl

DIRECTIONS: Put your ID#, class letter, and gender at the top of the paper. Read each
question and choose the best answer. Circle one (1) letter for your answer.

---

1. What part of this fraction is shaded?

   a. 5/9
   b. 6/9
   c. 7/10
   d. 4//9

2. What part of this fraction is shaded?

   a. 4/5
   b. 1/5
   c. 5/6
   d. 5/5

3. What part of this fraction is shaded?

   a. 1/8
   b. 7/8
   c. 5/9
   d. 6/8

4. What part of this fraction is shaded?

   a. 7/10
   b. 3/8
   c. 5/9
   d. 8/10

5. What part of this fraction is shaded?

   a. 5/9
   b. 6/12
   c. 6/10
   d. 7/10

APPENDIX F

FRACTIONS PRE-TEST 6-10

FRACTIONS POST-TEST   ID# _____ A B C
                             CIRCLE: Boy or Girl

6. What part of this fraction is shaded?

    a. 9/10
    b. 7/11
    c. 7/12
    d. 4/11

7. What part of this fraction is shaded?

    a. 5/6
    b. 4/7
    c. 5/8
    d. 8/10

8. What part of this fraction is shaded?

    a. 5/9
    b. 6/9
    c. 7/10
    d. 4//9

9. What part of this fraction is shaded?

    a. 3/9
    b. 6/8
    c. 6/9
    d. 3/8

10. What part of this fraction is shaded?

    a. 2/5
    b. 2/11
    c. 9/12
    d. 8/12

APPENDIX G

LINES/ ANGLES PRE-TEST 1-5

LINES/ANGLES PRE-TEST   ID# _____ A B C
CIRCLE: Boy or Girl

DIRECTIONS: Put your ID#, class letter, and gender at the top of the paper. Read each question and choose the best answer. Then circle one (1) letter for your answer.
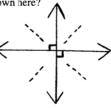
----

1. Which type of lines is in the word "small?"

   a. Line segment
   b. Parallel lines
   c. Intersecting lines
   d. Perpendicular lines

2. What type of angle is in this picture?

   a. Acute angle
   b. Right angle
   c. Obtuse angle
   d. line

3. Which type of lines is shown here?

   a. Parallel lines
   b. Perpendicular lines
   c. Intersecting lines
   d. Line segment

4. The dog's mat contains a _____.

   a. ray
   b. line
   c. line segment
   d. intersecting lines

5. What type of lines is inside the box?

   a. Parallel lines
   b. Perpendicular lines
   c. Intersecting lines
   d. Line segment

APPENDIX H

LINES/ANGLES PRE-TEST 6-10

LINES/ANGLES PRE-TEST ID#_____ A B C
CIRCLE: Boy or Girl

6. What type of angle is in this picture?

   a. Acute angle
   b. Right angle
   c. Obtuse angle
   d. ray

7. What is this the name of this angle?

   a. Acute angle
   b. Right angle
   c. Obtuse angle
   d. Point

8. Which of the following is in this picture?

   a. line
   b. Line segment
   c. ray
   d. perpendicular lines

9. Which of the following is shown in the tree?

   a. Perpendicular lines
   b. Parallel lines
   c. Right angle
   d. point

10. This is called a _____.

   a. line
   b. line segment
   c. ray
   d. point

APPENDIX I

SHAPES PRE-TEST 1-5

SHAPES PRE-TEST   ID#_____ A B C
CIRCLE: Boy or Girl

DIRECTIONS: Put your ID#, class letter, and gender at the top of the paper. Read each question and choose the best answer. Then circle one (1) letter for your answer.

1. The television is shaped like a _____.

   a. Sphere
   b. Cylinder
   c. Cone
   d. Cube

2. What two (2) shapes are in this picture?

   a. Heptagon and Cone
   b. Cylinder and Sphere
   c. Trapezoid and Cone
   d. Cube and Cone

3. Which figure is shown here?

   a. Pentagon
   b. Hexagon
   c. Heptagon
   d. Octagon

4. A basketball is a _____.

   a. Sphere
   b. Cube
   c. Cone
   d. Rhombus

5. How many sides does a Heptagon have?

   a. 5
   b. 6
   c. 7
   d. 8

(turn over)

APPENDIX J

SHAPES PRE-TEST 6-10

SHAPES PRE-TEST

ID#_____ A B C
CIRCLE: Boy or Girl

6. The shape of the dog house is a (an) ____.

   a. Pentagon
   b. Hexagon
   c. Heptagon
   d. Octagon

7. The can of soup is a ____.

   a. Sphere
   b. Cylinder
   c. Cone
   d. Cube

8. The stop sign is a (an) ____.

   a. Pentagon
   b. Hexagon
   c. Heptagon
   d. Octagon

9. The fish bowl is shaped like a (an) ____.

   a. Pentagon
   b. Hexagon
   c. Heptagon
   d. Octagon

10. The kite is shaped like a ____.

   a. Rhombus
   b. Sphere
   c. Cylinder
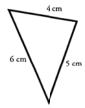   d. Cone

APPENDIX K

PERIMETER PRE-TEST 1-5

PERIMETER PRE-TEST   ID#_____ A B C
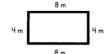   CIRCLE: Boy or Girl

DIRECTIONS: Put your ID#, class letter, and gender at the top of the paper. Read each
question and choose the best answer. Circle one (1) letter for your answer.

1. What is the perimeter of this shape?

   a. 4 cm
   b. 5 cm
   c. 6 cm
   d. 15 cm

   4 cm
   6 cm
   5 cm

2. What is the perimeter of this shape?
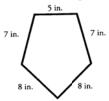
   a. 4 m
   b. 8 m
   c. 12 m
   d. 24 m

   8 m
   4 m
   4 m
   8 m

3. What is the perimeter of this shape?

   a. 3 ft
   b. 9 ft
   c. 18 ft
   d. 36 ft

   9 ft
   9 ft
   9 ft
   9 ft

4. What is the perimeter of this shape?

   a. 5 cm
   b. 7 cm
   c. 19 cm
   d. 35 cm

   7 cm
   7 cm
   5 cm

5. What is the perimeter of this shape?

   a. 5 in
   b. 7 in
   c. 8 in
   d. 35 in

   5 in.
   7 in.
   7 in.
   8 in.
   8 in.

APPENDIX L

PERIMETER PRE-TEST 6-10

PERIMETER PRE-TEST   ID# _____ A B C
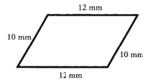   CIRCLE: Boy or Girl

6. What is the perimeter of this shape?

    a. 3 mm
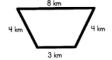   b. 9 mm
    c. 18 mm
    d. 36 mm

7. What is the perimeter of this shape?
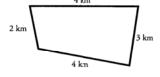
    a. 10 mm
    b. 12 mm
    c. 24 mm
    d. 44 mm

8. What is the perimeter of this shape?

    a. 3 km
    b. 4 km
    c. 8 km
    d. 19 km

9. What is the perimeter of this shape?

    a. 2 km
    b. 7 km
    c. 13 km
    d. 15 km

10. What is the perimeter of this shape?

    a. 3 m
    b. 6 m
    c. 9 m
    d. 18 m

APPENDIX M

FRACTIONS POST-TEST 1-5

FRACTIONS POST-TEST   ID# _____ A B C
                             CIRCLE: Boy or Girl

DIRECTIONS: Put your ID#, class letter, and gender at the top of the paper. Read each question and choose the best answer. Circle one (1) letter for your answer.

1. What part of this fraction is shaded?

   a. 3/9
   b. 6/8
   c. 6/9
   d. 3/8

2. What part of this fraction is shaded?

   a. 4/5
   b. 1/5
   c. 5/6
   d. 5/5

3. What part of this fraction is shaded?

   a. 1/8
   b. 7/8
   c. 5/9
   d. 6/8

4. What part of this fraction is shaded?

   a. 7/10
   b. 3/8
   c. 5/9
   d. 8/10

5. What part of this fraction is shaded?

   a. 5/9
   b. 6/12
   c. 6/10
   d. 7/10
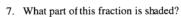
APPENDIX N

FRACTIONS POST-TEST 6-10

FRACTIONS POST-TEST   ID# _____ A B C
                                   CIRCLE: Boy or Girl

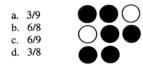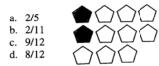6. What part of this fraction is shaded?

   a. 9/10
   b. 7/11
   c. 7/12
   d. 4/11

7. What part of this fraction is shaded?

   a. 5/6
   b. 4/7
   c. 5/8
   d. 8/10

8. What part of this fraction is shaded?

   a. 5/9
   b. 6/9
   c. 7/10
   d. 4//9

9. What part of this fraction is shaded?

   a. 3/9
   b. 6/8
   c. 6/9
   d. 3/8

10. What part of this fraction is shaded?

   a. 2/5
   b. 2/11
   c. 9/12
   d. 8/12

APPENDIX O

LINES/ANGLES POST-TEST 1-5

LINES/ANGLES POST-TEST   ID# _____ A B C
                          CIRCLE: Boy or Girl

DIRECTIONS: Put your ID#, class letter, and gender at the top of the paper. Read each question and choose the best answer. Then circle one (1) letter for your answer.

----

1. What type of angle is in this picture?

   a. Acute angle
   b. Right angle
   c. Obtuse angle
   d. line

2. Which type of lines is shown here?

   a. Parallel lines
   b. Perpendicular lines
   c. Intersecting lines
   d. Line segment

3. Which type of lines is in the word "small?"

   a. Line segment
   b. Parallel lines
   c. Intersecting lines
   d. Perpendicular lines

4. The dog's mat contains a _____.

   a. ray
   b. line
   c. line segment
   d. intersecting lines

5. This is called a _____.

   a. line
   b. line segment
   c. ray
   d. point

APPENDIX P

LINES/ANGLES POST-TEST 6-10

LINES/ANGLES POST-TEST   ID# _____ A B C
CIRCLE: Boy or Girl

6. What type of lines is inside the box?

     e. Parallel lines
     f. Perpendicular lines
     g. Intersecting lines
     h. Line segment

7. What type of angle is in this picture?

     a. Acute angle
     b. Right angle
     c. Obtuse angle
     d. ray

8. What is this the name of this angle?

     a. Acute angle
     b. Right angle
     c. Obtuse angle
     d. Point

9. Which of the following is in this picture?

     a. line
     b. Line segment
     c. ray
     d. perpendicular lines

10. Which of the following is shown in the tree?

     a. Perpendicular lines
     b. Parallel lnes
     c. Right angle
     d. point

APPENDIX Q

SHAPES POST-TEST 1-5

SHAPES POST-TEST   ID# _____ A B C
                                   CIRCLE: Boy or Girl

DIRECTIONS: Put your ID#, class letter, and gender at the top of the paper, Read each
question and choose the best answer. Then circle one (1) letter for your answer.

1. The shape of the dog house is a (an) ____.

   a. Pentagon
   b. Hexagon
   c. Heptagon
   d. Octagon

2. Which figure is shown here?

   a. Pentagon
   b. Hexagon
   c. Heptagon
   d. Octagon

3. A basketball is a _____.

   a. Sphere
   b. Cube
   c. Cone
   d. Rhombus

4. How many sides does a Heptagon have?

   a. 5
   b. 6
   c. 7
   d. 8

5. The television is shaped like a _____.

   a. Sphere
   b. Cylinder
   c. Cone
   d. Cube

APPENDIX R

SHAPES POST-TEST 6-10

SHAPES POST-TEST   ID# _____ A B C
                          CIRCLE: Boy or Girl

6. The can of soup is a _____.

   a. Sphere
   b. Cylinder
   c. Cone
   d. Cube

7. The stop sign is a (an) _____.

   a. Pentagon
   b. Hexagon
   c. Heptagon
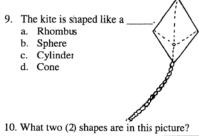   d. Octagon

8. The fish bowl is shaped like a (an) _____.

   a. Pentagon
   b. Hexagon
   c. Heptagon
   d. Octagon

9. The kite is shaped like a _____.
   a. Rhombus
   b. Sphere
   c. Cylinder
   d. Cone

10. What two (2) shapes are in this picture?

   a. Heptagon and Cone
   b. Cylinder and Sphere
   c. Trapezoid and Cone
   d. Cube and Cone

APPENDIX S

PERIMETER POST-TEST 1-5

PERIMETER POST-TEST   ID# _____ A B C
                            CIRCLE: Boy or Girl

DIRECTIONS: Put your ID#, class letter, and gender at the top of the paper. Read each question and choose the best answer. Circle one (1) letter for your answer.

1. What is the perimeter of this shape?

   a. 4 m
   b. 8 m
   c. 12 m
   d. 24 m

   8 m
   4 m   4 m
   8 m

2. What is the perimeter of this shape?

   a. 3
   b. 9
   c. 18
   d. 36

   9
   9   9
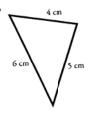   9

3. What is the perimeter of this shape?

   a. 5 cm
   b. 7 cm
   c. 19 cm
   d. 35 cm

   7 cm   7 cm
   5 cm
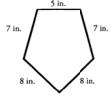
4. What is the perimeter of this shape?

   a. 4 cm
   b. 5 cm
   c. 6 cm
   d. 15 cm

   4 cm
   6 cm   5 cm

5. What is the perimeter of this shape?

   a. 5 in
   b. 7 in
   c. 8 in
   d. 35 in

   5 in.
   7 in.   7 in.
   8 in.   8 in.

APPENDIX T
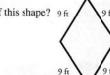
PERIMETER POST-TEST 6-10
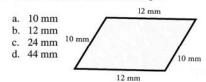
PERIMETER POST-TEST   ID# _____ A B C
                                                CIRCLE: Boy or Girl
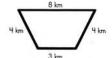
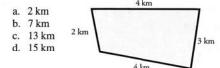6. What is the perimeter of this shape? 9 ft 9 ft

   a. 3 mm
   b. 9 mm
   c. 18 mm
   d. 36 mm   9 ft 9 ft

7. What is the perimeter of this shape?

   a. 3 m   3 m
   b. 6 m   3 m   3 m
   c. 9 m
   d. 18 m   3 m   3 m
                    3 m

8. What is the perimeter of this shape?

                              12 mm
   a. 10 mm
   b. 12 mm
   c. 24 mm   10 mm
   d. 44 mm   10 mm
                       12 mm

9. What is the perimeter of this shape?

                       8 km
   a. 3 km
   b. 4 km
   c. 8 km   4 km   4 km
   d. 19 km
                     3 km

10. What is the perimeter of this shape?

                         4 km
   a. 2 km
   b. 7 km
   c. 13 km   2 km
   d. 15 km   3 km

                       4 km
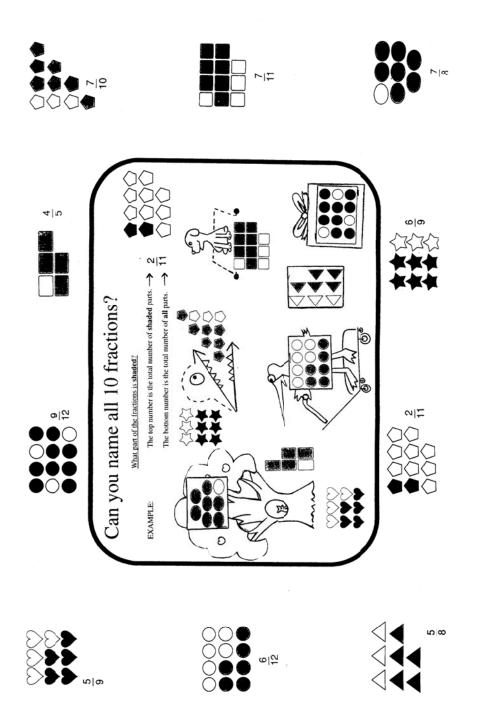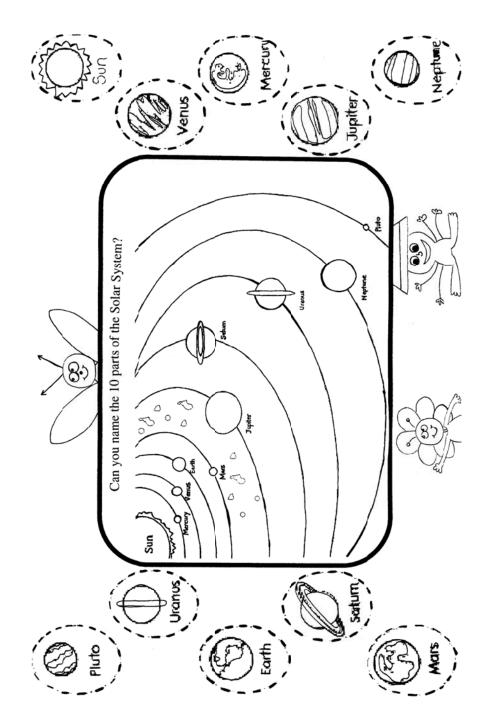
APPENDIX U

FRACTIONS PLACEMAT
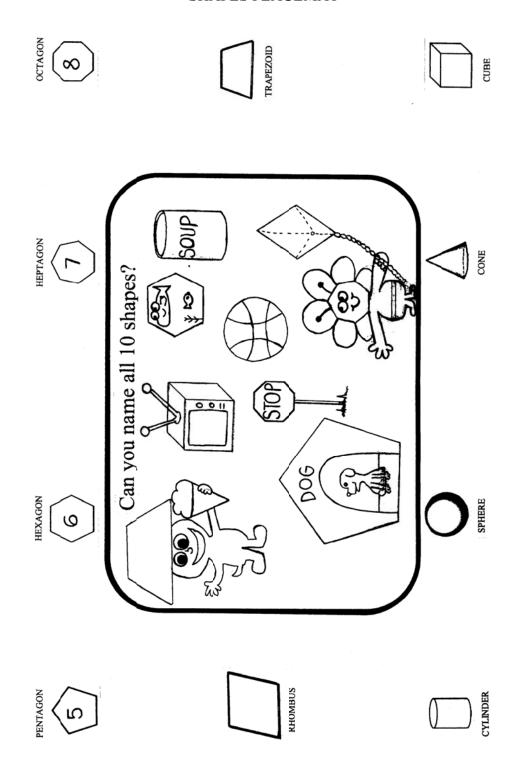
APPENDIX V

SOLAR SYSTEM PLACEMAT
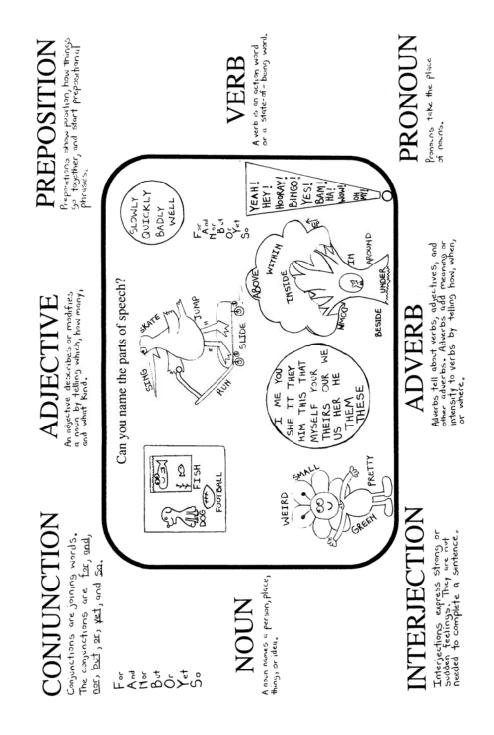
APPENDIX W

SHAPES PLACEMAT

OCTAGON 8

TRAPEZOID

CUBE

HEPTAGON 7

Can you name all 10 shapes?

SOUP

STOP

DOG

CONE

HEXAGON 6

SPHERE

PENTAGON 5

RHOMBUS

CYLINDER

APPENDIX X

PARTS OF SPEECH PLACEMAT

PREPOSITION

Prepositions show position, how things go together, and start prepositional phrases.

VERB

A verb is an action word or a state-of-being word.

PRONOUN

Pronouns take the place of nouns.

ADJECTIVE

An adjective describes or modifies a noun by telling which, how many, and what kind.

ADVERB

Adverbs tell about verbs, adjectives, and other adverbs. Adverbs add meaning or intensity to verbs by telling how, when, or where.

CONJUNCTION

Conjunctions are joining words. The conjunctions are for, and, nor, but, or, yet, and so.

For
And
Nor
But
Or
Yet
So

NOUN

A noun names a person, place, things, or idea.

INTERJECTION

Interjections express strong or sudden feelings. They are not needed to complete a sentence.

Can you name the parts of speech?

SLOWLY
QUICKLY
BADLY
WELL

For
And
Nor
But
Or
Yet
So

YEAH!
HEY!
HOORAY!
BINGO!
YES!
BAM!
HA!
WOW!
OH MY!

SKATE
JUMP
SING
RUN
SLIDE

ABOVE
WITHIN
INSIDE
IN
AROUND
BESIDE
UNDER

I ME YOU
SHE IT THEY
HIM THIS THAT
MYSELF YOUR
THEIRS OUR WE
US HER HE
THEM
THESE

FISH
FOOTBALL
DOG

WEIRD
SMALL
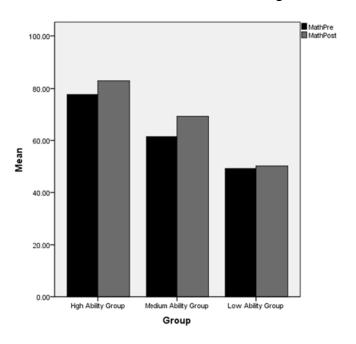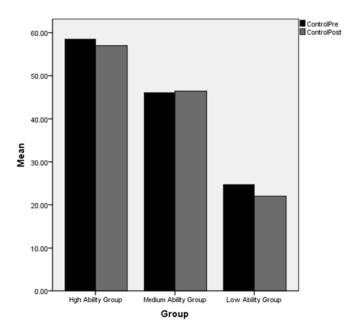GREEN
PRETTY

APPENDIX Y

MATH AND CONTROL PRE-TESTS AND POST-TESTS

Math Pre-Test and Post-test Averages

Control Pre-Test and Post-test Averages

APPENDIX Z

ADDITIONAL INFORMATION ABOUT

PRE-TESTS, POST-TESTS, AND PLACEMATS

Order	Color	Content	Corresponding Test
Placemat # 1	Yellow	Fractions	Fractions Tests
Placemat #2	Pink	Solar System	Lines/Angles Test
Placemat #3	Teal	2D and 3D Shapes	Shapes Test
Placemat #4	Light Blue	Parts of Speech	Perimeter Test

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