Culminating Experience Action Research Projects, Volume 17, Fall 2010

Edited by
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Introduction

As a part of the teacher licensure program at the graduate level at The University of Tennessee at Chattanooga (UTC), the M.Ed. Licensure candidate is required to complete an action research project during a 3-semester-hour course that coincides with the 9-semester-hour student teaching experience. This course, Education 5900 Culminating Experience, requires the student to implement an action research plan designed through (a) the Education 5000 Introduction to Inquiry course or the Education 5010 Methods of Educational Research course, (b) one of the two learning assessments required during student teaching, or (c) a newly-designed project not used as one of the learning assessments.

With funding through a UTC Teaching, Learning, and Technology Faculty Fellows award, the Education 5900 course is conducted through the use of an online, course management system (Blackboard), allowing for asynchronous discussion and use of the digital drop box feature for submitting required papers.

The action research projects from, fall semester 2010, are presented below.

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April 25, 2011

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Student Perceptions of Layered Curriculum® vs. Traditional Coursework on Class Grades for 11th-12th Grade Economics and Government Students

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Education 5900, Fall 2010

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The Institutional Review Board of The University of Tennessee at Chattanooga (FWA004149) has approved this research project # 10-112.

Introduction to the Problem

Today, teachers and administrators are under constant pressure to improve student achievement in the classroom. Federal acts such as No Child Left Behind have heightened the requirements for school systems to show adequate yearly progress (U.S. Department of Education, 2004). As a result, educators are searching for, and developing, new strategies to assist in students' learning. One such methodology that has gained momentum is differentiated instruction. Differentiated instruction provides multiple methodologies to reach the different learning styles of the individual student (Levy, 2008). One popular methodology is Kathie Nunley's Layered Curriculum®.

Nunley developed Layered Curriculum® as a means to teach students on multiple levels (Nunley, 2003). Students work through three "layers" of coursework. The first tier is "Layer C;" it is designed to assess basic knowledge and understanding. It is the foundation for the upper two levels. Both "Layer B" and "Layer A" are based on the highest levels on Bloom's Taxonomy. "Layer B" involves problem solving and other higher-order thinking tasks. The final tier is "Layer A." This layer requires the student to think critically and analyze the course information utilizing higher level thinking skills. As students work through each layer, they are allowed to choose between different options. This gives the students more ownership of their work because they are deciding on their own tasks.

Zuckerman (2007) suggested classrooms that had an established routine resulted in a more ordered and disciplined environment. He suggested that, by reducing students' downtime, teachers could maintain better class order. Layered Curriculum® addresses both of these concerns. It provides students with options and the ability to work as individuals.

Review of Literature

In 2004, the U.S. Department of Education plainly laid out their expectations for student achievement improvement. They provided teachers with a toolkit which clearly defined how adequate yearly progress was to be determined in the school system, as required by No Child Left Behind legislation. Teachers typically answer to their local authorities; however, this act made teachers accountable to the Federal government. It required that each school meet the state's expectations by the 2013-2014 school year (U.S. Department of Education, 2004).

These requirements and expectations put increasing pressure on teachers to increase student achievement. They were already dealing with classroom management issues such as on-task behavior, class disturbances, and different levels of skill and attention of their students. They were incorporating different strategies to maintain classroom management (Zuckerman, 2007). According to a study by Zuckerman, keeping students on task was the number one way to improve classroom management and provide students with a peaceful, productive environment.

In 2001, Tomlinson introduced the topic of differentiated instruction. She provided guidance, principles, and strategies for teachers who were interested in creating learning environments that addressed the diversity of the typical, mixed-ability classroom. This helped educators understand what differentiated instruction is, why it is appropriate for all learners, how to begin to plan for it, and how to become comfortable enough with student differences to make school comfortable for each learner in the classroom.

Since that time, the effectiveness of differentiated instruction has been studied by educators world-wide. Many teachers have turned to differentiated instruction in order to meet the needs of students in mixed-ability classrooms. Differentiated instruction allows choice, flexibility, on-going assessment, and creativity to exist in the classroom (Anderson, 2007). Differentiated

instruction was noted as one of the top ways to adjust teaching strategies in an effort to decrease the student drop-out rate. It did so by providing students with choices in their assignments. This choice gave the student more accountability and flexibility in their work, which, in return, resulted in more student ownership (Gunn, Chorney, & Poulson, 2009).

Each student enters the class with differing levels of knowledge. However, educators are asked to teach each student the same curriculum. Differentiated instruction allows teachers to meet the learning needs of each student, in order to cover the required standards (Levy, 2008). In 2009, principals at Conway Elementary School, in St. Louis, MO, and Colchester High School, in Colchelster, VT, supported and encouraged their teachers to utilize differentiated instruction in their classrooms. The teachers focused, not only on what they needed to cover, but, additionally, made sure the students learned the material. The results were dramatic when comparing statistics on the two schools, before and after utilizing differentiated instruction. Not only did state test scores improve, but there was a sharp decline in discipline issues reported, as well (Tomlinson, 2009). This happened because students weren't taught as a group; they were taught as individuals. That is the beauty and the major purpose of differentiated instruction.

Nunley is the creator of a specific form of differentiated instruction known as Layered Curriculum®. In this strategy, students work through three "layers" of course work. The first tier is "Layer C;" it is designed to assess basic knowledge and understanding. It is the foundation for the upper two levels. Both "Layer B" and "Layer A" are based on the highest levels on Bloom's Taxonomy. "Layer B" involves problem solving and other higher-order thinking tasks. The final tier is "Layer A." This layer requires the student to think critically and analyze the course information utilizing higher-level thinking skills. As students work through each layer, they are allowed to choose between different options. This gives the students more ownership of

their work because they are deciding on their own tasks. Nunley explains the multiple benefits of using this methodology such as student control; learner accountability; and students learning, not just doing (Nunley, 2003). As we face lower student achievement as a country, we must work diligently to find strategies that reach and assist all students to achieve more and to move forward. Strategies like differentiated instruction, and more specifically, Layered Curriculum®, may be part of the answer.

Data Collection and Results

Data Collection

Surveys were distributed and administered by the alternative high school's Economics and Government teacher during the second miniterm of the 2010-2011 school year. Surveys were completed during the first 10 minutes of class time and collected by the administering teacher. There were 39 student surveys collected for data analysis.

Subjects. The participants for this study were taken from an approximate population of 50, 11^{th}- and 12^{th}-grade Economics and Government students at an alternative, adult high school. The school consists of approximately 220 students who are between the ages of 17 and 21. This school is designed, specifically, to support students who have typically had to miss school for reasons such as expulsion, pregnancy, and criminal charges. The demographics as of 2009, according to the Tennessee Department of Education, were as follows: African-American, 45.1%; White, 53.3%; and other, 2%. Students participating were at least 18 years of age and had completed at least one session of Layered Curriculum® coursework.

Methodology. The students' responses to the survey were used as the measuring instrument for this study. Content validity was justified because each participating student had experience with both Layered Curriculum® and traditional coursework. This non-experiment

study was designed as a one-shot survey that consisted of nothing but a single observation. (See Figure 1.)

Group	Class	*n*	Treatment
1	Economics	19	Survey
2	Government	20	Survey

Figure 1. Non-experimental design.

Students were given identical surveys in the same classroom environment. The time limit was 10 minutes. The surveys were administered and collected by the same teacher. Once the surveys were collected, they were placed in a sealed envelope and contained in a secure environment until they were collected by the study organizer. Once surveys were collected, results were tallied by counting the number of individual responses to each of the seven questions.

Results

Students were asked a variety of questions regarding their thoughts on Layered Curriculum® vs. traditional coursework. The objective was to determine their overall thoughts on Layered Curriculum®, based on their past experience with the learning strategy. How many times have they experienced it? Is it more challenging than traditional coursework? Are their grades higher with Layered Curriculum®? What do they like about it? What do they not like about it? Do they want it offered more? How high do they aim when working through the tiers of Layered Curriculum®? The results are as follows.

Question 1: How many Layered Curriculum® units have you worked through in your high school career? (See Figure 2.)

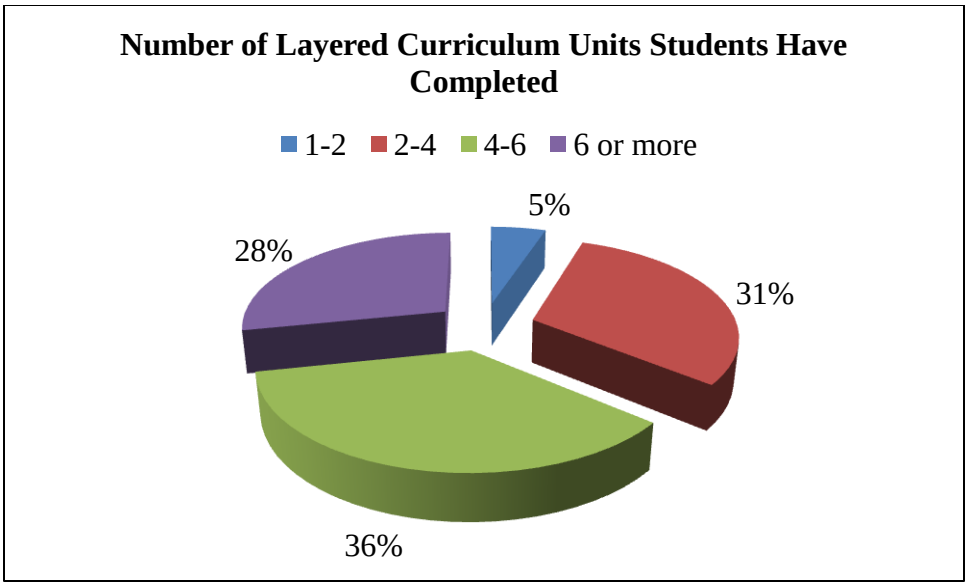

Figure 2. Number of Layered Curriculum units students have completed.

This question was asked to gauge how much experience students had with the learning strategy. According to the data results, 95% of the participating students have participated in at least two units of Layered Curriculum®. This indicates a high familiarity with the learning strategy. The largest portion of students (36%) has worked with Layered Curriculum® at least four times.

Question 2: Do you find Layered Curriculum® more challenging than traditional coursework? (See Figure 3.)

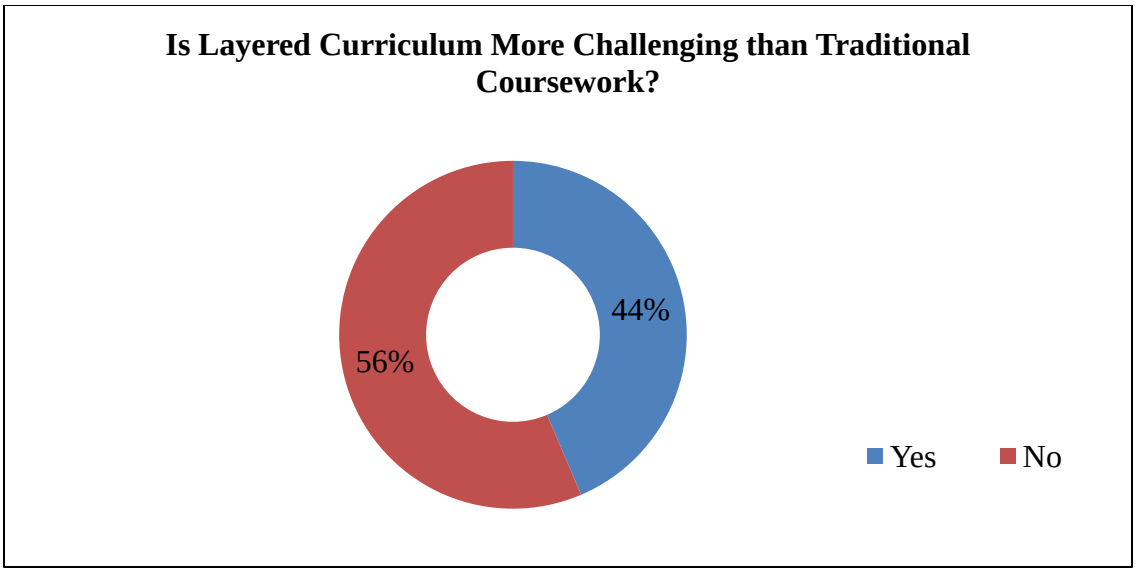

Figure 3. Is Layered Curriculum® more challenging than traditional coursework?

The results from this question were closely proportioned. The majority found that Layered Curriculum® was more challenging. The closeness of results indicates that, overall, the group is split on their perceptions of the rigor of Layered Curriculum®.

Question 3: Do you feel like your grades are higher or lower when Layered Curriculum® units are assigned? (See Figure 4.)

Based on the results from the last question, one might assume that the answer to this question would be proportionally answered; however, the results were greatly different.

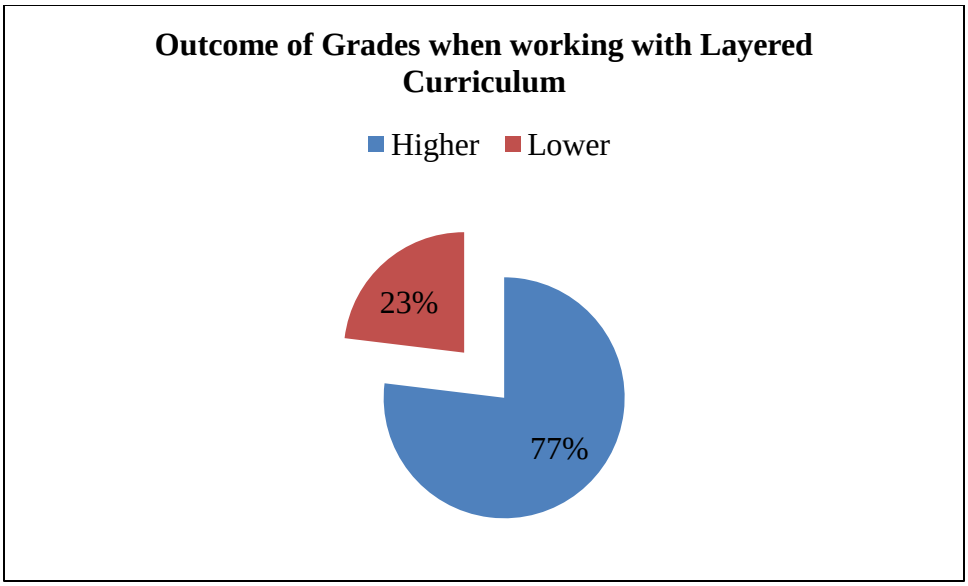

Figure 4. Outcome of grades when working with Layered Curriculum®.

The results from this question seem to imply that students do not associate their grade with how challenging the coursework is to complete. According to the data, a high majority of students feel they receive higher grades on coursework completed utilizing Layered Curriculum®.

Question 4: What is your favorite characteristic of Layered Curriculum®? Please choose only one. (See Figure 5.)

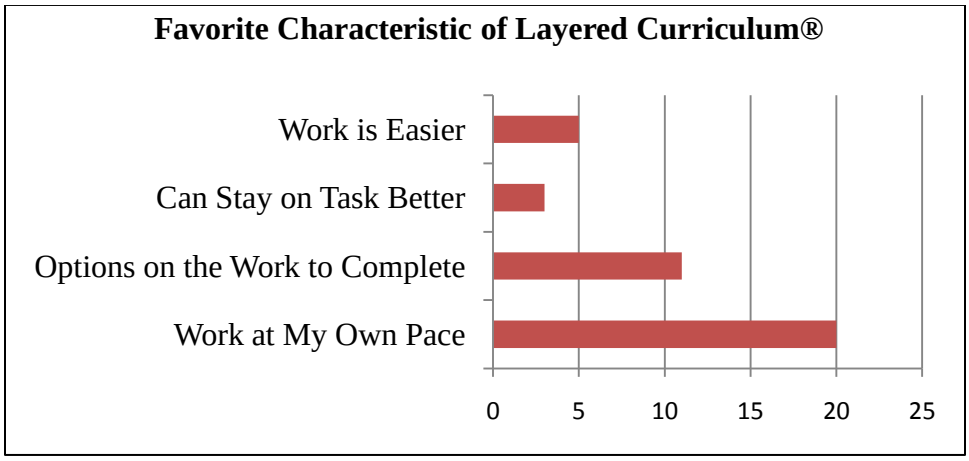

Figure 5. Favorite characteristic of Layered Curriculum®.

The results indicate that almost half of the students find the ability to work at their own pace an advantage of Layered Curriculum®. The second highest response was "Options on the Work to Complete." Both answers concur with research of differentiated instruction, especially that of Layered Curriculum®'s creator, Kathie Nunley.

Question 5: What is your LEAST favorite characteristic of Layered Curriculum®? (See Figure 6.)

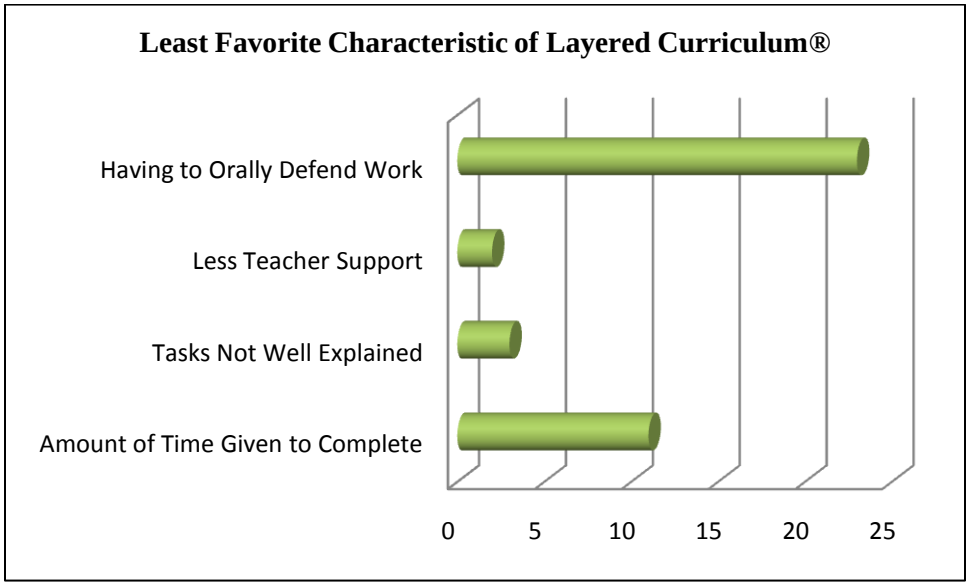

Figure 6. Least favorite characteristic of Layered Curriculum®.

The majority of students (59%) thought that having to orally defend their work was their least favorite characteristic of Layered Curriculum®. This is the only answer available that actually pertains to the student. The other options are controlled by the administrator.

Question 6: Would you like Layered Curriculum® to be administered in more of your class offerings? (See Figure 7.)

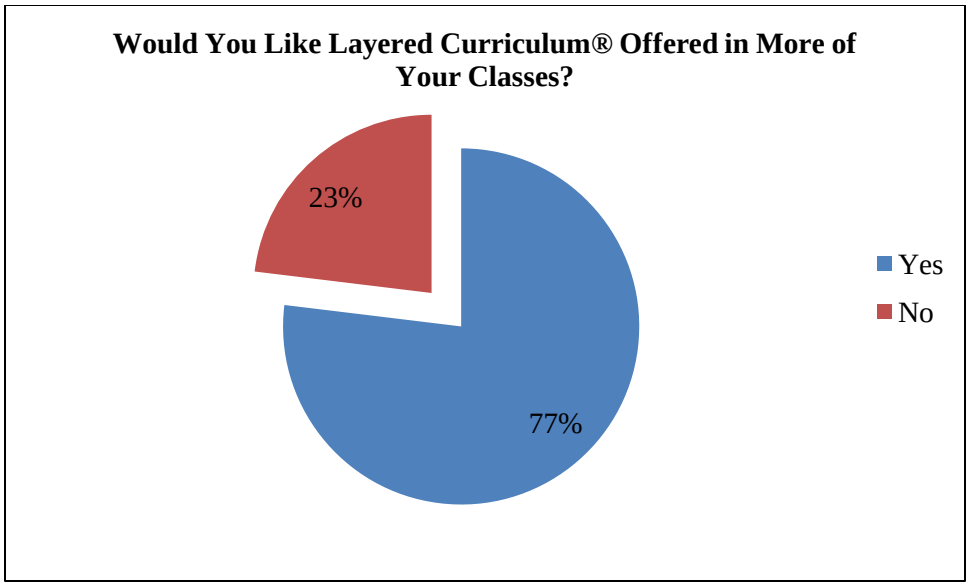

Figure 7. Would you like Layered Curriculum® offered in more of your classes?

The results from this question correlate identically with the response to Question 3, regarding grades. The same majority of students that feel their grades are higher when working with Layered Curriculum® would like to see it used in more classes. This seems logical, as most students prefer work that allows them the best opportunity for success.

Question 7: When assigned a Layered Curriculum® unit, which grade tier do you typically strive to complete? (See Figure 8.)

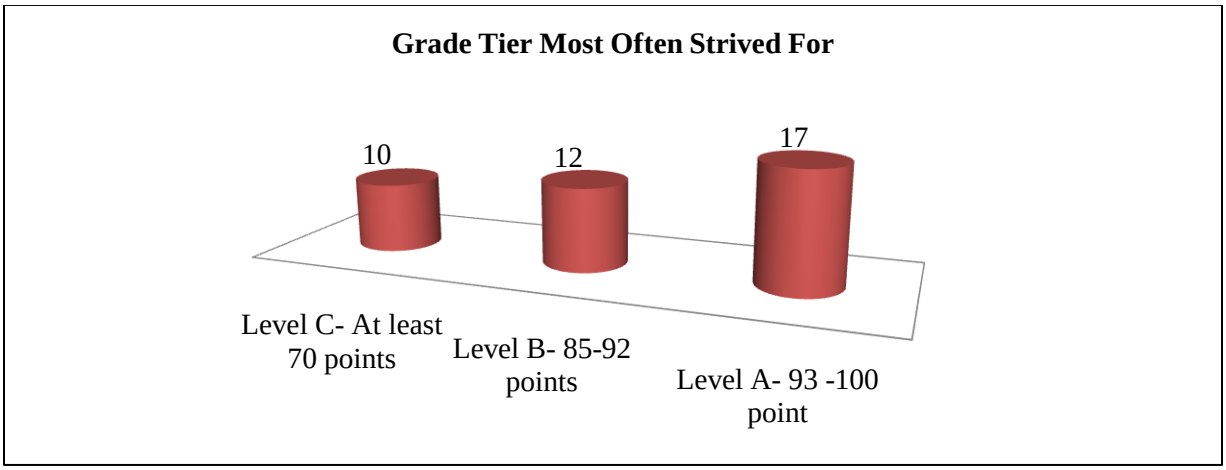

Figure 8. Grade tier most often strived for with Layered Curriculum®.

The responses to this question were spread somewhat evenly on the choices given. The highest number of students (44%) typically aims to receive 93-100, which equates to a letter grade of "A."

Conclusions and Recommendations

Conclusions

Based on the data obtained, it appears that the majority of participating students participated in at least four units of Layered Curriculum®. When asked if Layered Curriculum® was more challenging than traditional coursework, the participants were split in their answers. Approximately half of the respondents thought it was more challenging. The majority of students felt their grades were better when Layered Curriculum® was utilized as the assessment method. The same number of students responded that they would like Layered Curriculum® to be offered in more of their classes. This makes sense, if you assume students want to make better grades. When asked about what they liked best and least, with regard to Layered Curriculum®, students' answers varied, with the exception of what they liked the least. The favorite characteristics of Layered Curriculum® were that they could work at their own pace, followed closely by having options on work to complete. The least favorite characteristic of Layered Curriculum® was that they had to orally defend their work. Students were across the board in terms of what their grade goal was, when assigned a Layered Curriculum® unit. Although 44% answered they aimed for Layer A, the remaining students evenly chose Layer B and Layer C.

Recommendations

Having worked at this particular school, I would highly advise professional development workshops on how to best create Layered Curriculum® units. This could be peer facilitating in which teachers who understand the process and its purpose help those who are new to Layered

Curriculum®. Kathie Nunley's (2010) Layered Curriculum® Web page provides a great resource for information on the learning strategy. I would recommend that teachers look closely at the list of "Frequently Asked Questions" found there. Teacher collaboration opportunities should occur on a regular basis to clear any concerns or share positive experiences using Layered Curriculum®. Although there is no grant money currently available that is specific to Layered Curriculum®, there are several grants such as the Junior League Grant and the Unum Grant available. Monies received from these grants could be used on specific tasks or projects within a Layered Curriculum® unit. The use of technology can be intertwined within each layer of this learning strategy. Presentations can be made through PowerPoint, research for essays can be conducted via the Internet, and Skype interviews could be held as a task on a Layer in the unit.

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Appendix A

Student Perceptions of Layered Curriculum vs. Traditional Coursework

Note: Traditional coursework is defined as lectures, quizzes, and tests. Layered Curriculum is defined as a 3-tier method of working through coursework in which grades are determined by tier-level reached.

Please circle the most appropriate answer:

1. How many Layered Curriculum units have you worked through in your high school career?
    A. 1-2
    B. 2-4
    C. 4-6
    D. 6 or more
2. Do you find Layered Curriculum more challenging than traditional coursework?
    A. Yes
    B. No
3. Do you feel like your grades are higher or lower when Layered Curriculum units are assigned?
    A. Higher
    B. Lower
4. What is your favorite characteristic of Layered Curriculum? Please choose only one.
    A. I can work at my own pace.
    B. I have options on the work I choose to complete.
    C. I feel like I can stay on task better.
    D. The work is typically easier with Layered Curriculum.
5. What is your LEAST favorite characteristic of Layered Curriculum?
    A. The amount of time given to complete the unit.
    B. The tasks are not well explained.
    C. There is less teacher support provided in accomplishing the tasks.
    D. Having to orally defend my work.
6. Would you like Layered Curriculum to be administered in more of your class offerings?
    A. Yes
    B. No
7. When assigned a Layered Curriculum Unit, which grade tier do you typically strive to complete?
    A. Level C- At least 70 points
    B. Level B- 85 to 92 points
    C. Level A- 93-100 points

Thank you for your responses!

What Motivates Young Readers to Read?

Sarah W. Bolton

Education 5900, Fall 2010

The University of Tennessee at Chattanooga

The Institutional Review Board of The University of Tennessee at Chattanooga (FWA004149) has approved this research project # 10-141

Introduction to the Problem

A preservice teacher needs to know what types of books to put in her classroom to meet the needs of all of her students. This pre-service teacher wants her classroom to be focused around reading. The International Reading Association provides a list of book titles that children want to read each year. However, they do not provide the types of books that children want to read, only the titles. Young readers may choose these books for various reasons.

Area of Focus Statement

The purpose of this study is to determine what motivates young readers to read.

Research Questions

- What type of books do early readers like to read?
- Does gender make a difference in what type of books early readers like to read?
- Do early readers have a preference between fiction and nonfiction books?
- Are early readers more motivated to read when they are able to choose their book?

Limitations

The researcher is aware of two limitations for her research project. Since this research project will be conducted during the researcher's student teaching, the sample size of the project will be small. A larger sample size would provide the researcher with a wider variety of types of books students select. It would also provide more research of students choosing the same type of book, and solidify the data.

Another limitation is the terminology used to describe types of books to the students on the checklist. One first grader may have been exposed to terms used on the checklist while another student may not have been exposed to the terms. This may skew the results, if the students do not understand what the terms mean. However, the students may ask where a

particular favorite book would fall among the terms. That would help the results be more accurate.

Review of Literature

Young readers are motivated to read for various reasons. In particular, making connections with the text motivates young readers the most. The gender of a young reader affects his or her interest in a book. The genre of the text affects what the student will choose to read. Also, whether or not the reader is allowed to choose his or her own book to read motivates the reader. Reading motivation is correlated with frequency of reading and self-esteem. Students that read more have an increase in comprehension and higher achievement rates (McPherson, 2007).

Connection

Various researchers have stated that reading to your child early is important. In fact, reading to your child, even before it is born, is effective in developing literacy skills. The reader can take on different roles and responsibilities while being read aloud to (Wickstrom, Curtis, & Daniel, 2005). Ashley is highlighted in "Ashley and Junie B. Jones" as having special needs. She has short-term memory and has no interest in reading, even though her parents read to her while she was in the womb and began school early. A teacher that works with Ashley's mother was told about her and offered Ashley a book to read. The teacher told Ashley about the book because she thought she could relate to the character in the book, Junie. B. Jones (Wickstrom, et al.). The teacher was right. Ashley could relate to the character as an emergent reader, kindergartner, and being a loud girl. Ashley's mom read the book to her, that night, and Ashley was so excited about this book that she went back to the teacher the next day and picked up the next book in the series. Wickstrom et al. (2005, p. 20) quoted Meek in their article, saying, "The only motivation for reading that really works is the pleasure of the text or feelings of increasing

success, and these depend on the reader's own activity." Ashley connected with Junie B. Jones and wanted to continue to read about Junie B. Jones and her adventures. Along with her mom reading the books to Ashley, Ashley started memorizing phrases from the books and repeating them often (Wickstrom, et al.). Boltz (2007) thought along the same lines with Wickstrom, Curtis, and Daniel (2005). Boltz (2007) thought that boys and girls often make connections with their books, and that is what guides their choices. He proposed that boys make connections with information books because they connect to the world around them. Williams, Hedrick, and Tuschinski (2008) stated, "According to Vygotsky (1978), effective learning takes place when learners are aware of their own needs, maintain a locus of control, and communicate with a more knowledgeable other. Literature circles can provide these opportunities as participants make connections to their own lives, hear different interpretations, and continue their own learning by working with others and using text as they explain their own interpretations."

Gender and Genre

A teacher-librarian found that there are trends in the choices of books selected by boys and picked by girls (Doiron, 2003). He decided to conduct some research to discover if his observation of these trends was, in fact, true. His first study indicated that most students were choosing information books. His third study showed that more fiction books were selected. More girls than boys checked out books, in general. Girls chose more fiction books than information books. Boys chose more information books than fiction books. There are books that are targeted toward boys and some targeted toward girls. As young readers, Doiron (2003) suggests that teachers should encourage and introduce girls to information books and boys to more fiction books, for common exposure. In addition, teacher-librarians should "celebrate everything they ever read" (Doiron, 2003, p. 16). Boltz (2007) suggests that the reason boys may read less than

girls is because of the choices of books they are given in school to read. Boltz made the point that the books that boys tend to choose rarely make it to the Newbery or Caldecott lists. For example, R. L. Stine's *Goosebumps* series are sometimes banned from school libraries. The horror and excitement of these books appeal to the action-thirsty boy. A boy's favorite, *Captain Underpants*, even made the banned book list for a year. Boltz (2007, p. 9) feels that, "Girls are much more motivated by interpersonal relationships and character analyses than boys." Boys choose to read books on sports, action, and adventure, and nonfiction books, to understand the world around them and meet the need of exploration within them. Boltz's study consisted of a survey containing questions such as What kind of reader are you? Do you like to read for pleasure? What would you rather do than read?, to name a few. According to the answers from that survey, boys want to read books about animals, sports, cars, and the military. Comics and graphic novels were preferred. Also, the adventure series books, like *Magic Tree House*, *Harry Potter*, and *The Chronicles of Narnia*, were chosen by boys to read. Six of the girls polled chose *Harry Potter* as a favorite book series to read. Among the other favorites of girls were magazines titled, *American Girl*, *Fanzines, and Zoobooks.* A study conducted by Allison (1994), resulted in information books being checked out most frequently at a public library, with contemporary realistic fiction coming in second. Her study did not distinguish gender.

Choice

Boltz (2007) defined preference and interest as two different terms. He stated, "A preference implies a forced choice between options selected by someone other than oneself (p.7)." Then he said, "An interest, on the other hand, comes from within oneself, can encompass whatever can be imagined, and implies freedom of choice (p. 8)." Children selecting books from Accelerated Reader and leveled reading programs are actually choosing books based on

preference rather than complete interest. Teachers, eventually, learn the students' individual interests throughout the year, and can make accommodations to their classroom library to meet each student's reading needs. A child's preference of books is often based on the child's intrinsic and extrinsic motivation (Guthrie, Hoa, Wigfield, Tonks, & Perencevich, 2006). The study conducted by Guthrie resulted in a vast number of boys choosing information books. In fact, 68% were boys and 32% of girls choose information books. Boys and girls choosing narrative books were a little closer in number, with 55% of girls and 45% of boys choosing narrative books. An increase in intrinsic motivation for young readers can only be increased by supplying choice and exciting activities for these readers to want to read. Reader's theater is a great activity to increase intrinsic motivation in a young reader (Guthrie, et al., 2006). According to McPherson (2007), students are intrinsically motivated to read when given the choice of what to read, and, then, in turn, become deeply engaged in the text. According to Williams et. al. (2008), extrinsic rewarding ultimately decreases intrinsic motivation. Also, it "cheapens the value and love of learning." Choice gives the child power over his own education and path through life (Williams et al., 2008).

Methodology

This study took place during the researcher's second student teaching placement in Hamilton County, Tennessee. The placement was in a first-grade class at a magnet school. There were 20 students in the class. Both girls and boys were included. The students were from Caucasian and Hispanic backgrounds.

The researcher created a checklist of types of books. The researcher administered the checklist to the students in her classroom. She reviewed, with the class, the terminology of the types of books listed on the checklist. The students were instructed to place an "X" next to their

top three favorite types of books. They were also instructed to circle “boy” or “girl” to record their gender. The students were allowed to ask the teacher and the researcher the category of their favorite book, if they were unsure.

The researcher also created a questionnaire containing questions about how the students selected their book to borrow from the library. This questionnaire was designed for students to be filled out after checking out a book from the school library. Another part of the study included the researcher selecting out 10 books, 5 fiction books and 5 nonfiction books. She called each student to the table, one at a time, and asked each of them, if they could choose any book, at the table, to read, which book would they choose, and why. This survey was to answer if students had a preference to read fiction or nonfiction books. The researcher noted if the student was a boy or a girl. Instruments are contained in Appendices A, B, and C.

Data Collection and Results

After the checklist was completed, the researcher tallied the results. She was able to determine the types of books young readers liked to read and if gender was a factor. (See Figures 1 and 2.) She discovered that, after polling 16 students, books on sports and series books were the most preferred books. Gender was a factor. In fact, boys preferred to read books on sports, science, and series books the most. Girls chose to read books on pets, fairytales, ocean life, and outer space.

However, after asking the students to each choose a book from the selected books on the table, the boys and the girls chose to read a fiction book over a nonfiction book. Six girls chose to read a fiction book and three girls chose to read a nonfiction book. Five boys chose to read a fiction book and two boys chose to read a nonfiction book.

This was surprising to the researcher since the results from her literature review found that boys would choose more nonfiction books over fiction books. This finding may be a result from a small sample. If the researcher enlarged the sample, the results might differ.

Most of the students' responses for their reasons for selecting books from the questionnaire and the oral survey were because the book seemed funny, based on the cover of the book, or they liked funny books and heard the book was funny. The researcher did not find much evidence from the students' reasons for selecting books.

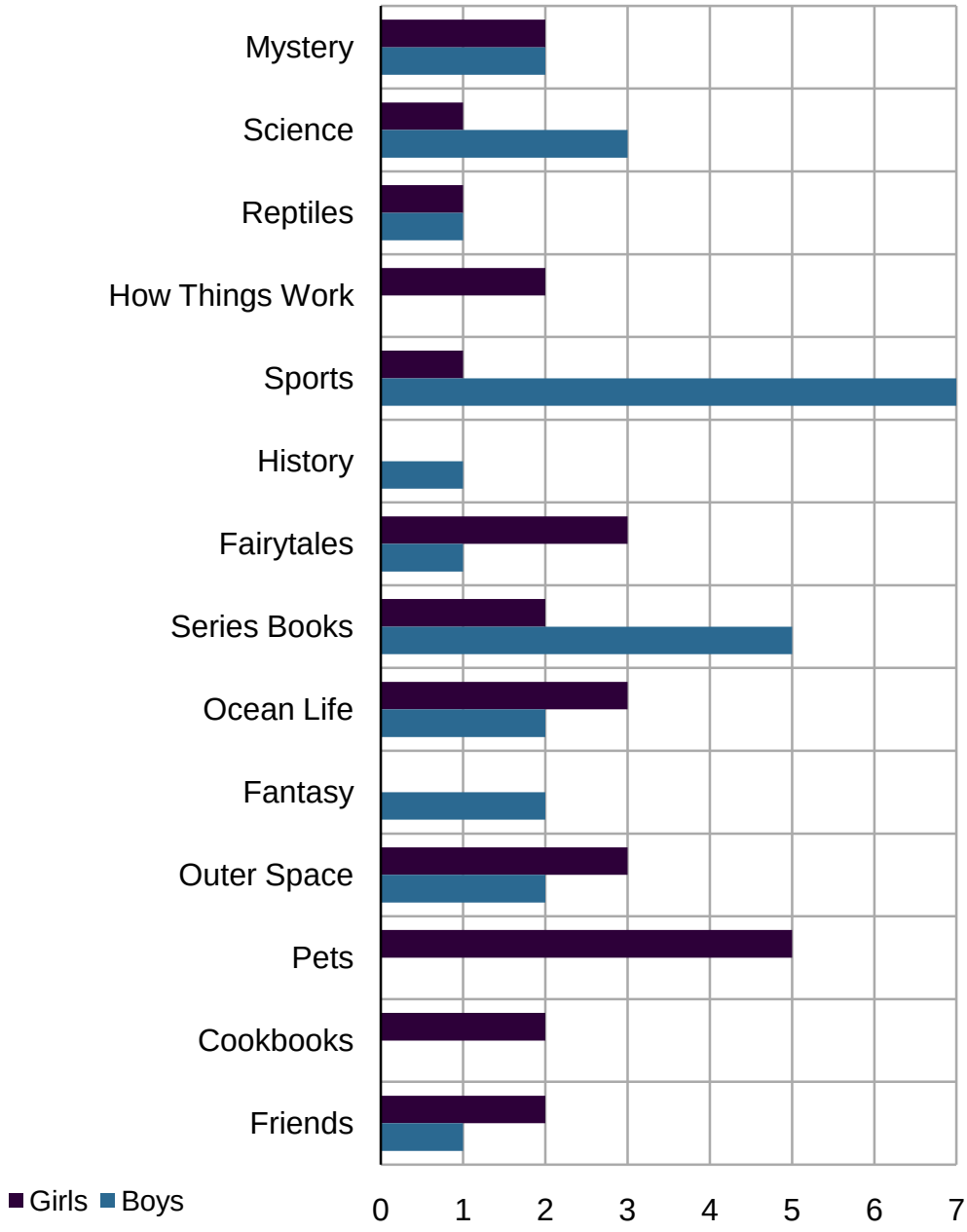

Figure 1. Types of books young readers love to read.

Type	*Boys*	*Girls*
Fiction	5	6
Non-Fiction	2	3

Figure 2. Book preference by gender.

Conclusions and Recommendations

In general, young readers enjoy reading fiction books that can make them laugh. Furthermore, boys like to read books that contain adventure and sports. Girls like fairytales and animal books. As a preservice teacher, the researcher can provide these types of books in her future classroom to satisfy her students reading choices. In order to completely determine what motivates young readers to read, the sample size needs to be enlarged. This study could be conducted across the county adjacent states. The checklist could be modified to include examples of titles that would fall under the categories. That might improve the results and create a tangible list of the types of books young readers like to read. Ultimately, the researcher wants to discover more of the young readers' motivation for reading, and gather a larger list of the types of books to place in her classroom to meet the needs and desires of her students.

This study could be used to add to professional development already in place in Hamilton County. The literacy professional development that is required in each school could add to their discussion the types of books that are needed in young elementary classrooms. Already, teachers are taught how to organize their classroom library, but they are not provided with what types of books, based on student interest, to put in their library. Technology could enhance the project by having the students enter their preferences in an online survey instead of using paper documents. This would allow the researcher to easily calculate the results and distribute the instruments to more students to enlarge the sample. The International Reading Association (2008) does not have

a position on what types of books young readers like to read. They do, however, have reading lists, based on children's choices and teachers' choices that include titles of books. The titles of the books could be sorted into the different genres and analyzed in the future. The International Reading Association has a grant called the Elva Knight Research Grant that is available for application. It is a 2-year grant that provides up to $8,000 for research. The researcher must be a prek-12 teacher and have at least 3 years of teaching experience. Since the researcher of this case study is a preservice teacher, she will have to wait until she has completed her 3 years of teaching experience in order to apply for this grant.

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Appendix A

Boy or Girl

Types of Books I Love to Read

Please put an X in the box next to the type of book you like to read.
(Choose your TOP 3)

X	Type of Book	X	Type of Book
	Social Sciences		Series Books
	Philosophy		Ocean Life
	Language		Fantasy
	Pure Sciences		Transportation
	Reptiles		Astronomy
	How Things Work		Buildings
	Sports		Insects
	Mammals		Pets
	Countries		Cookbooks
	History		Technology
	Biography		Reference
	Holidays		Fairytales
	Mystery/Detective		

Appendix B

Questionnaire to Fill Out After Checking Out a Book

Your Grade level_____

Your Reading Level_____

Circle one: **Boy** or **Girl**

1. What is the title of your book?

2. What is the book's reading level?

3. Why did you check out this book?

4. What do you like most about the cover of the book?

5. Does the book have an award on the cover? If so, what is the award?

Appendix C

Fiction or Nonfiction Survey Results

Boy or Girl	*Book*	F or NF	*Why?*
G	Officer Buckle and Gloria by Peggy Rathman	F	It looks funny.
B	Skippyjon Jones by Judy Schachner	F	It looks funny.
G	Horses by Monica Kulling	NF	Horses are my favorite animal.
B	Skippyjon Jones by Judy Schachner	F	Skippyjon Jones is silly.
B	Officer Buckle and Gloria by Peggy Rathman	F	It is funny.
B	Skippyjon Jones by Judy Schachner	F	The cat looks funny.
G	Dog Breath by Dav Pilkey	F	It looks silly. I like funny books.
B	Sharks by Jonathan Sheikh-Miller	NF	It is about sharks and looks interesting.
G	Weather & Climate Change by Laura Howell	NF	It looks interesting and could learn about seasons.
G	Officer Buckle and Gloria by Peggy Rathman	F	It looks like a good kids book.
B	Sharks by Jonathan Sheikh-Miller	NF	I like sharks and studying about them.
G	Lucky by Jane E. Gerver	F	I like horses.

Boy or Girl	*Book*	F or NF	*Why?*
G	Sharks by Jonathan Sheikh-Miller	NF	It is about the ocean.
G	Officer Buckle and Gloria by Peggy Rathman	F	It looks cool because the dog is jumping.
G	Skippyjon Jones by Judy Schachner	F	It looks very funny.
B	Skippyjon Jones by Judy Schachner	F	I love Skippyjon Jones.

Just Story Time? An Evaluation of the Effects of Reading Aloud to Secondary-aged Students

Keeton Christian

Education 5900, Fall 2010

The University of Tennessee at Chattanooga

The Institutional Review Board of The University of Tennessee at Chattanooga (FWA004149) has approved this research project # 10-145.

Introduction to the Problem

More than six million middle and high school students read below grade level in the United States (Wise, 2009). Reading problems especially affect low income and minority secondary students, who, in ninth grade, read, on average, at a fifth- or sixth-grade level (Joftus, 2002). Tennessee has focused on increasing high school graduation rates, in recent years, due to No Child Left Behind and Race to the Top. Tennessee educators will struggle to increase graduation rates, while many high school students continue to struggle with the high level of reading skills needed for increasingly difficult high school work (Wise, 2009).

Through a curriculum focused on building literacy skills, Tennessee educators can empower students to succeed, because "students who receive concentrated, focused support in literacy graduate from high school and attend college in greater numbers" (Joftus, 2002, p. 17). According to Wise (2009), the vast majority of struggling readers, between 90 and 95 percent, do not need intensive extra help (Wise, 2009). Current research suggests a need to bring literacy instruction into the content classroom as a way to provide those students who do not need interventionist help with "concentrated and focused" literacy support (Chant, 2009; Joftus, 2002; Ness, 2009; Hinde, Popp, Dorn, Eskiss, Mater, Smith, & Libee, 2007).

States across the country have integrated literacy skills into their social studies curriculum. Programs such as Arizona's GeoLiteracy have significantly increased students' reading comprehension scores (Hinde et al., 2007). Despite the need for, and effectiveness of, incooperating reading instruction into content lessons, secondary teachers focus less than five percent of instruction time on the development of reading comprehension skills (Ness, 2009). Middle and high school content teachers feel excessive pressure to cover standardized tests' material and lack confidence in reading comprehension instruction (Ness, 2009). Chant (2009)

addresses teachers' fears that focusing on reading instruction will limit content instruction. He urges secondary teachers to adopt collaborative strategies which emphasize literacy instruction across the curriculum and strengthen reading classes' content focus (Chant, 2009).

The objective of the current research is to incorporate focused literacy instruction into a ninth-grade, world geography unit. The researcher intends to develop and investigate a simple, replicable, and effective method, particularly focused on improving literacy skills of students who do not need intensive extra help.

Area of Focus Statement

The goal of this research is to determine the effectiveness of reading aloud to secondary-aged students in a diverse classroom. The researcher will examine students' comprehension of material when they hear it read aloud. The researcher will compare the results to comprehension of material when the students read silently. The researcher will also compare the students' retention of information when the students receive the material by the two different methods. Specifically the researcher hopes to determine:

1. The extent that students comprehend material when it is read aloud.
2. The extent that students retain auditory information.
3. The extent that reading aloud to students prompts critical thinking.
4. The ways in which reading aloud to students impacts their educational experiences as individual and unique learners.

Review of Literature

Literacy of secondary-aged students is a major concern in the education community. Educators and researchers have adopted a variety of strategies to improve literacy rates of youth including "back to basic methods," and providing "on-level" reading materials (Ivey & Fisher,

2006). Some scholars argue that educators need to expand the tradition of reading aloud in primary schools to secondary schools. Research has addressed the possible benefits of reading aloud to students which include increases in fluency and other literacy skills (Zehr, 2010; Rasnik & Padak, 2005; Ediger, 2010).

Research has shown that secondary-aged students' higher-order thinking skills sometimes outdevelop their reading skills (Ivey & Fisher, 2006). Ivey and Fisher (2006) argue that reading aloud to students may "simultaneously develop students' literacy skills and higher-order cognitive skills" (p. 17). Other research shows that secondary students positively benefit from being read aloud to, and that they learn to appreciate literature, from the process (Blessing, 2005; Giorgis, 1999).

Previous research has examined how reading aloud to secondary students may improve literacy and critical thinking skills. The current research aims to determine, specifically, how reading aloud to secondary students affects their comprehension and retention of current event material covered each day in class. The current research will expand the body of knowledge of reading aloud strategies by comparing student performance, with and without the reading aloud strategies implemented. The researcher will examine the data qualitatively and quantitatively to determine how specific students respond to the reading aloud strategies.

Data Collection and Results

Data Collection

Subjects. The researcher used two world geography classes at a local public high school as subjects for this study. The students were all ninth graders, of diverse readiness levels, backgrounds, and socioeconomic status. The researcher separated the subjects into Class A and Class B, based on student schedules.

Methodology. The researcher assigned both classes, class A and class B, a current event bellringer, each day, at the beginning of class. In Class A, the researcher the put the article of the day on the students' tables and wrote the corresponding questions on the board. The researcher gave the class approximately 20 minutes to read the article and answer the questions. The students kept each day's bellringers in a journal. After the allotted time passed, the researcher instructed the students to put their journals under the tables. The researcher then led the class in discussions of the day's article and the related questions. Volunteers explained how they answered the questions, and shared their opinions about the day's article. The researcher made notes, during this time, of student participation, and relevance and quality of the discussion.

In Class B, the researcher used the same articles and questions as she used in Class A. She gave each student a copy of the same article used in Class A and wrote the identical questions on the board. The researcher read the questions to the students, and instructed them to think about the questions, as she read the article. The researcher read the article, and the class followed along, as she read. The students then had approximately 10 minutes to answer the assigned questions. At the end of 10 minutes, the students put away their journals, and the researcher led the class in a discussion of the article and the students' responses to the questions. The researcher recorded observations concerning student participation, and quality and relevance of the discussion.

The teacher tested the students' retention of the information gained in the current event bellringers during the last day of her unit. The teacher gave each student a quiz with short answer, true and false, and multiple choice questions related to each of the unit's current event bellringer articles.

Results

The researcher examined the Activity 2 to determine how students in both class responded to different types of questioning on a single assignment. Activity 2 contains two distinct sections. The first element instructs students to identify causes and effects of environmental devastation in Portugal by underlining environmental problems with a single line and the causes with two lines. The students also identified and defined challenging vocabulary words as part of the first component. The second part of the assignment required students to write a detailed plan of action to improve Portugal's environmental situation. The researcher analyzed student performance on elements of the assignment by assigning a score of A, B, C, or D to each section. In order to compare the mean quality of answers for each class, the researcher assigned numeric values to each score (see Figure 1).

A	4
B	3
C	2
D	1

Figure 1. Numerical value of scores.

Class A scored an average of 2.91 on Section 1 of Activity 2, and an average of 2.83 on Section 2 of Activity 2. Figure 2 illustrates the distribution of scores for both sections of Activity 2 for Class A. Figure 3 shows the score percentages for Section 1 and Figure 4 shows the score percentages for Section 2.

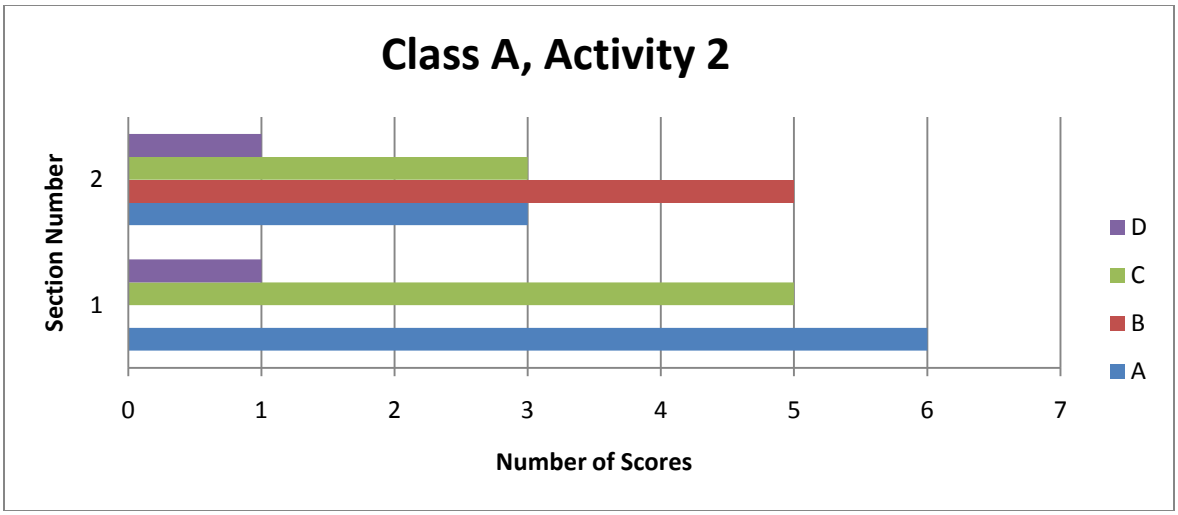

Figure 2. Class A Activity 2 scores.

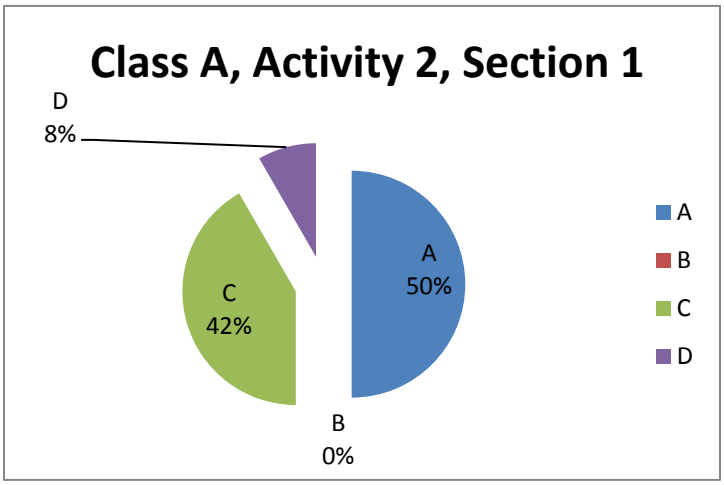

Figure 3. Class A, Activity 2, section 1, score percentages.

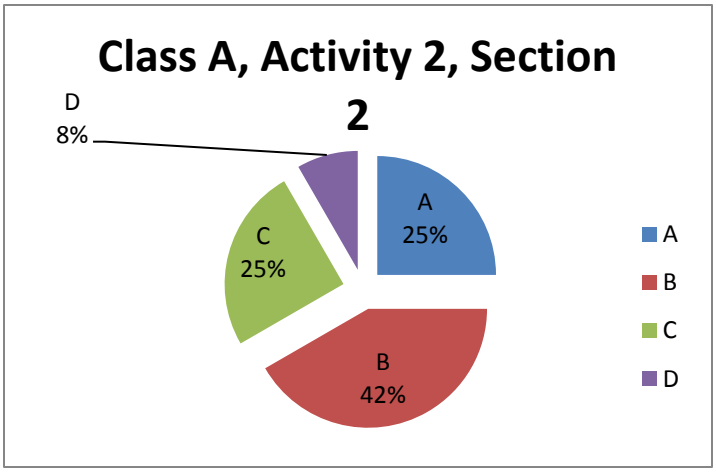

Figure 4. Class A, Activity 2, section 2, score percentages.

The data indicates that students in Class A performed better, on average, on the first component of Activity 2. Figure 3 and Figure 4 illustrate the score distribution. Figure 3 indicates that 50 percent of students in class A received an A on section 1, and the other 50 percent scored Cs and Ds. A score of a C or D signifies that the students did not complete the section correctly or left the section blank. These results indicate a prominent divide in the students' comprehension of section 1.

Figure 4 indicates that students' scores were more evenly distributed on section 2. The data suggest that some students who scored a C or D on section 1 scored a B, scores representing proficient performance, on section 2. This data reveal students' ability to identify a few of Portugal's environmental problems and creatively write about possible solutions. The students could not, however, successfully identify cause and effect relationships in the article. The Tennessee Department of Education (2010) includes the identification of cause and effect relationships as a necessary reading comprehension skill as part of the learning expectations in its Content Reading 3081 curriculum. Class A's performance on Activity 2 shows that half of the class mastered a key reading skill and the other half struggled with the skill; while performing proficiently on the part of the activity that required less comprehension of the article. The distribution of Class A's scores on the distinct sections of Activity A indicate students may perform well in class, overall, but may not fully comprehend reading assignments.

Students in Class B performed similarly on Activity 2. Based on the numerical values of scores in Figure *1*, students in Class B had an average score of 2.89 on Section 1 and 3.0 on Section 2. The students performed slightly worse on Section 1 and slightly better on Section 2.

*Figure **5*** displays Class B's score distribution for Activity 2. The data show that students in Class B scored fewer As on Section 1 than Class A, but they scored more As on Section 2. The data also shows that no one in Class B scored a D on Section 1, which signifies that all the students attempted the activity, unlike in Class A. Figure 6 and Figure 7 show the percentages of scores for Sections 1 and 2. Class B, similarly to Class A, had a greater distribution of scores for Section 2 than Section 1, and a distinct split in Section 2.

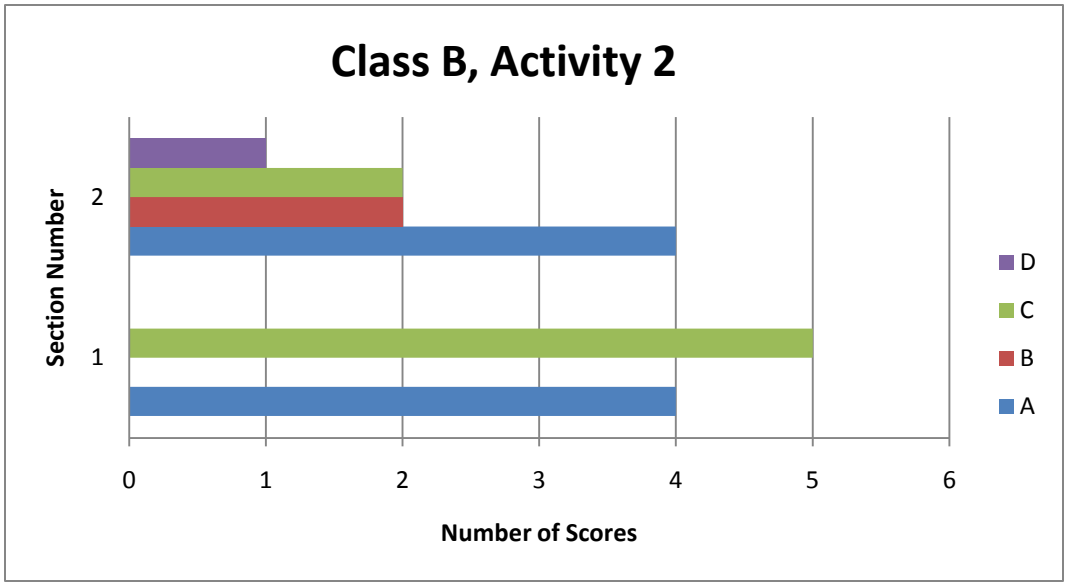

Figure 5. Class B, Activity 2 scores.

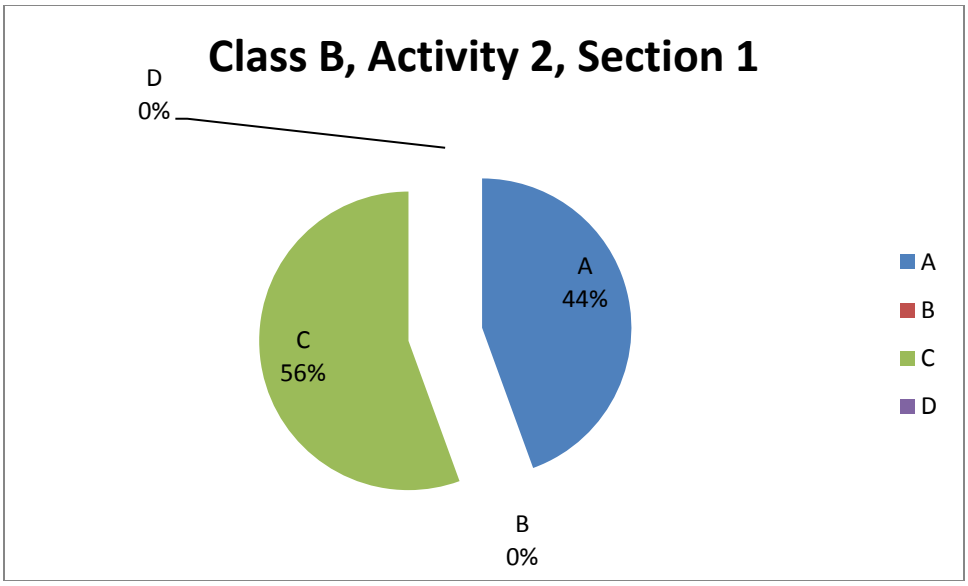

Figure 6. Class B, Activity 2, Section 1 score percentages.

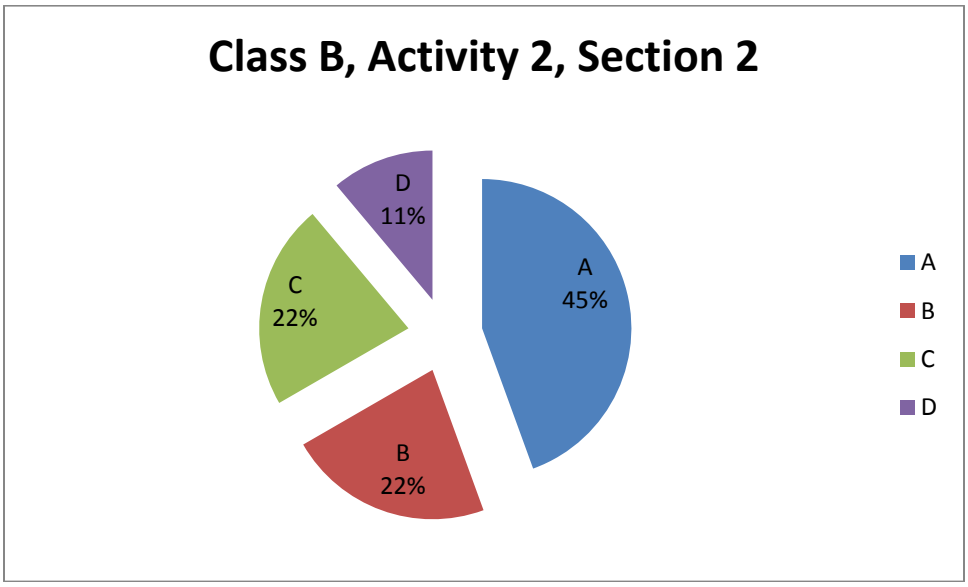

Figure 7. Class B, Activity 2, Section 2 score percentages.

Comparative analysis of Figure 3 and Figure 6 reveals that students who heard the article read aloud did not display stronger reading comprehension skills than those students who read the article silently. The researcher noted however that students in Class B were more attentive during the bellringer time in Class B. She attributes Class B's lack of a D in Section 1 of Activity 2 to the class's attentiveness. Though students in Class B did not score more As on Section 1, which represented mastery of essential reading comprehension skills, the data indicate that they

made 20% more As on section 2. The jump of As in Class B may be attributed to the higher level of focus in Class B. Students may not have exhibited increased reading comprehension, yet, because of the short exposure to the read aloud strategy, but the overall percentages of As on Activity 2 was greater in Class B (see Figure 8 and Figure 9). The researcher attributes the increase in the percentage of As in Class B to superior atmosphere in Class B.

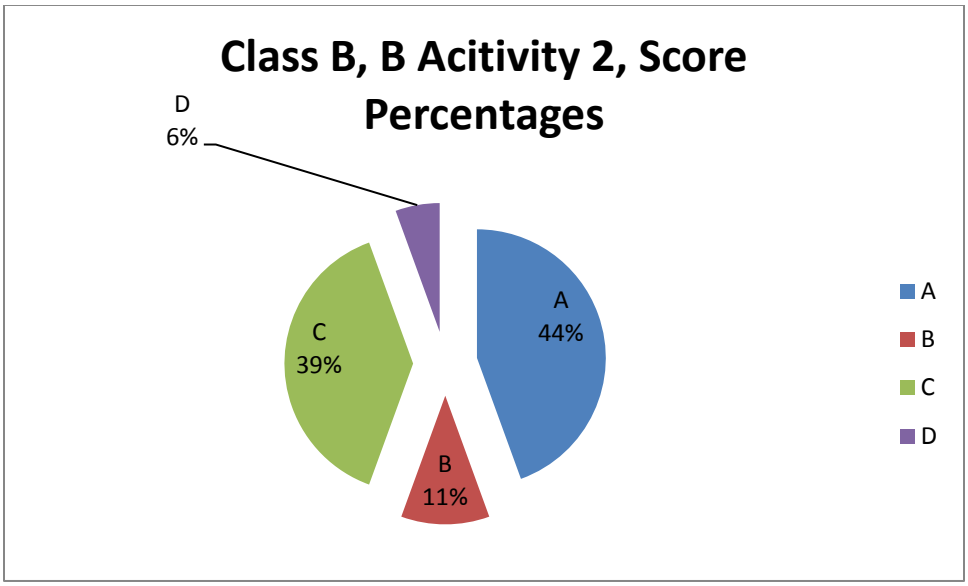

Figure 8. Class B, Activity 2, score percentages.

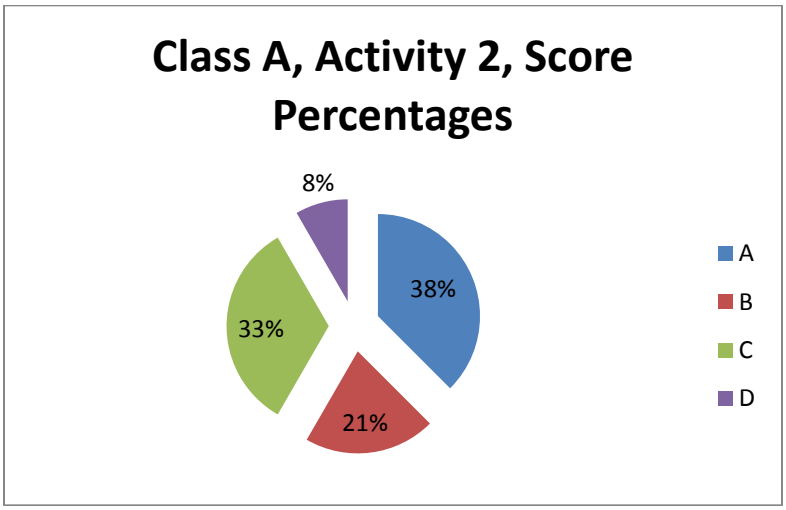

Figure 9. Class A, Activity 2, score percentages.

The data does not point to a significant difference in the scores of Class A and Class B. The researcher scored all questions answered by Class A and Class B in the daily bellringers. Figure 10 and Figure 11 illustrate that Class A did slightly better, overall, on their daily bellringers. The researcher does not view the better scores as an indicator that silent reading improved Class A's reading comprehension. Before the researcher began the case study, she observed the overall behavior, performance, and attitudes of both classes. Class B tended exhibit more instances of disruptive behavior and were less likely to be engaged in class. She chose to implement the reading aloud strategies in Class B because it needed the extra help, especially during the daily bellringer time slot. The researcher sees the similarity in scores of Class A and Class B as an indication that the reading aloud strategies were successful.

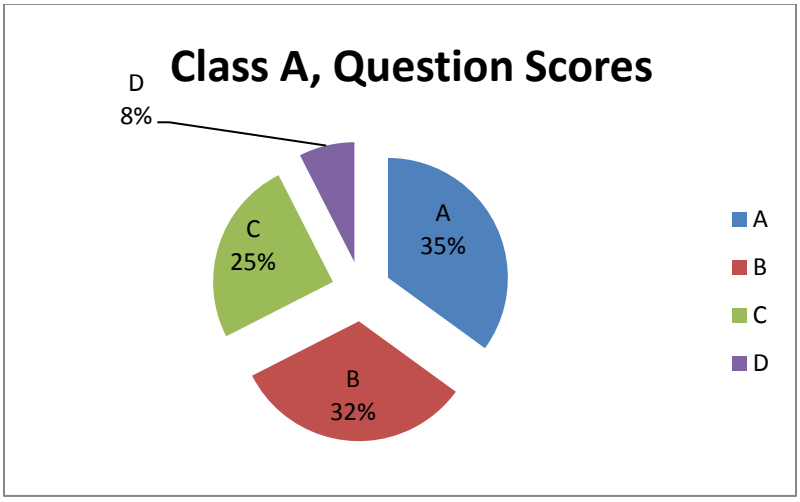

Figure 10. Class A, percentage of scores for all questions.

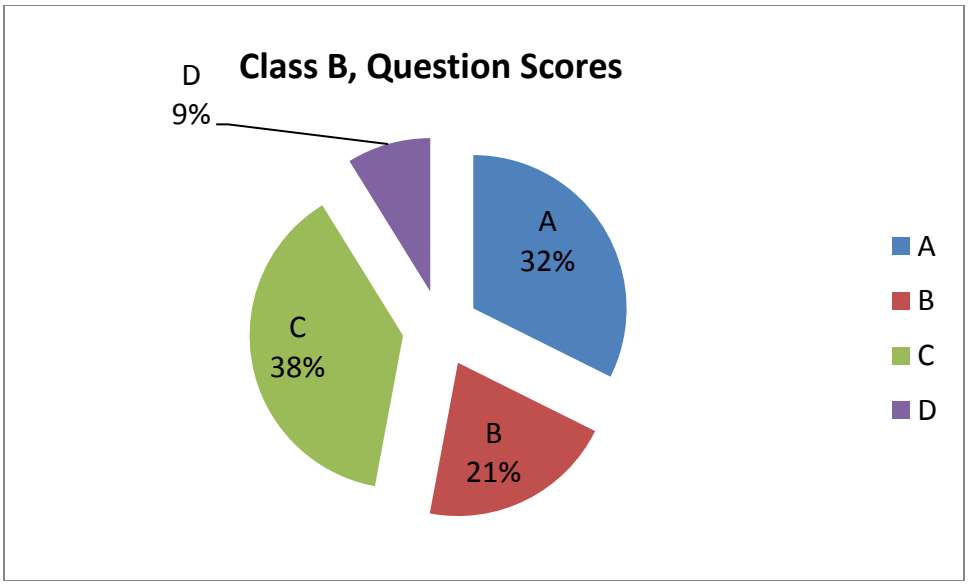

Figure 11. Class B, percentage of scores for all questions.

Students in Class A and Class B performed similarly on the daily bellringer quiz given at the end of case study. Figure 12 and Figure 13 show the distribution of scores for Classes A and B. Class A performed slightly better than Class B. The data indicate that both classes retained the content on similar levels. Activities are presented in Appendix A, and the scoring rubric is presented in Appendix B.

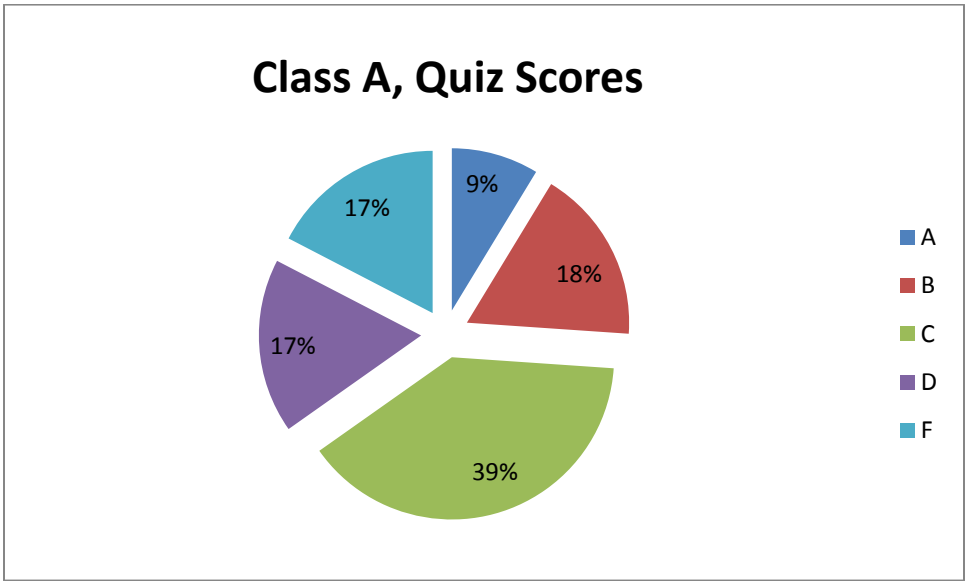

Figure 12. Class A quiz scores over all daily bellringers.

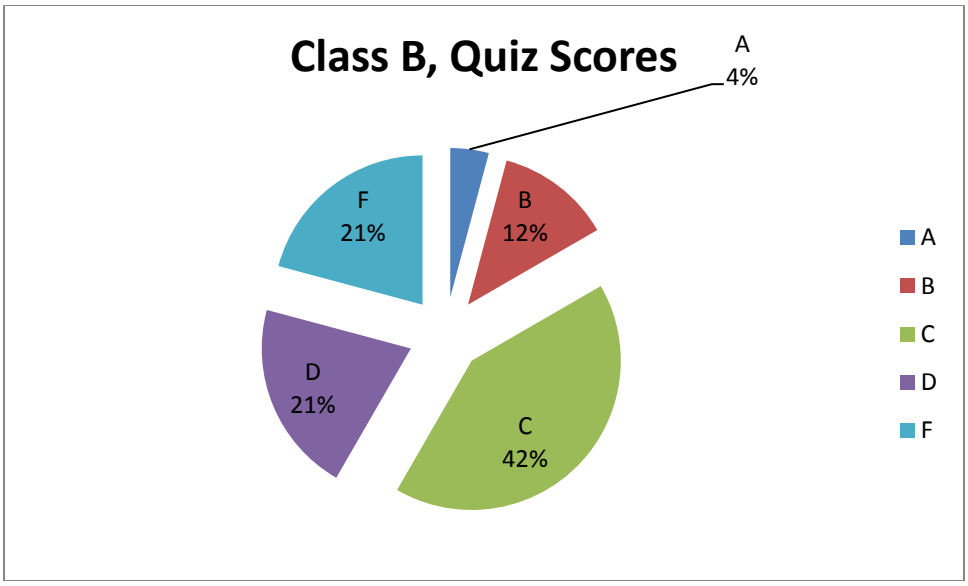

Figure 13. Class B quiz scores over all daily bellringers.

Conclusions and Recommendations

Quantitative review of the data does not indicate a difference in student performance through silent reading and read aloud strategies. The researcher did notice a qualitative difference in the performance of the two classes. The researcher started both classes with the bellringer activities. Class A continued to be social and unfocused during this time. When the researcher walked around the class during this time period, she noticed most students skimming the articles for answers. In Class B, the first few minutes of class each day were devoted to reading the article, as a class. The class was quiet and attentive during this time. Before implementing the technique, the teacher was very cautious of using the strategy in Class B, due to their disruptive behavior. Class B's engagement surprised her. The scores do not indicate improved performance in Class B, however, the researcher emphasizes the short duration of the case study. The researcher highly recommends using reading aloud strategies in secondary classrooms. The students were highly engaged during read alouds and during discussions of the material. The read aloud time at the start of class was an excellent way to bring the class under control, and focus on the day's content.

Improving reading in adolescents is a major initiative in Tennessee and across the country. The researcher did not find any specific information related to a professional educators of Tennessee's stance on the implementation of reading aloud strategies. The development of teacher professional development of reading aloud strategies in secondary classrooms would be a positive step toward improving adolescent reading comprehension. I believe teachers would benefit from reading testimonies and hearing other teachers discuss how reading aloud to their students benefited their classrooms. I believe teachers would implement these strategies because they are simple and affective. With read alouds, content teachers do not have to be reading specialists to give their students extra reading support.

Technology could have been simply integrated into this case study. Many Web sites have audio options, which could have been utilized. Students could also record themselves reading and use the recordings in various ways. I would recommend using the Race to the Top Grant money available at the school where the research was conducted to purchase recording devices and for professional development costs.

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Appendix A

Activities

Activity 1

1. Read " Pope Consecrates Barcelona" (Govna, 2010)
2. Answer the following questions:
    a. What did the "kiss-in" protest?
    b. What issues does the Pope address in his defense of the "traditional family"
    c. Does this article describe cultural conflict?
        i. If so what are the two conflicting sides?
    d. Find 2-4 vocabulary words from the article define them using your own words based on context clues from the article.

Activity 2

1. Read "Environment Day-Portugal: One-Way trip to Disaster" (Quieroz, M.)
2. Underline Portuguese environmental problems with one line.
3. Underline the causes of Portuguese environmental problems with two lines.
4. Circle difficult vocabulary words and define them in your own words on the back of the article.
5. Write a complete paragraph describing how Portugal can improve their environmental situation.

Activity 3

1. Read "Modern Day Spartans: "Does Violence Beget Violence"
2. Answer the following questions:
    a. Is this article biased?
    b. Who do you think wrote the article?
    c. Do violent sports promote violence in athletes in society? Why? Why not?
    d. Should the United States government restrict violence in sports? Explain.

Activity 4

1. Read “Europe Tested as War Crimes Suspect Remains Free”
2. Answer the following questions:
    a. Why is Mladic considered a war criminal?
    b. How has Mladic avoided arrest?
    c. Which European country is pushing most for his arrest? Why?
    d. Should Serbia be forced to find Mladic before being admitted into the European Union? Why?

Appendix B

Scoring Rubric

A	- addresses entire question - provides adequate explanation - exhaust texts for supporting details
B	- addresses majority the question - provides some explanation - uses some supporting details from the text
C	- addresses part of the question - does not give adequate explanation - uses little or no supporting details
D	- does not attempt to answer the question - answer does not match question

Using a Behavioral Management Reward System to Decrease the Behavioral Problems in a High School Setting

Amber Collins

Education 5900, Fall 2010

The University of Tennessee at Chattanooga

The Institutional Review Board of The University of Tennessee at Chattanooga (FWA004149) has approved this research project # 10-104.

Introduction to the Problem

School-aged children have made it difficult for educators to do their job due to disruptive behavior in the classroom. “From elementary to high school, managing behavior is by far the most difficult part of being a teacher” (Richert, 2009, ¶ 1). Disruptive behavior is defined by Chen & Ma (2007) as, “an excessive behavior that can interfere with the general activities proceeding at the time” (¶ 5). Children are sleeping in class, talking during inappropriate times, fighting with other students, not turning in their assignments or participating in class, and talking unsuitably to their teachers and/or administrators. Although some disruptive behaviors are not life-threatening or excessively severe, they are considered to be problematic by participants’ teachers, parents, and caregivers, or anyone that is inconvenienced by their behavior (Chen & Ma, 2007).

Richert (2009) stated, “Children also come to school with a variety of emotional and life challenges, which may make their problem behaviors seem complex and difficult to correct. However, behavior problems and appropriate interventions can be discovered readily when the function of the behavior is explored” (¶ 1). In order for each student to succeed throughout school and beyond, there needs to be a behavioral management system implemented into each school to help control the behavior problems. This study examines the benefits of a behavioral management system in a high school setting.

Area of Focus Statement

The purpose of the behavioral management system is to determine the effects on high school students’ behavior by using a daily point sheet that will allow students to receive a reward if their points have been met throughout the week. The researcher will also determine if there is an effect on the overallm performance quality of the student on class assignments.

Limitations

There are a few, primary limitations that exist, concerning this study. The subjects of the study, may fail to respond honestly to the questionnaires they are given or they may not return them.

Secondly, the study will only be performed with a small number of students in a single school, so there will be no control group to make comparisons.

Lastly, the subjects of the study have been placed in an alternative school setting due to previous behavioral problems, so working to help fix or improve their behavior may be an obvious limitation.

Research Questions

1. Does receiving a daily point sheet affect a student's behavior and performance at school?
2. Can a reward for good behavior improve a high school student's attitude?
3. What effect does posting a student's behavior level on a wall inside the school have on his or her self-image?

Review of the Literature

Controlling problems from children in the classroom has always been a challenge for educators. "Educators face daily and continuous challenges in efforts to establish and maintain safe and orderly classroom environments where teachers can teach and students can learn" (Scott, White, Algozzine, & Algozzine, 2009, p. 45). Some students are facing big and difficult changes and/or responsibilities that many children should not have to deal with at their age. Some student changes and responsibilities are causing the child to fall behind in academics and/or cause disruptions in the classroom. Students who are having difficulty outside of school

do not always cause disruptive behavior in the classroom. Many students have been diagnosed with some type of disorder, such as Attention Deficient Disorder (ADD) or Attention Deficient Hyperactivity Disorder (ADHD), which can cause a child to be disruptive and act out of order.

Although disruptive behavior is a problem in schools, it is not something that cannot be fixed or improved. There are many different strategies that educators can put into practice to develop and improve a student's behavior while in the classroom.

Classroom Management

Classroom management is one of the most important ways for teachers to maintain their students' behavior in the classroom. "Disruptive behavior causes interference in the teaching and learning environment" (Harrell & Hollins, 2009). It is important for all educators to maintain a good classroom management plan and stick with the plan at all times. Harrell and Hollins (2009) stated, "As each faculty member designs his/her learning environment, attention has to be given to what student behaviors will and will not be considered disruptive" p. 70. All teachers should have a set of classroom rules and expectations that they should not only go over frequently with their students, but also have them posted in their room for the students to see. Prevention is the most effective method for dealing with disruptive behavior (Harrell & Hollins, 2009). Harrell & Hollins (2009) also stated that, for a teacher to have a positive, nondisruptive classroom environment, he or she should involve active learning, and collaboration, which will enhance the students' engagement and allow them to become more interested in the lesson. If students are interested in what they are learning then it will be less likely that they will act out and disrupt the class. Marshall (2005) states that there are three principles for a teacher to practice that will enhance classroom management and promote responsible behavior. These three principles are (a) to stay positive, (b) offer choices, and (c) understand the differences between controlling

someone else and attempting to change someone else. If a teacher practices these three principles in his or her classroom, Marshall (2005) feels the classroom environment, as well as the structure, will be improved for the teacher and the students.

Behavioral Management System

In order for each student to succeed throughout school and beyond, there needs to be a behavioral management system implemented in each school to help control the behavior problems. Many researchers state that a behavioral management system that relies on both praises and rewards, and less on reprimands, will contribute to the decrease of classroom disruptive behavior (Daddario, & Anhalt, & Barton, 2007; Baker & Holloway, 2009; Filcheck & McNeil, 2004; Goldstein & Mather, 2001; Reinke, Lewis-Palmer, & Merrell, 2008). Goldstein and Mather (2001) stated, "Methods can be developed for defining, observing, and measuring behaviors, as well as designing effective interventions. Behavior modification techniques never fail" (¶ 1). "All behavior is maintained, changed, or shaped by the consequences of that behavior. Although there are certain limits, such as temperamental or emotional influences related to ADHD or depression, all children function more effectively under the right set of consequences" (Goldstein & Mather, 2001, ¶ 1).

A great way for teachers to improve and manage their students' behavioral problems is through a behavioral management system. Filcheck and McNeil (2004) explain their study on the use of a token economy in preschool classrooms. "A token economy is a program in which individuals earn tokens for exhibiting targeted behaviors and can exchange these tokens for rewards" (Filcheck & McNeil, 2004, p. 95). It is important for the teacher to decide what the tokens will be and also make any accommodations for individual differences (Filcheck & McNeil, 2004). Once the child understood the process, the "token economy seemed to be a

promising intervention to assist teachers in managing the increasing levels of disruptive behavior exhibiting in their classroom" (Filcheck & McNeil, 2004, p. 102).

According to Goldstein and Mather (2001), all teachers should focus on positive reinforcement that will strengthen a student's behavior and try to decrease any punishments that could weaken a student's behavior. Effective teaching practices, frequent monitoring, clear rules and procedures, and social praise are all ways that a teacher should center his or her classroom management skills to help prevent disruptive behaviors (Goldstein & Mather, 2001). Reinke et al. (2008) also agree that an increase in praise and a decrease in reprimands contribute to a reduction in children's disruptive behavior while in the classroom. According to Reinke et al. (2008), a good example of praising a child would be "any verbal statement or gesture that indicates teacher approval of a desired student behavior" (¶ 16).

Daddario et al. (2007) investigated a study on the effectiveness of implementing Differential Reinforcement of Other behavior (DRO) at the class-wide level to decrease the disruptive behavior. "Differential reinforcement of other behavior (DRO) is a procedure in which reinforcement is delivered dependent on the absence of the target behavior" (Daddario, et al. 2007, p. 342). The DRO system has been proven to be effective in reducing behavior problems in certain school-aged children (Daddario, et al. 2007).

The majority of researchers agree that the benefits of a well-developed behavioral management system and good classroom management skills from teachers are required for students to succeed throughout school and beyond. Since disruption is a common behavior in children (Fox, Guffey, Huseman, Lane, & Smither, 2007), it is important for educators to prevent as many behavioral problems as they can, from the beginning, instead of waiting until it is too late. "Teachers are faced daily with deciding how much energy to control battle with the troubled

child while dealing with the additional responsibility of keeping the rest of the students safe" (Baker & Holloway, 2009, p. 39). If a teacher wants better behavior from his or her students then they need to teach it, and teach it well, as well as reinforce it (Scott et al., 2009). "When misbehavior happens, respond with instruction through corrective teaching, maintaining emotional poise and control, and without engaging in power struggle. Respond to misbehavior consistently with corrective teaching, so students learn that the correction is intended to help and not to hurt" (Scott, et al., 2009, p. 47).

Methodology

This study took place in an alternative high school setting of approximately 60 students. Of these 60 students, 18 of them were selected to participate in the study. Each high school student had been placed in an alternative school setting due to previous behavior problems from their regular zoned school. I conducted the research throughout a 6-week period of time, starting September 20 and ending November 5. The week of October 18 was not included in the study due to fall break. There was no change in the classroom instruction. During this time, I used various qualitative and quantitative methods of data collection to obtain information about the students' behavior and academic achievement. Students received a daily point sheet that was taken to each class, and the student's teachers determined the points received for each student during their class, based on their performance in behavior and classroom participation. If the students met a certain number of points by the end of the week, then they were rewarded with a 50-minute activity day each Friday. I also looked at each student's behavioral file and report cards to determine their behavioral status. Using this data, I determined whether the behavioral management system had any impact on the student's behavior and academic achievement.

Data Collection and Results

Data collection methods were both qualitative and quantitative. The first method of data collection was collecting archival documents, I collected archival documents through report cards, discipline referrals, and suspension referrals. The student's daily point sheets were also a form of data for the research.

Secondly, I conducted an informal interview with all participants, designed to find out more about the general attitude of the child, beliefs about school, etc. In addition, I conducted a formal interview with the student's classroom teachers to determine the student's behavior and academic status in their classroom.

Thirdly, I conducted passive observation throughout the study. This allowed me to be able to watch how each individual was behaving and reacting to their behavioral management system.

The last form of data collection was a student survey in the form of a Likert Scale. (See Appendix A.) This allowed the students to express their opinions of the behavioral management system.

Results

Archival Documents

The purpose of the archival documents was to determine if the behavioral management system affected the student's behavior and/or academics while participating in the research. I collected data from the student's report cards, suspension referrals, and daily point sheets for the 6-week time frame of the research.

Report cards. I compared the students' report cards from their progress report that was given to them at the first of the research and their report card that was given toward the end of the research. Of the 18 students that participated in the research, 13 of them increased their overall grades, one of them stayed the same, and four of them had a slight decrease. The overall GPA of the 18 students' at progress report time was 90.47, and at report card was 90.82.

Suspension referrals. Of the 18 participants, 12 of them had no referrals, 3 of them had only one, 2 of them had two, and 1 of them had more than two. Of the 12 total referrals, 5 of them were due to the students being out of dress code, 3 were from being disrespectful to authority, 3 were from using inappropriate language, and 1 was from flashing gang signs.

Daily point sheets.

Week 1: Fourteen of the 18 students (78%) earned the required amount of points to attend the activity period on Friday.

Week 2: Ten of the 18 students (56%) earned the required amount of points to attend the activity period on Friday.

Week 3: Eleven of the 18 students (61%) earned the required amount of points to attend the activity period on Friday.

Week 4: Nine of the 18 students (50%) earned the required amount of points to attend the activity period on Friday.

Week 5: Eleven of the 18 students (61%) earned the required amount of points to attend the activity period on Friday.

Week 6: Nine of the 18 students (50%) earned the required amount of points to attend the activity period on Friday.

Passive Observations

During the 6-week study, I observed each student's behavior while in my class, during class changes, and while interacting with other students and teachers. I noticed that most students were trying to act appropriately and earn their points. Many of the students seemed to shut down once they realized they had lost points in other classes or in my class. If a student had points deducted, some would stop doing their work or continue to act inappropriately because they felt there was no reason to cooperate, if they had already lost points from their daily point sheet. There were some students that would try harder to make sure they did not lose additional points.

Interviews

Informal student interview. Student interview responses are presented in Figure 1.

1. Do you feel that the Behavioral Management Plan helps you to think twice about your behavior and academics?

2. Do you take the Behavioral Management Plan seriously?

3. Do you look forward to the reward day at the end of the week?

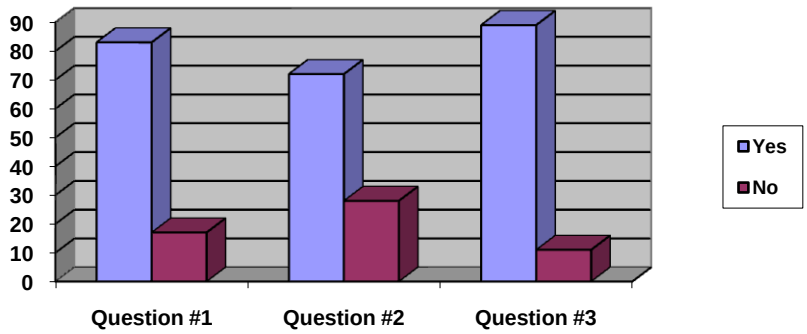

Figure 1. Percentage from questions #1-3.

4. Are there any other ways, besides the Behavioral Management Plan, that you feel would motivate you to improve your behavior and academics? Explain.

"Better rewards at the end of the week"

"Be able to return back to the students' zoned school early if perfect scores were achieved half way through their placement"

5. Any other comments? Concerns?

"The Behavioral Management System keeps students focused and on track all times of the day!"

Formal teacher interviews. Teacher interview responses are presented in Figures 2-4.

1. How seriously do you feel the students are taking the Behavioral Management Plan?

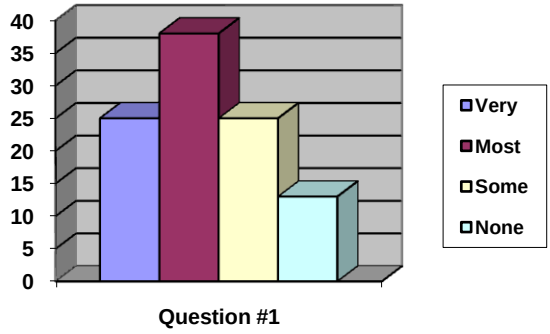

Figure 2. Percentage from question #1.

2. Do you feel that this plan is helping the students think twice about their behavior and academics?

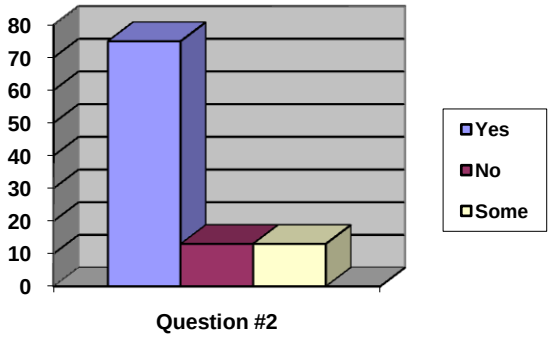

Figure 3. Percentage from question #2.

3. Do you think the reward period at the end of the week is sufficient for the students?

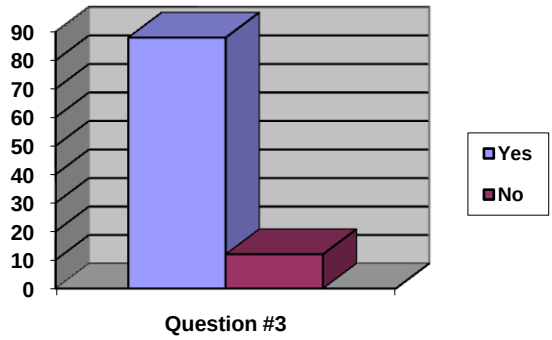

Figure 4. Percentage from question #3.

4. Is there anything you would like to change about the Behavioral Management Plan? If so, explain.

"Have an in-school detention room for students who are continuously disrupting class and acting inappropriate"

"Have students create a behavioral management plan"

"Allow students to receive points at lunch"

"Reward the student daily"

"Have all teachers hold their students more accountable"

5. Any other comments? Concerns?

N/A

Student Survey (Likert Scale). Student responses are presented in Figures 5-7. The survey is contained in Appendix A.

1. I believe that school is important.

2. I believe that in order to succeed in life you must graduate from high school.

3. I believe that good behavior is important for every student while at school.

4. I believe that doing your assignments for every class is important.

5. I believe that keeping up with daily points for behavior and academics helped me stay focused and do better while at school.

6. I believe that an activity for making the required number of points helped me stay focused and do better while at school.

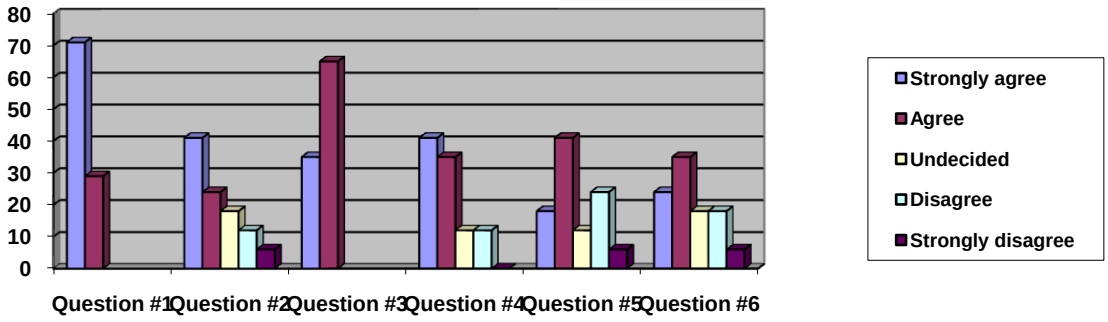

Figure 5. Percentage from questions #1-6 on the student survey.

7. Do you feel the behavioral management system program has helped you want to behave better while at school?

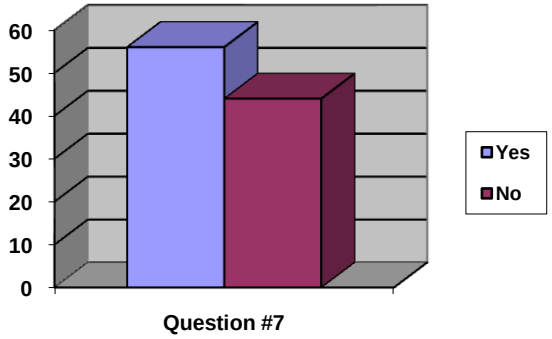

Figure 6. Percentage from question #7.

8. What do you think would be another way the teachers and administrators could do to promote better behavior and academics in students?

"Allow the students with good behavior to bring in fast food for lunch"

"Treats throughout the day"

"Allow students to choose the activity"

"Receive daily rewards, not just a reward on Friday"

"Go to six flags"

"Have more activities to choose from"

9. Did you look forward to having an activity day at the end of the week?

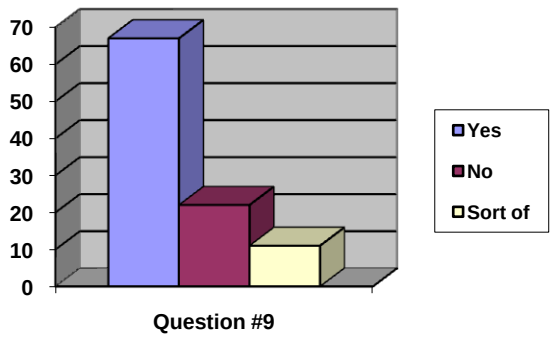

Figure 7. Percentage from question #9.

10. Do you have any other suggestions for rewarding the students you have stayed on track and met their required points for the week?

"Six flags"

"Longer lunches"

"More outside time"

"Chose our own reward"

"Go out to eat"

Conclusion

A review of recent literature has demonstrated a need to improve student behavior and academic achievement while in the classroom. This study provides a way of how a student's behavior and academic achievement could be improved through a behavioral management system. The results of the study suggest that a behavioral management system is beneficial while assisting behavioral problem students. There was a greater increase in grades during the 6-week study. Of the 18 students who participated, 67% of them did not receive any suspension referrals and an average of 59% of the students were able to attend each activity day on Fridays. The results of this study can be used to guide high school teachers on how to best improve their students' behavior in the classroom and help the students succeed throughout life.

Recommendations

It is my opinion that the Behavioral Management System is a success and is beneficial in the alternative high school setting. I think this system would also be beneficial in all school settings, but it may be harder to keep up with and tedious on the teachers in a regular school setting, since the classroom size is much larger.

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Appendix A

Behavioral Management System Survey

This is a survey on how you feel about the importance of behavior and academics in school. Please read the questions and be honest with your answers. There are no "right" or "wrong" answers and you will not be graded on your answers.

Please respond to the following items by drawing a circle around the response that most closely reflects your opinion: strongly agree (SA), agree (A), undecided (U), disagree (D), or strongly disagree (SD).

1. I believe that school is important.

   SA A U D SD

2. I believe that in order to succeed in life you must graduate from high school.

   SA A U D SD

3. I believe that good behavior is important for every student while at school.

   SA A U D SD

4. I believe that doing your assignments for every class is important.

   SA A U D SD

5. I believe that keeping up with daily points for behavior and academics helped me stay focused and do better while at school.

   SA A U D SD

6. I believe that an activity for making the required number of points helped me stay focused and do better while at school.

   SA A U D SD

Please respond to the following questions by answering your honest opinion. (Remember…you will NOT be graded on your answers)

7. Do you feel the behavioral management system program has helped you want to behave better while at school? Explain.

8. What do you think would be another way the teachers and administrators could do to promote better behavior and academics in students?

9. Did you look forward to having an activity day at the end of the week? Explain.

10. Do you have any other suggestions for rewarding the students you have stayed on track and met their required points for the week?

Ready for Middle School Math?

Dorothy L. Finch

Education 5900, Fall 2010

The University of Tennessee at Chattanooga

The Institutional Review Board of The University of Tennessee at Chattanooga (FWA00004149) has approved this research project # 10-149.

Introduction to the Problem

Transitional periods can be sources of a great deal of stress. Everyone reacts to change in different ways, and different situations bring about different reactions. Some transitions are looked upon with great excitement and anticipation, while others are faced with great fear and dread. The experiences adolescents face during the transitional period of moving from elementary school to middle school will have both positive and negative results in their lives. This is a critical time for an adolescent, and what occurs during this period could have long-term effects. Some students face the promotion with determined optimism, others with defeatist pessimism, and many fall somewhere in between. At the same time that this transitional move is occurring, students are also experiencing a host of physical changes. The changes in hormones, body size, and body shape seem to occur overnight, and can cause added stress. Additionally, students are trying to become more independent, make new friends, and prepare themselves to eventually, enter society as well-adjusted, productive members of society. As educators, many of these changes are out of our control; however, we can have a positive role in helping students have a smooth transition from elementary school to middle school. This study will focus on the students' perspectives of this transition, especially as it applies to the mathematics classroom.

Review of Literature

Much research has been done, in recent years, of the various challenges students face during the transitional period of moving from elementary school to middle school. Adolescents are especially vulnerable, during this transition, because it coincides with the physical and emotional changes that take place during puberty (Akos, 2004). Either of these events could be a source of anxiety for a student, by itself, but, together, the effects can be traumatic.

The middle grades are critical years for all students, but some groups have a more difficult transition. Akos (2004) and Cauley and Jovanovich (2006) reported that female students may have difficulty because more emphasis is placed on peer relationships, at this time. Minorities and students with low socioeconomic status can experience a difficult transition to middle school, as well (Shores, Shannon, & Smith, 2010). Hines (2007) found that students whose parents had divorced within the 2 to 3 years before starting middle school also had trouble academically, socially, and behaviorly.

One area of concern for students is learning the procedures of a new school (Cauley & Jovanovich, 2006). Students are concerned about getting lost, getting to class on time (Akos & Galassi, 2004), finding their lockers and remembering the combination (Akos, 2004), getting on the right bus, and learning a new set of rules and consequences (Cauley & Jovanovich, 2006). These concerns can be addressed in transitional programs that are designed to help the student become familiar with the facilities, before the school year begins. This can be accomplished with school visits and shadowing programs (Akos, 2004; Akos & Galassi, 2004; Cauley & Jovanovich, 2006).

Social and emotional concerns trouble adolescents, at this time, as well. When students arrive in middle school, the group dynamics of the elementary school have been disrupted (Kingery & Erdley, 2007). Best friends in elementary school, who were together all day in fifth grade, may not even see each other in the middle school. Many are concerned with meeting new people and making new friends (Akos & Galassi, 2004). This is a crucial issue for a successful transition to middle school. Kingery and Erdley (2007) found that peer acceptance is a predictor of loneliness. An eighth-grade writing prompt asked students to give advice to a student coming into the sixth grade (Akos, 2004). Common suggestions were to talk to people, be nice to others,

be yourself, and make new friends (Akos, 2004). Students who have the support of peers have a more successful transition into the middle grades (Cauley & Jovanovich, 2006). Akos (2006) determined that one way to increase peer support and acceptance was through extracurricular activities. Participation in school activities helps to give students a feeling of connectedness to the school and a connection to students with similar interests.

Many factors contribute to a successful transition to middle school, all of which can be sources of anxiety for adolescents. Not only do the actual changes cause stress, but the anxiety students feel because of these changes adds to the stress level. High anxiety can lead to a decrease in motivation (Parker, 2010), an increase in emotional stress, and a decrease in academic achievement (Shores & Shannon, 2007; Shores et al., 2010), and put a student at risk for dropping out of school (Cauley & Jovanovich, 2006). Adolescents' self-concept is especially vulnerable at this time (Parker, 2010). This can be a time of low self-esteem (Akos, 2006; Cauley & Jovanovich, 20006) which can influence academic achievement (Shores et al, 2010).

Academic concerns are extremely important to upcoming middle school students. The students are leaving a more nurturing environment (Parker, 2010) in the elementary school and entering a more academically challenging environment. Concerns arise over having tough teachers (Akos, 2004; Cauley & Jovanovich, 2006), the amount of homework (Akos & Galassi, 2004), and teacher expectations (Cauley & Jovanovich, 2006). Where many fifth-grade students have only one or two teachers, sixth-grade students commonly have six to eight teachers. This multiplies the number of classroom procedures and policies, and teacher personalities, with which the student must become accustomed. Some handle this quite well, while others need a longer time to adjust to the new structure.

The middle grades are a critical time for mathematics. Students may experience different teaching methods, an increase in independent work, and less connection to other disciplines (Schielack & Seeley, 2010). Switzer (2010) found that students in sixth grade typically experience little connection to the mathematics done in fifth grade, and that teachers in middle school may not be familiar with algorithms taught in the elementary school. Switzer, and Schielack and Seeley, suggest communication among elementary math teachers and middle school math teachers, and that vertical alignment of the math curriculum could establish important connections in math concepts for students.

Data Collection and Results

Data Collection

Subjects. The subject of this study were sixth-grade students attending the same middle school in the southeastern United States. The school has approximately 600 students. Approximately 65% are White, 25% are African American, and 7% are Hispanic. Over 75% of the student population at this middle school are considered economically disadvantaged.

Methodology. A survey was given to sixth grade students to evaluate their experience entering the middle school mathematics class. This survey was completed midway through the second quarter of the 2010-2011 school year. Parental consent forms were sent home with apporximately 185 students. Eighteen students returned a signed parental consent form and completed a survey. The survey consisted of both multiple choice questions and written response, open-ended questions. (See Appendix A.)

Results

The students were asked multiple choice questions, comparing their attitudes about mathematics in the fifth grade to mathematics in the sixth grade. The survey began with

questions concerning the student's grade in math in fifth grade and sixth grade. Of the respondents, 33.3% reported having the same grade at the end of the first quarter of sixth grade as they had at the end of fifth grade, 11.1% reported a higher grade, and 55.6% reported a lower grade. The median grade at the end of fifth grade was an A, with a mean score of 3.5 on a 4.0 scale. The median grade at the end of the first quarter of sixth grade was a B, with a mean score of 2.83 on a 4.0 scale. (See Figures 1 and 2).

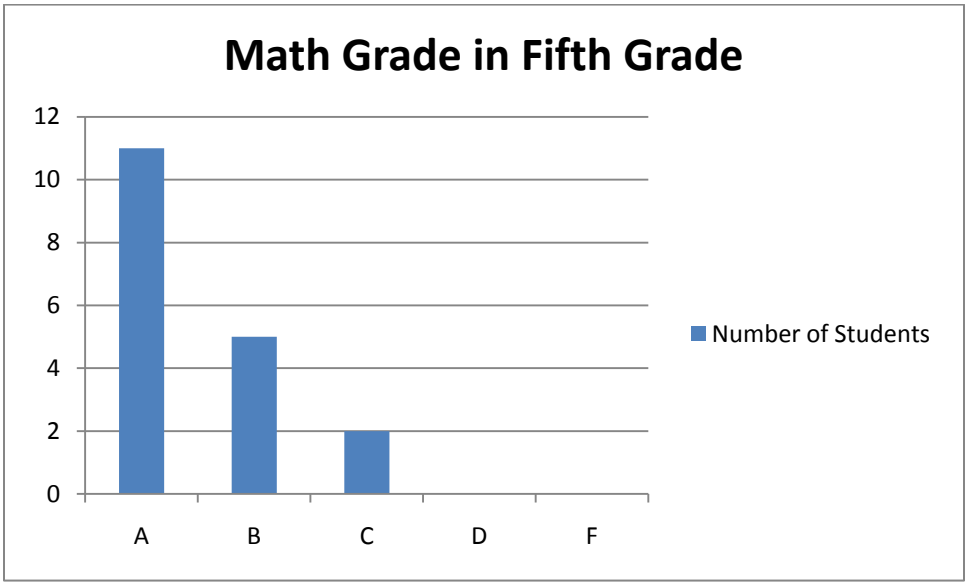

Figure 1. Students' math grades at the end of fifth grade.

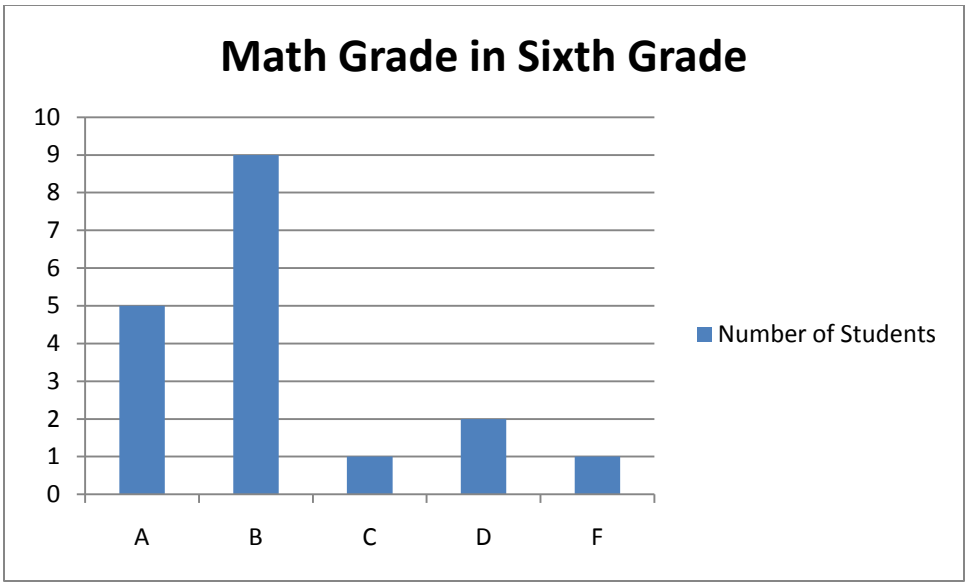

Figure 2. Student's math grades at the end of the first quarter of sixth grade.

The next questions asked about the students' attitudes towards mathematics: whether they felt sixth-grade math was harder than fifth-grade math, whether they enjoyed math more in the sixth-grade, whether their sixth-grade teacher expected them to have learned something in fifth-grade that they did not learn, and whether they felt that fifth grade math class was "too easy." Of the 18 respondents, 33.3% felt that sixth-grade math was harder than fifth-grade math, 16.7% felt sixth-grade math was easier than fifth-grade math, and 50% reported the difficulty level of the two grades was about the same. Of the students, 44.4% reported to enjoy math more in sixth-grade than they did in fifth-grade, 27.8% enjoyed math more in fifth grade, and 27.8% enjoyed them both about the same. Of the students, felt that their sixth-grade math teacher expected them to have learned certain concepts in their fifth-grade class that they had not learned. Topics that students felt that they did not learn in fifth-grade included stem and leaf plots, turning decimals into fractions and percentages, positive and negative numbers, multiplication, division, fractions, and mean, median, mode, and range. Of the students surveyed, 61.1% felt that math in fifth-grade was "too easy."

The second part of the survey required students to write their responses, comparing their current math class to their fifth-grade math class. Responses to the question, "How is 6th grade math class different from your math class in 5th grade?," included fifth-grade did more worksheets, played a lot of games in fifth-grade, use calculators more in sixth-grade, teacher helps us more, and in fifth-grade sometimes worked in a group. The most common answer was that sixth-grade math was harder. When asked to compare their teachers, students commented about their current teacher being more strict, meaner, nicer, expects us to know it all, makes sure you understand, and explains more. The students were asked to compare the amount of homework and studying they did in sixth-grade, as compared to fifth grade. The common responses were they have less, the same, or no homework in sixth grade. Only one student reported having more homework now, than in fifth grade. Of the students, 72.2% reported that they study more in sixth grade than they did in fifth grade.

The last question asked students to suggest something that the fifth-grade teacher could have done to better prepare them for middle school. The most frequent response was nothing, followed by give harder work, and explain things better. Students also suggested that fifth-grade teachers use a sixth-grade textbook, tutor after school, spend more time on a unit, and use calculators more.

Conclusions and Recommendations

Conclusions

Due to the small sample size of this study, specific conclusions are difficult to reach. However, generalizations can be made, as a result of this survey. The majority of students felt that fifth-grade math was too easy. The level of difficulty of the fifth-grade mathematics curriculum apparently did not prepare the students for the level of work required of them in the

sixth grade. The difference in academic environments, teacher expectations, and the textbooks, all work together to create a disconnect between the elementary and middle school mathematics classrooms. Typically, elementary school teachers use a wider variety of teaching strategies, including games and more group work. The middle school teacher, typically, uses more direct instruction and independent work. The lower math grades in sixth-grade could be an indication that the students were not prepared for the rigor of sixth-grade math or the teaching style of the instructor.

Recommendations

It is recommended that educators in the fifth- and sixth-grade mathematics classroom be aware of the differences of the classes, and use that information to help students prepare and adjust to the changes they face. Schielack & Seeley (2010) found that successful transition programs encourage communication among educators. Involvement in each other's classroom, either by visits or video recordings, can assist fifth- and sixth-grade math teachers to form a connection between the two grades for the students. Fifth-grade teachers can prepare students for the type of math class they can expect to see in middle school. Sixth-grade teachers can observe different instructional strategies that they can incorporate into their classrooms. Having a math curriculum that begins in the elementary school and continues into middle school can reinforce this connection for the students.

Technology can be a useful tool to help students connect what was learned in fifth grade to the sixth-grade curriculum. Computer software from the same publisher could be designed to begin in fifth grade and continue into middle school.

Since no two school systems are alike, each school district should examine its own mathematics curricula in the elementary and middle schools to analyze whether there is a

connection from one year to the next. A curriculum could be developed so that the student entering middle school is not introduced to a mathematics program that is considerably different from elementary school mathematics.

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Appendix A

6th Grade Survey

Please answer the following questions as accurately as possible. Circle your answers.

1. What was your grade in math at the end of 5th grade?

A B C D F

2. What was your grade in math for the first quarter of 6th grade?

A B C D F

3. Is math harder in 6th grade, easier, or about the same as it was in 5th grade?

A. Harder B. Easier C. About the same

4. Do you enjoy math more in 6th grade, less, or about the same as you did in 5th grade?

A. I enjoy math more now.

B. I enjoyed math more in the 5th grade.

C. I enjoy math about the same as I did in 5th grade.

5. Were there things that your 6th grade teacher expected you to have learned in 5th grade, but you didn't?

Yes No

If yes, which topics?

_____

6. Do you think your 5th grade math class was too easy?

Yes No

7. Please describe your first few weeks in middle school math class by answering the following questions.

How is 6th grade math class different from your math class in 5th grade?

How is your 6th grade teacher different from your 5th grade teacher?

Do you have more homework now or about the same as 5th grade?

Do you have to study more than you did in 5th grade?

What do you think your 5th grade math teacher could have done to better prepare you for middle school?

Improving Vocabulary Acquisition and Grammar Comprehension in The Second Language through Five Minutes of In-class Reading Time

Veronica V. Herrera

Education 5900, Fall 2010

The University of Tennessee at Chattanooga

The Institutional Review Board of The University of Tennessee at Chattanooga (FWA00004149) has approved this research project # 10-129.

Introduction to the Problem

During the last 4 years, I have been using student-selected, weekly, second language (L2) immersion reading as a method for vocabulary and grammar acquisition with my first-year French students. I assign my students to read one picture book from our vast library collection as their weekly reading assignment. At the end of the week, I quiz them by asking them to give a brief description of the book, to explain two grammar connections related to the topics we are studying in class, and to list five new words they learned from the reading (see Apendix A). These reading quizzes are open-book quizzes, so the student can focus on identifying learning opportunities in the book, rather than trying to memorize the storyline, itself.

Through this reading immersion experience, I have seen the students who were diligent about completing their reading assignment acquire vocabulary and understand grammar at an accelerated rate; to the point that some students have even skipped 1 high school year. They have advanced directly from middle school French 1b to high school French 3, by testing out of high school French level 2 (L2) at the end of the 8th grade.

The challenge I face, at this point in this reading process, is that not all students are reading at home on a daily basis. By the end of the first semester, it is evident, by the level of vocabulary acquisition and grammar command, that those who have diligently read outside of class are assimilating the material, and those who have not are not making significant progress. Those not reading, and, therefore, scoring low on reading quizzes, fall behind, and, inevitably, separate themselves from those who are achieving true L2 acquisition. The gap becomes so large that those needing more reading feel motivated to face further academic challenges in the L2 classroom.

Based on the success of those students who have achieved a high level command of the L2 by completing their reading assignment, I want to ensure all my students are reading on a daily basis. My objective is to provide everyone in the class the chance to experience success through reading as a formative task toward L2 fluency.

Reading immersion in the L2 is a methodology that has been researched for, at least, the last 2 decades (Kweon, 2008); however, it is not yet a preferred formative methodology in the L2 classroom. Since reading is a quiet activity, there is the fear of wasting classroom L2 immersion time.

In this research, I explored implementing an Individualized Reading Program (IRP) (Hunt, 1970), by assigning 5 minutes of free reading at the beginning of our daily lesson. I wanted to find out if, by monitoring that all students are reading everyday, the overall average vocabulary acquisition and grammar comprehension rate of the class would improve.

I set a goal of 15% improvement in the classroom's mean reading quizzes score as a minimum success rate to consider adopting the IRP as a standard classroom procedure. My premise for allowing my students to complete some of the reading assignment in the classroom is that the root cause of the problem, not reading, is an extraneous variable. Additionally, this variable is most likely a different reason for each student; it has nothing or little to do with what we do in the classroom. By bringing reading into the classroom, I will be able to manage my students' reading habits and help them succeed in L2 acquisition.

Review of Literature

In order to develop L2 communication skills, the learner is challenged with multitasking by acquiring new vocabulary and learning grammar structures, all while striving to succeed in the immersion classroom. This challenge hinders the learning process, itself, because it increases the

"affective filter" (Krashen, 1982) by expecting rapid development of new study habits, and by requiring a summative outcome from thematic vocabulary lists and isolated grammar charts.

First-year, L2 middle school students need training on managing vocabulary lists and on segmenting phrases to make sense of the grammar structures they are learning in the L2. According to Floyd-Bann and Van Tassel (2006), even though there is greater brain "plasticity" during the adolescent years, decision-making skills are still developing. Young adolescents need to exercise their brains to refine these new skills.

This lack of experience makes L2 acquisition a long and, somewhat, frustrating process; at the middle school level, learners are just beginning to develop abstract thinking. Eccles and Wigfield (1997) support that this lack of experience in early adolescence affect decision-making, and assert that, in order to master the new skills that come with cognitive changes, young learners need practice: "They need a lot of experience before they can use the skills efficiently" (p. 18). Then, the authors reinforce their statement by pointing out that other authors also agree with the need for practice: "For example, as children's cognitive skills increase and they have more experience in the educational settings, they should be able to regulate their learning better and so do more complicated and elaborate achievement tasks" (p. 18).

L2 textbooks present vocabulary and grammar by thematic chapters. Young adolescent, L2 learners are expected to memorize vocabulary and blend grammar bits and pieces to construct sentences of their own, and apply the latter to construct in oral communication. This is a multilayered procedure that young adults are not capable of handling with ease because they don't have the necessary experience. These new L2 learners need familiar formative learning methods like reading.

In spite of the 40 years of success so far achieved through reading programs, like Hunt's (1970) Uninterrupted Sustained Silent Reading (USSR, a.k.a. SSR), there is still skepticism to implement reading as a regular practice in the L2 classroom. It is not a common practice because, as Garan and DeVoogd (2008) explain:

> Like other instructional methods, it can and it does operate in a continuum. At one end of the continuum is pure SSR as a time devoted to free reading during which students read books of their own choice, without assessment, skills work, monitoring, or instruction form the teacher. (p. 337)

Any teaching methodology that operated in a continuum would require time, patience, knowledge of formative vs. summative assessments, and confidence in the long-term benefits of the teaching method. Hunt (1970) corroborates this need to foster the reading environment: "Building this atmosphere takes careful nurturing; it also takes time" (p. 4).

L2 teachers are trained to provide constant, spoken aural input in the classroom and a methodology, like reading, that would require quiet time, would not be a preferred one. Garan and DeVoogd (2007) clearly describe this fear as a feeling of "free fall," a situation where the teacher is not controlling the reading (p. 341).

In his meta-analysis study of SSR research, as it relates to attitude towards reading, Yoon (2002) recommends the same, long-term approach. He concludes that: "To enhance children's positive attitude, thus, a relatively long duration of the treatment should be considered" (p. 193). This indicates that, in order to derive the true benefits of an IRP, both the teacher and the student need to make a long-term commitment to the reading process.

Data Collection and Results

Data Collection

Subjects. The population was comprised of private-school, middle school boys. The sample was selected based on their L2 classes. This study targeted first-year French students and, because the nature of action research, the sample was selected from a specific course, thus making it a purposive sample. Since participation was voluntary and students were given the option of withdrawing from the study at any time, the sample size ended up being 8 of 13 students enrolled in the course.

Research Design. The idea was to keep reading practices the same: read a book each week and take a reading quiz at the end of the week. I transferred part of the reading assignment, 5 minutes of in-class reading, as part of the daily classroom routine. The objective was to find out if providing an IRP in the classroom would increase the overall vocabulary acquisition and grammar understanding of the class, as a whole.

The internal validity of this study is strong because the study will help improve the language acquisition rate of the students in this specific class. I stayed away from additional procedures or instruments to ensure the focus of the research remained on improving the observed lack of commitment to reading on a daily basis.

Typically, in an action research, external validity is going to be weaker than internal validity because the research methodology focuses on improving a single classroom situation; however, there is still a degree of application that can be transferred to other classrooms or research opportunities. In this case, the study could be used by other private schools with similar L2 programs, where classes met at least three times per week for 45-50 minutes.

Instrument. Vocabulary acquisition and grammar understanding were measured by the results of the weekly reading quiz. After 3 weeks of including reading as part of the daily lesson,

the results of the quiz grades were compared to the results of the quiz grades from the 3 weeks prior to the research.

Assumptions. There were three basic assumptions made based on the level of motivation historically exhibited by students who sign up for the middle school French program: (a) students will naturally choose books or magazine articles they find interesting, (b) students come to the classroom with the intention of learning and improving their command of the language, and (c) students are looking forward to a positive classroom experience.

Variables. Since the reading will take place in the classroom, the possible extraneous variables that were preventing students from reading on a daily basis were eliminated. Only aspects like learning disabilities, and maturity within the L2 reading process or grammar, could affect the results. To minimize the effects of the former, I used classroom management reminders of expected behavior; as for the latter, I reminded student to use different grammar connections for each quiz.

Results

The quiz scores were based on a scale from 0-10. The mean of the scores on the quizzes the students took, accounting for the 3 weeks prior to implementing the IRP, resulted in a 7.925 (79%) value and the mean of the scores on the quizzes students took while reading under the IRP resulted in a 9.148 (91%) value. This indicates that the class on average, scored 1.22 points higher, while reading under the IRP. This difference in scores represents a 15.4% improvement in the overall classroom performance. In terms of our grading system, this represents one whole letter grade; this improvement will impact the students' GPAs.

An important qualitative observation during this process was the enthusiasm my students exhibited toward reading in the classroom. On the other hand, I also observed some students

struggling to stay focused, wandering while trying to choose their reading material, and seeking the attention of others, like the behaviors Hunt (1970) explained would be common to see when trying to implement an IRP:

> …those gossips, those who prefer talking to reading, are common… The wanderers usually spend excessive amount of time searching for suitable reading material… "Squirrels" get a new book each day but are too busy gathering them to take time to read them. (p. 5)

Conclusions and Recommendations

Conclusions

The results of this study indicate that providing reading time during class, even as short as 5 minutes each day, will increase L2 vocabulary acquisition and understanding of grammar. Setting and expected improvement rate of 15% was an aggressive expectation on my part; however, I wanted to see results that would give me strong evidence to justify devoting classroom time to independent reading. Based on these results, I can backup my observations from the last 4 years while using reading as an immersion method. Therefore, I feel confident in generalizing that reading can be considered an effective form of L2 immersion, as strong as, or stronger methodology than, oral input from the teacher.

The standards for foreign language learning in the 21st Century (American Council on the Teaching of Foreign Languages, 1999) address reading under the goals related to acquiring communication skills in the L2, and on making comparisons between the L2 and the learner's native tongue. They don't mention any long-term reading approach with the objective of enhancing vocabulary acquisition and grammar understanding. The standards deal with the skills the students should be able to demonstrate; unfortunately, becoming an active reader in the L2 is

not mentioned, either. Reading, like oral immersion, promotes language acquisition; language acquisition is developing L2 communication skills.

Another benefit of L2 reading is that it can serve as a familiar study procedure for students at the middle school level. It can serve as a vehicle to aid in the transition from the elementary school educational experience to the new level in their academic career (Eccles & Wigfield, 1997); this makes L2 reading immersion an ideal formative learning method to acquire new vocabulary and grammar understanding.

Recommendations

After this action research, I recommend adopting the IRP as a standard, daily classroom procedure, and I plan to increase its duration to, at least, 10 minutes of silent reading each day. Increasing the time to 10 minutes would allow time for coaching students who are facing challenges with the IRP procedures.

I also recommend to future teacher-researchers, who are trying to develop their curriculum and professional practices, to read the original presentation about IRPs and the role of USSR within the IRP (Hunt, 1970); by reading this document, the teacher will be able to clarify concepts that will aid in the development and implementation process of the IRP.

If funding the reading program is an issue interested teachers should pursue grant money; an excellent resource for French teachers is the American Association of Teachers of French (AATF, 2010). AAFT offers, every year, about $5,000 in grant monies to sponsor innovative teaching practices that promote French in the United States; there is a yearly limit of $500 per teacher. Information about these grants can be found at http://www.frenchteachers.org/hq/smallgrant.htm.

In order to continue to expose learners to aural input, the program could be extended with the use of audio books and other multimedia resources students can listen in to, both and out of the classroom. The ancillary resources that come with the textbook are ideal for this purpose.

The first step on setting up an IRP should be to add a large selection of easy-to-read book to the library collection. Illustrated material is highly recommended; students can draw conclusions from the pictures, thus making the reading process a positive experience. The use of teacher-created stories or materials printed from the Internet are discouraged; the process of selecting a book (Hunt, 1970), and the sense of completion learners get from reading a book from front to back, are powerful elements in making them life-long, active learners through reading.

Finally, to expand the external validity of this study, further research on monitoring this L2 reading method, and its impact in vocabulary acquisition and grammar comprehension, is recommended. This is strictly a practical action research, with limitations by the size of the sample, the homogeneous demographics, and the possible maturational level of the participants, in relationship with the material and methodology.

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Appendix A

Open-Book/Article Reading Quiz

OBJECTIVE: Write a summary about the book/article you read this week.

You have to talk about the content and the grammar of the book/article. Your goal is to show me you read the book/article several times and that you spent quality time learning new words.

In your writing, you'll need to talk about at least 2 grammar facts, by making connections or comparisons to the grammar we are learning in class.

At the bottom of this page you need to write a minimum of 5 words from the book and their translations into English (they can't be obvious cognates or proper names), and the MLA citation. Watch your spelling in both languages!

Rubric:

Two grammar facts with connections/comparisons (2 points)
A short explanation about the content of the book (1 point)
Five words and their English translations (5 points)
Spelling in both languages (1 point)
MLA citation (1 point)

Reaction and facts:

_____

_____

_____

_____

_____

_____

Five new words (French and English)

1._____

2. _____

3. _____

4. _____

5._____

REMEMBER TO CITE THE BOOK HERE (MLA Style):

_____

_____

Technology and Mathematics: Classroom Companions for the Future

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Education 5900, Fall 2010

The University of Tennessee at Chattanooga

The Institutional Review Board of The University of Tennessee at Chattanooga (FWA00004149) has approved this research project # 10-143.

Introduction to the Problem

Introduction

Given the fast-paced, ongoing developments in technology outside of the classroom, it is not surprising that educational technology is starting to rally a change in both curriculum and instruction. Most students are able to correlate the need for technological skills in the real world, and view them as a way to enter into, and flourish in, a future profession (Spires, Lee, Turner & Johnson, 2008).

Despite this fact, most classrooms rarely offer technology to rival the outside world, and most instructors are hesitant to fully integrate technology into their teaching. In 2002, fewer than 20% of classroom teachers described themselves as being well-prepared to integrate technology into instruction (Cullen, Brush, Frey, Hinshaw, & Warren, 2006; U.S. Department of Education, n.d.). While 8 years can change opinions regarding technological preparedness, the dramatically low rate gives pause when considering the growing research to support the utilization of technology in the classroom as an effective way to "promote problem-solving, reasoning, and conceptual understanding" amongst mathematics students (National Council of Teachers of Mathematics [NCTM], 2000; Dewey, Singletary, & Kinzel, 2009, p. 383).

Regardless of individual teacher response, the recommendations for technological integration espoused by NCTM have become a staple in many curriculums. States now have stronger technology standards. Tennessee, in particular, has begun to examine the necessity in, and impact of, technology on mathematics. The Tennessee Science, Technology, Engineering, and Mathematics (STEM) Innovation Network represents the state's goals to increase and foster growth of science, engineering, math, and technological disciplines through development of supportive "tools and resources" (Tennessee Department of Education, 2010). These tools

include teacher training, and helping educators generate powerful and cutting-edge curricula, with the goals of expanding STEM fields throughout the state for all students K-12 (Tennessee Department of Education, 2010).

Research Rationale

The rationale for this study is to determine possible benefits, if any, provided by the use of technology in middle grades mathematics instruction. The middle grades represent a very important time in social, psychological, and academic transitions for students, especially in mathematics, that can determine much of how they will perform in the future. This action research will look at the reasons that may bolster or hinder teacher use of technology in mathematics, as well as gathering general data regarding teacher use of technology within Hamilton County, Tennessee middle schools. It is hoped that the suggestions offered through this research will assist and shape future research into educational technology and Hamilton County technology policies. It is also hoped that there will be a general positive correlation between classroom technology utilization and student performance on standardized tests.

Purpose Statement and Research Questions

Hamilton County middle schools have experienced rapid growth and change during the past 2 years, allowing the administration to spotlight literacy development, strengthen mathematics, and integrate technology, both physically and instructionally, in every classroom (Hamilton County Department of Education, n.d.b). The research questions that will be addressed throughout the study are as follows:

1. Has the use of technology in middle school mathematics classrooms in Hamilton County improved student performance?
2. How can teachers use technology in their classrooms more effectively?

Context of the Study

The Hamilton County school district is located in the Chattanooga area of southeastern Tennessee. The district is composed of 78 schools (Hamilton County Department of Education, n.d.a), 20 of which are the schools that serve Grades 6-8 included in the study. Of the 20 schools serving 6-8 grades, 7 of the schools are combination facilities, additionally instructing students in elementary, high school, or some combination thereof.

While the county ranks fifth in size within Tennessee, and most of the Chattanooga area has a thriving economy and strong growth rate in business and population, 44% of the district schools are classified as Title I (Hamilton County Department of Education, n.d.a). Within the study's scope of 20 schools, 64% are Title I.

As with other districts across the state of Tennessee, Hamilton County instructors are required to be degreed and licensed. While the survey does not usurp specific information regarding licensure field or type, a large majority of the sampled schools have 100% rates of highly-qualified instructors. Each teacher participating in the study is currently teaching mathematics to sixth-, seventh-, or eighth-grade students, either full or part-time. Each is an instructor in a dedicated Hamilton County school.

Variables of the Study

This study has several variables that may affect the progress of research or acquisition of data. Some of these variables may affect the data itself, and, due to their external nature, the researcher is unable to control them. These external variables that may affect student achievement information obtained from Tennessee Department of Education (TDOE) report cards include student aptitude and cognition affected by learning disorders or poor pre-existing foundations in mathematics. Additional external variables affect teacher response. These include

approval time by research boards and the Hamilton County Department of Education, teacher response rate due to receipt and scheduling, timely delivery of survey packets to the school, each school principal's willingness to distribute survey packets to math instructors, and compliance of teachers to respond honestly to survey queries.

Limitations and Assumptions

Several limitations played a role in this study. The first limitation is that of time. Due to the necessity of this research to be completed during the course of an academic semester, survey response time was limited to approximately 2 weeks. Additionally, time limitations and survey limitations necessitated the survey and research analysis be more general. Scope also presented a limitation, as surveys were geared to, and submitted to, middle grades mathematics teachers in a single district.

Therefore, given the limitations of this study, it is impossible to fully determine the true effects that technology may have in a mathematics classroom. At this juncture, it is only appropriate to define the correlations as general assumptions, regarding benefits or downfalls, specific to Hamilton County, Tennessee. There is simply not enough long-term research in the overall field able to create specific relationships between student performance and levels of technology employed.

Review of Literature

It seems difficult to go a week in media or educational circles without hearing some sort of report or new theory regarding math. But why is there such concern for the mathematical achievement of American students? This lies in the fact that the general consensus of researchers believes that "math achievement is a key predictor of a nation's long-term economic potential" (Groff, Lake, & Slavin, 2009, p. 839).

Although the U.S. has struggled in the past, things have improved, especially with middle school students (Groff et al., 2009). A large part of this improvement, over the past decade, has been due to a nationalized focus on improving mathematics in the schools, led by policymakers and national organizations. The NCTM has led the way to creating "content standards and a guiding framework" for mathematics instruction since 1989 (NCTM, 2009). The National Mathematics Advisory Panel stated, in 2008, that the quality of teaching must be raised to help further propel math achievement in the U.S. (Groff et al., 2009).

One method employed to raise the quality of teaching and bolster the depth of learning has been to integrate technology. NCTM has been at the forefront of this movement, and, in addition to their recommendations, and the Tennessee goals for the STEM Network, federal No Child Left Behind (NCLB) legislation is also asking for stronger technological integration. This integration is specifically in light of testing, reporting, and classroom assessments (Cullen et al., 2006).

How is it that technology appears to be such an important part of the mathematics classroom and curriculum? Perhaps one of the most cited rationales behind integrating technology into education is that, for economic success in a global market, students must be prepared to meet the technological and educational challenges to compete for jobs and to compete within global economies (Spires et al., 2008; Stevens & Weale, 2003).

More importantly, to compete globally, the U.S. must improve mathematics knowledge. The nation has made some gains on worldwide rankings, but still stuffers. While there is little long-term research to definitively link technological integration to dramatic mathematics success, there have been enough studies completed to show humble gains. However, this research has only been done, thus far, under general terms (Lei, 2010), and the focus has

remained set on the quantity of the technology rather than the quality provided (Lei, 2010). Regardless of this caveat, researchers have often observed that the more classroom-related technology that is available, the stronger the student interest and enthusiasm for the educational content will be (Keaster, Metze, & Hillegass, 2007).

Teacher- and School-centered Research

Individual teachers represent the gateway for technological integration in math classrooms. While each educator shares similar beliefs and training that brought them to the profession, they exhibit many different characteristics in light of beliefs and instructional styles, with regard to technology.

Research points to two wide perspectives on mathematics that play a role in how teachers are able to adapt to technology. Those that follow more "rule-based views of mathematics" may have more rigid perspectives (Dewey et al., 2009). Calculator use may be viewed as a "hindrance" (Dewey et al., 2009), and other methods of technology may prove to be more of a burden than a blessing. Rule-based instructors also have a particular penchant for having students complete mathematical computations solely by hand, believing deeply that this method ensures true comprehension of the subject (Dewey et al., 2009). The teachers that fall into the second group perceive mathematics in a "less rule-based view" (Dewey et al., 2009, p. 383; Tharp, Fitzsimmons, & Brown-Ayers, 1997, p. 558). In this view, classroom technologies provide necessary and "integral" contributions to instruction (Dewey et al., 2009, p. 384; Tharp et al., 1997, p. 558).

Continuing onward, there are two general dynamics that serve to guide and modify an instructor's perceptions towards technology operating inside of math-based perspectives: (a) "willingness to change," and (b) "the control structure" of the school (Cullen et al., 2006, p. 10).

A “willingness to change” (Cullen et al., 2006, p. 10) represents traits and beliefs inherent to individual instructors, and hinges strongly on teaching experience, comfort with the mathematical subject matter, depth of knowledge with subject standards, and their ability to see the uses of the technology. If a teacher is able to see the benefits offered through technological integration, there is a high likelihood that he or she will be willing to change perceptions towards said technology (Cullen et al., 2006).

For any new educational endeavor to be successful, individual teachers need to feel they have control. This is especially true, with regard to technology, where teachers must feel they have control over the devices, applications, and the frequency of use (Cullen et al., 2006). The second dynamic, the “control structure” (Cullen et al., 2006, p. 10), refers to the ability of teachers to utilize, modify, and access technology without infringement from administration or colleagues. The more “empowered” (Cullen et al., 2006, p. 10) a teacher feels, with regard to technology use, the more likely he or she is to successfully implement new methods. Training teachers to deal with the nondigital side of technology can include providing teachers with good transitioning and classroom management examples pertaining to technology, then allowing them to scaffold their own activities (Means, 2010). Encouraging collaboration between teachers also develops a beneficial environment for technology use, helping them with planning, ideas, and shared technical knowledge (Means, 2010).

While the upsides of technology in the classroom have been explored, there, have also, been side effects. On the teacher’s end, technical difficulties play a major role in modifying perceptions. Whether there are infrequent major issues or frequent minor issues, exposure to problems can turn a technology-friendly or undecided instructor away from successful integration (Cullen et al., 2006). Frustration can also take the form of reliance on media or

technology specialists within the school district, where teachers are forced to wait on equipment repairs. In these cases, teachers may feel they are losing control and empowerment. Some may create contingency plans without technology, and, eventually, move away from using high-tech tools, altogether.

Because of this possibility of adopter-teachers abandoning technology, it is important that teachers are supported by fellow instructors, teammates, supporting staff, and, especially, by the administration. The school, as a whole, serves an important purpose for the classroom teachers that integrate technology. They can provide physical support through purchase and maintenance of equipment, training opportunities for teachers and other staff, and emotional backing for planning and frustrations with technological errors (Means, 2010).

Furthermore, teachers should complete all technology professional development on their own volition (Garthwait & Weller, 2005). Being forced to attend such workshops will not offer the same level of benefit as the programs they choose to attend. Professional development is key to teachers developing both necessary skills and comfort with the technology they plan to use.

While outside, uncontrollable changes to standards and curriculum my wreak havoc on technology use in the classroom, creating a school-wide technology policy that is actively updated and changed each year, under the collaboration of participating teachers, is an excellent way to retain technological integration. And, as standards and curriculum change, from year to year, there may be a tendency for teachers to drop or decrease technology use in their classroom, due to the difficulties they may encounter when trying to reformulate integrations and grasp changes (Means, 2010). Because of this, it is even more important that school staff and administration, collaborating teachers, and state and federal management give additional support to counteract any negative changes.

Curriculum, Classroom Management, and Instructional Methods

Much of technology use and attached benefits are often seen as being closely related to a teacher's "beliefs about teaching and learning" (Garthwait & Weller, 2005, p. 373). That is to say, the pedagogy employed by any given teacher may serve to be the litmus test as to whether he or she is willing to, or able to, successfully integrate technology into their classroom. In the content field of math, technology use appears to be affected by, not only teacher beliefs, rule-based perspectives on mathematics, and willingness to adapt, but, also, how a teacher chooses to approach the actual instruction of mathematics.

Three general stages of mathematics instruction exist. The first is that of "introduction," which utilizes "interactive activities" and necessitates a high level of communication between both teacher and student (Liu, Chou, & Liu, 2006, p. 347). The second is that of "development," in which scaffolding plays a role through teacher-driven models (Liu et al., 2006, p. 347). The final stage is that of consolidation, in which concepts are summarized and finalized for students (Liu et al., 2006). While these stages of mathematics instruction may vary between teachers, they represent a framework that can be used to integrate and build technology into the curriculum.

Introduction provides opportunities for boosting communication through educational technologies such as interactive whiteboards and other presentation-based software. With regard to the development stage, technology may present additional opportunities for scaffolding through software, peripherals, and wireless devices. Regardless of the technological level used, scaffolding remains a necessary and intensely important part of mathematics instruction.

When any level of mathematics instruction has been successfully integrated with technology, students may exhibit less "compartmentalization of mathematical concepts and techniques," when compared to those whom were taught by "traditional," low-technology

methods (Dewey et al., 2009 p. 383). Because of this, growing numbers of teachers from a wide array of subjects are becoming more "receptive to using technology" as a way to both "supplement" and "expand the curriculum" (Dewey et al., 2009, p. 391).

For teachers ready to integrate technology, some considerations exist with regard to selecting the right devices or software to apply, or modifying curriculum. The more "flexibly" the software or digital device can be used, the more likely it is an easier fit into curriculum and pacing (Means, 2010, p. 294). This can present a challenge to some instructors, as there is no conclusive compendium of information about all existing classroom technologies, but many teachers are able to make decisions, based on both observation of instructors currently utilizing technology and the opinions provided by research (Means, 2010). Selection must also consider the quality versus the quantity of technology to be integrated. Quality of technology may be defined as the level of student engagement, how well the integration uses standards, and the necessary skills it helps students build (Lei, 2010).

Classroom management strategies can also be modified and helped through technology. Routines represent an important factor in classroom management, but become even more important when teachers seek to institute technological integration into daily instruction (Means, 2010). Software reports can help teachers gather and analyze student data, giving insight into their progress and success (Means, 2010). They can also be a good way to deliver data on student performance during parent conferences (Means, 2010).

There may be a tendency, with some teachers, to drop work, or overload students with work to fill in the gaps they feel may have been left by technology use during class time. Instructors must be careful not to decrease or increase assignment load, too drastically, as, often, achievement levels and assignment loads are positively correlated to each other (Logan &

Skinner, 1998). Falling achievement levels may precipitate student failure, loss of motivation, and a teacher's willingness to integrate technology, in the long run.

Advisement is also key factor that can be affected by technology. Long-term data showed "performance increases with computer-based lessons" when "learner control and advisement" are present (Van Eck, 2006 p. 170). Even by itself, advisement may help many students build both motivation and their levels of perseverance (Van Eck, 2006). It is one of the strongest tools a teacher can employ, both with and without technology, to maximize student benefit. Most importantly, teachers who offer "timely assistance" and corrective feedback to their students can greatly assist in building their motivation within the classroom. (Bottoms, 2009, p. 1) Therefore, when software is being used, teachers should be available to provide timely assistance, and help keep students on-task and motivated (Means, 2010).

Technology integration can represent challenges to instruction, curriculum, and classroom management, however. Teaching skills through technology are apt to be greatly "influenced by technical problems" encountered, and vary greatly, based on the frequency and severity of the dilemmas (Garthwait & Weller, 2005, p. 369). Because of potential difficulties with integrating technology, some teachers remain "ambivalent" (Garthwait & Weller, 2005, p. 369). This means that, for implementation to occur, instructors must successfully replace not only the old methods with the new methods via technology, but these new methods must be superior (Garthwait & Weller, 2005).

For teachers that are unwilling or unable to fully adapt, problems can arise in both attitude and instruction. Technological additions to instruction may seem forced and out of place, and students, especially in middle grades, can sense artificiality in content and curriculum. Such occurrences could serve as a detriment to learning.

Another detriment to learning occurs when educators attempt to let the technology do their instructional duties. Whether they are unwilling or unable to plan for technology use, or are content to sit idly during technological tasks, while students work, these teachers are doing more harm than good. Monitoring success is essential, especially when technology is involved. To re-iterate Marzano's words, simply using the technology does not ensure success (2009).

Additional issues exist. Teachers may, sometimes, need to reserve instructional time to specifically train students on the technical skills necessary to use classroom technologies (Garthwait & Weller, 2005). This can consume instructional time and create issues with classroom management. Other teachers may want to see clear results of technology in the classroom, in the form of test scores, but, as of yet there is "no clear way to measure if student achievement is impacted" (Cullen et al., 2006, p. 15).

Student-centered Research

Technological developments in society have helped to contribute to a generation of students that are able to create "understandings and knowledge in new and different ways" (Spires et al, 2008, p. 497). Given this ability, students are now increasingly more able to make "clear distinctions between their uses of technology inside and outside of school" (Spires et al., 2008, p. 507). The primary reason for this distinction is due to the frequency of use for nonacademic communication, extending to sites such as Facebook and chat applications (Spires et al., 2008).

Despite the distinctions, applied technology in math instruction can serve to benefit all students. Three broad groups may receive more gains than others. These students are grouped as those with low self-efficacy, motivation deficits, and English Language Learner (ELL) students.

Self-efficacy is an important factor in building and maintaining student motivation. This refers to a student's conviction that he or she can accomplish goals through self-control and personal behavior regulation. Students that possess low levels of self-efficacy may be helped by content-related games integrated into classroom instruction. These games may also provide those students struggling with basic subject matter a way to build confidence and skills (Van Eck, 2006). It is important to avoid competition-based games, however. Competition can negatively affect students, especially those with low learning levels and low motivation (Van Eck, 2006). The students that are able to "adopt performance goals have more positive outcomes," with regard to performance, cognition, and motivation (Van Eck, 2006, p. 169).

As pointed out by Hootstein's (1994) research, prior to 1994, there was little knowledge regarding the strong correlation between student motivation, subject matter, and student grade level. Now that educators have seen these correlations, they have begun to create innovative methods to enthuse students, with regard to mathematics, and help them succeed further in the field. Technology is an excellent vehicle for such methods, especially since it gives students a greater degree of interactivity and control, as compared to what they experience through low-technology, traditional instruction. It is "important for students to be full participants in their own education," and good technology can help do this in school while, also, delving into necessary academic content (Spires et al., 2008, p. 512).

ELL students can also benefit from technological integration through customization options in software and hardware (Means, 2010). Some programs may also allow instructors to customize questions to simplify tasks and text, making comprehension for these students somewhat easier.

Some students can be assisted by the use of differentiated techniques in instruction, especially those that amplify and complement different learning styles (Allsopp, 1999). These diverse learners can be benefitted greatly by the use of technology in individualized instruction (Ozel, Yetkiner, & Capraro, 2008), multiple delivery methods, and the environment it creates that allows students to be more willing to take conceptual risks.

Types of Technology

Technology, within the classroom context, has become a blanket term for anything that may be perceived as different from traditional instruction. While chalkboards, radios, and adding machines represented the cusp of technology during the mid-20th Century, the list of devices now present in most American classrooms has expanded dramatically. Technology, therefore, is constantly changing. What was viewed as new can quickly become outdated and extinct, in a matter of years.

To add challenges, the girth of the technology market is overwhelming. The product choices offered for educational technology are equally expansive. It can be difficult for even knowledgeable consumers to select appropriate materials, and can be equally difficult to truly learn and maintain the software or hardware they have procured.

For the scope of this research, it is necessary to define major groups of technology observed for both classroom and personal use. The following groups are not inclusive, but highlight some of the most frequently-used types of technology employed in mathematics instruction.

Calculators. Calculators are typically viewed as core technology in mathematics classrooms, especially at higher levels of math. The use of graphing calculators, in particular, is growing steadily throughout American classrooms (Dewey et al, 2009). While basic calculator

technology is not necessarily cutting edge, many of the features offered through graphing calculators may provide benefit for students, at all levels of mathematics, via user interface and computational capabilities.

However, calculator use is a hot-button topic in mathematics instruction and research, especially when students are permitted to use them before they have truly "mastered the equivalent pen-and-paper algorithms without the technology" (Dewey et al, 2009, p. 383). While this debate exists amongst educators regarding use, studies have found benefits to "problem-solving and conceptual understanding," and that calculator use does not necessarily "undermine computational ability" (Dewey et al, 2009, p. 383).

The way in which most teachers use calculators is as an "extension" of their standard teaching methods (Dewey et al, 2009, p. 383). This may serve to maximize limited instructional time by allowing students to focus on the new ideas without the worry of basic calculation errors. It also helps as a way to demonstrate multiple methods of calculation and approaching problems.

Digital games. Digital games, on the whole, provide instructional opportunities beyond that of pen-and-paper instruction. For middle schoolers, who learn best when given authentic tasks with real-world correlations, games can help act as a "bridge" to ensure beneficial academic progress (Ray & Coulter, 2010, p. 93; Bransford, Derry, Berliner & Hammerness, 2005). Mini-games are short, simulation-style educational activities that are mainly online, "require less time to play, provide a limited set of challenges, and are mastered quickly" (Prensky, 2006; Ray & Coulter, 2010, p. 92). Given these factors, mini-games are often a popular way to integrate technology and learning in mathematics classrooms, especially considering the time limitations that teachers face.

Games, along with other digital interfaces providing students with math-based problems, can also ensure student motivation by providing a safe environment. Through this informal setting, students may have a lowered fear of failure, which may lead them to try new types of problems or solution methods they would have previously avoided, in traditional assignments. Games can increase "attitude towards content," helping "ensure that students get the best mathematics skills they need" by "ameliorating the negative" aspects of "attitude and motivation" (Van Eck, 2006, p. 166). Games that utilize characters or representations demonstrating social cues often help students with the content being presented (Van Eck, 2006).

A few caveats exist when implementing games in a learning environment. First, the teacher must understand the composition and process of the game, and how it can relate to curriculum (Ray & Coulter, 2010). Educators may have some difficulty integrating games into curriculum, but, given experience with content, pacing, and standards, integration may become easier over time. Second, to keep attitudes about math high and anxiety low, competition should be eliminated from games integrated into classroom curriculum (Van Eck, 2006).

Computers. When computers first entered the classroom during the 1970s, they offered limited applications to instruction outside of basic tasks. These tasks were primarily restricted to automating standard classroom activities such as writing and calculation. Not only have the speed and capabilities of computers drastically increased over the decades, but their applications have begun to extend far beyond basic automation. Indeed, they offer educators an array of options for use in instruction.

Two main types of computing have been examined in previous research: laptops and desktop. Desktop computers are hindered by their immobility and size, but still offer great benefits, regarding learning, especially when they are placed in a classroom setting. Findings

"based on cognitive science and technology suggest that a high ratio of computers to students may change the teaching and learning dynamics in the classroom (Garthwait & Weller, 2005, p. 363)." Classroom computer use can benefit students by creating a "sense of learning in a community" (Lei, 2010, p. 456; Wighting, 2006).

However, much of desktop computer use in mathematics has been hindered, due to their presence solely in labs, which may require careful scheduling and preplanning, or due to a lack of technical upkeep and upgrades that may affect software or hardware (Ozel et al, 2008). Indeed, computer lab upkeep may represent a two-fold problem as teachers and students may become frustrated with slow technology, or, due to technical malfunctions, completely eliminate lab use from their planning. For desktop computers present in classrooms, there are never enough for individual student use, and issues with classroom management and scheduling may arise.

Laptops have shown that the "increased use of differentiated or individualized learning tasks" can help to benefit students requiring instructional modifications to maximize comprehension (Garthwait & Weller, 2005, p. 363). Under this premise, some states have opted to experiment with giving all students laptops to use for academic instruction. The Maine Learning Technology Initiative represents one of the leaps forward in such state-funded, educational technology. In addition to providing the financial support and resources for one-to-one laptop and computing opportunities, there were necessary changes to school technology policies, and how teachers instructed and managed classes on a day-to-day basis (Garthwait & Weller, 2005).

Offering personalized computing devices such as laptops to complete classroom tasks may not deepen students' reasoning or thought, but it does dramatically improve their "willingness to think through conceptual mistakes" (Garthwait & Weller, 2005, p. 367). This,

often, in turn, leaves students more apt to take on more challenging material. Laptops and personal computing in the classroom may, also, encourage students to flex their creative muscles, with regard to approaching content (Garthwait & Weller, 2005). They also serve to "equalize" communication and learning structures between teachers and students (Garthwait & Weller, 2005, p. 368).

However, it can be difficult to find "appropriate" activities for mathematics with personal computing technologies (Garthwait & Weller, 2005, p. 369). Such challenges may deter many teachers, unfamiliar with standards and subject matter, from true implementation. Additionally, teachers used technology such as laptops, for both personal and professional uses, showed faster, higher levels of comfort and satisfaction with potential changes to their classroom regimens (Cullen et al., 2006). Quite literally, these instructors were able to develop "ownership" of the technology by both physical and philosophical means (Cullen et al., 2006, p. 12).

Internet and online resources. The Internet offers assistance to mathematics instruction by providing a place to "investigate mathematical concepts" and obtain "additional resources" and assistance (Ozel et al., 2008, p. 81). Additional resources for assessment and student review are also available on the Internet, including mini-games, wikis, and interactive quizzes. These provide "practical and flexible approaches" to learning that can benefit struggling math students (Ozel et al., 2008, p. 81), especially those in middle grades who are building foundational mathematics skills.

One of the more popular methods for mathematics differentiation has been manipulatives. For those unfamiliar with the terminology behind manipulatives, as utilized in mathematics classrooms, "concrete" refers to tools that help physically engage students within the numeracy process. (Brown, 2007; McClung, 1998) Virtual manipulatives refer to a digitized, computerized

version of these physical tools that incorporate other features that are limited beyond the hands-on, tangible concrete manipulatives (Brown, 2007). While both types of manipulatives are useful, research has determined that it is important that the instructor understand how to properly use them and when to use each type, with regard to the concepts presented to the students (Brown, 2007).

Virtual manipulatives have gained popularity in mathematics instruction in recent years, due, in part, to the benefit they can provide students with more complex theories and more abstract equations (Brown, 2007). Additionally, they allow a unique method for teachers to integrate technology into the classroom and help improve student attitudes, in the process (Brown, 2007). Concrete manipulatives still remain useful, more so than their virtual counterparts, when dealing with more solid ideas in mathematics such as number lines (Brown, 2007).

Interactive whiteboards. Interactive whiteboards represent another important piece of educational technology becoming immensely popular. One suggestion offered through research has been to create wireless classrooms that provide students interactivity with a shared whiteboard (Liu et al., 2006). Benefits to communication and student comprehension checks are high, but high equipment costs, maintenance, student training during instructional time, and necessary teacher training represent hindrances (Liu et al., 2006).

For classrooms that may not have wireless capabilities, however, these interactive whiteboards still offer noteworthy benefits to students and teachers. Marzano states that a 16-percentile-point increase in pupil success can be attributed to the use of interactive whiteboards, and it is this notable increase that has encouraged many schools to adopt the technology behind products such as Promethean and Smart Boards (2009). Interactive whiteboards also minimize

time spent writing on the board, especially in comparison to standard whiteboards and chalkboards (Ozel et al., 2008).

Interactive whiteboards offer three major features that assist students with learning gains. The first is through immediate-response voting, which has the ability to give immediate response to student answers, opinions, and interests (Marzano, 2009). This feature has two-fold importance as it gives speedy feedback, and, most importantly, it helps bolster students' communication with their instructor. The second feature is that of integrating rich visuals and sounds (Marzano, 2009). Benefits extend to student interest and attention spans. Given a visually intriguing presentation, students will be more apt to focus on the subject matter. It is important to note, however, that visual and audio components should be pertinent to the lesson (Marzano, 2009). The third feature is that provided through complementary software (Marzano, 2009) such as the flipcharts used on Promethean Boards. These interactive presentations engage students through participation and timely responses.

With all the benefits that interactive whiteboards provide, it is important to remember that organization plays the most vital role in successful use. By carefully planning lessons, presentations, and methods of student and teacher involvement, instructors may be able to obtain dramatic improvements in student achievement (Marzano, 2009). This means carefully using instructional time, excellent classroom management, and instituting best practices within the framework of content standards to achieve success. Marzano warns that "simply assuming that using this or any other technological tool can automatically enhance student achievement would be a mistake" (2009, p. 87).

Recommendations on Technological Integration

For a long time, technology was viewed as more for mechanizing traditional teaching methods, within the standard mathematics education framework, rather than as the stepping stone for educational innovation and excellence. Simply allowing mechanization to be the primary function will not lead to successful student performance (Brandt, 1995; Ozel et al., 2008). It is important to remember that the "positive effects of technology on mathematics teaching and learning are mediated by how well the technology is used" (Ozel et al., 2008, p. 81; Guerrero, Walker, & Dugdale, 2004), and the quality of the instruction and technology plays a far more key role that the quantity of instruction provided (Lei, 2010). Technology, certainly, has the means to become a true "agent of educational change," but educators must first "understand the kinds of learning outcomes that technology can enhance and the circumstances under which that enhancement will be realized in practice" (Means, 2010, p. 287).

Data Collection and Results

Data Collection

To maximize the validity and reliability of findings, several sources were used for data collection. To perceive the use of technology and teacher perspectives, a survey (see Appendix A) consisting of both qualitative and quantitative questions was administered to 20 middle schools in Hamilton County. Every teacher of one or more classes of mathematics received a survey and accompanying consent form. To gather quantitative data about school performance, TDOE data regarding middle schools were gathered. Information from years 2004 through 2009 were used. All information is publicly available through the TDOE Web site.

All data gathered from these tools were analyzed statistically through the use of charts and graphs based on frequency distribution and percentages. These statistical analyses will show any correlations between student performance and technology use.

Subjects. The subject participants in this study are all part- and full-time mathematics instructors in 20 middle grades schools throughout Hamilton County, Tennessee public schools. Socioeconomic, educational, and ethnic composition is unknown. Subjects are able to name their gender on the survey, but it is a purely optional question.

Methodology. At the onset of this study, permission was obtained to contact each middle grades principal through the district math and science director. Following submission and approval of the project scope and forms to the university review board, and initial contact to each school's principal by e-mail, surveys were distributed to 20 schools in the district in a single packet. Instructions in each packet requested the teacher packet be given to every part- and full-time mathematics instructor in the school. Surveys were tagged with an identifying symbol to track the school from which they originated, but no other identifying information was used. Following completion of the surveys, participant teachers were asked to return them via mail in a pre-addressed and stamped envelope. One hundred four total surveys were distributed amongst the 20 schools serving sixth-through eighth- grade students.

Resources needed included consent forms, surveys, and envelopes for each teacher participant. Surveys were geared to be completed in approximately 30 minutes, with no defaulting of the entire survey if one question is not answered. This flexibility was built in to entice a greater number of responses from teacher participants.

Once surveys were received, basic statistical analyses were run between survey data and report card data on each correlating school and the district. These analyses were able to derive general correlations regarding teacher use, technology, and test scores.

Results

One hundred four surveys were initially distributed during November 2010, and 25 completed surveys were returned to the researcher. Eleven of the 20 participant schools serving Grades 6-8 returned surveys. Of the 11 schools corresponding to participant teachers, 64% are classified as Title I and receive additional funding for student success. Of the 25 respondents, 52% were instructors at Title I classified schools. The surveys returned represent a 24.04% rate of teacher response and a 55% rate of school participation. It is important to factor these rates into findings presented by this study.

Gender participation was heavily skewed towards female teachers, with women comprising 64% of the respondents. Men represented 16% of the population. Those that chose not to answer represented 20% of the respondents.

Figure 1 exhibits the relationship between broad classifications of technology used in the home and the percentage frequency of implementation by the respondents. The higher the percentage, the more subtypes the teacher was using. Each subtype frequency is further classified by the skill level the respondents selected for each technology subtype.

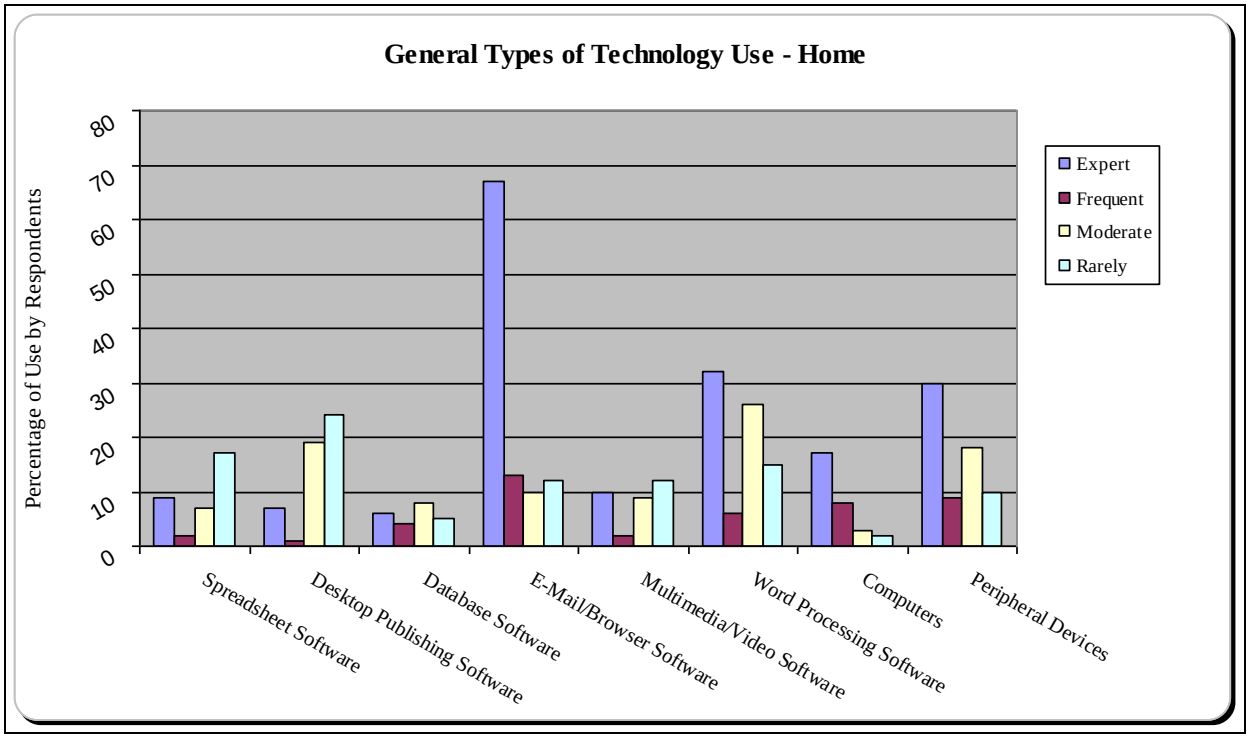

Figure 1. Home uses of technology by surveyed teachers.

Figure 2 exhibits the relationship between broad classifications of technology used in the mathematics classroom and the percentage frequency of implementation by the respondents. As with the graph presented in Figure 1, the higher the percentage, the more subtypes the teacher was using. Each subtype frequency is further classified by the skill level the respondents selected for each technology subtype.

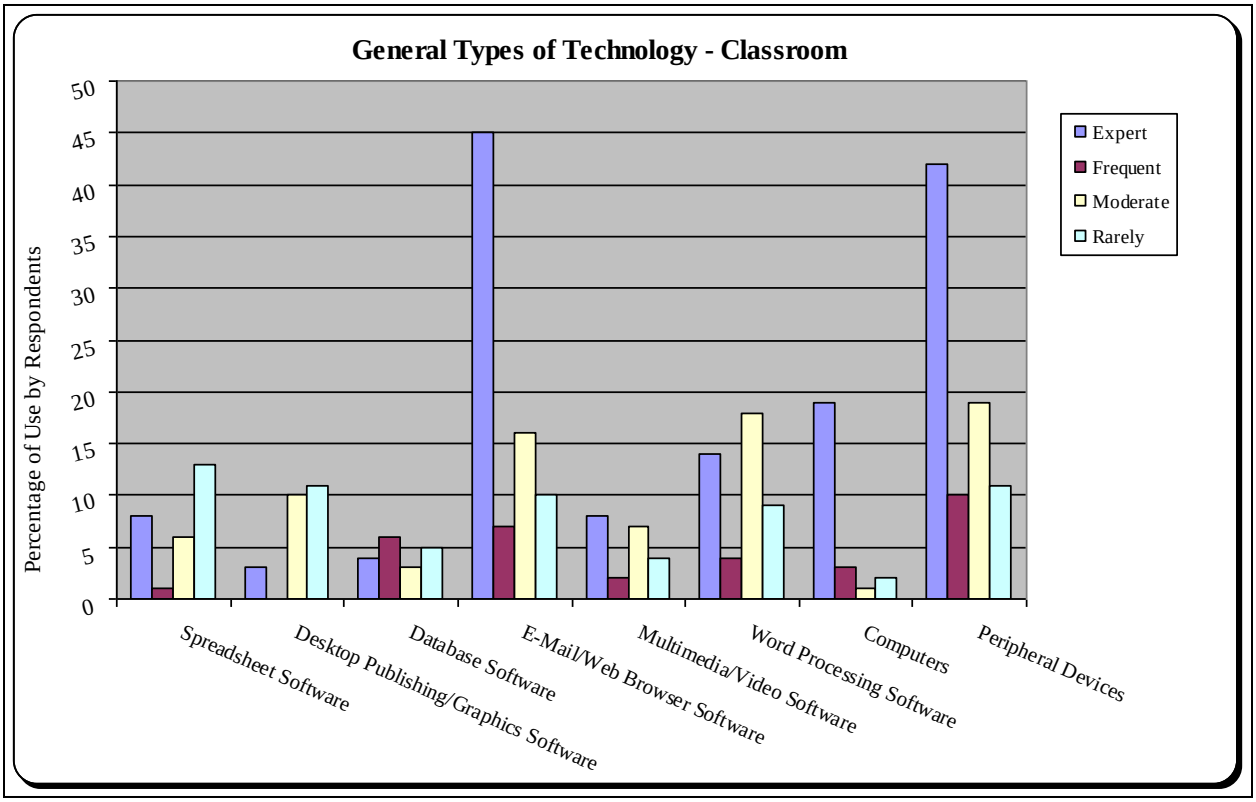

Figure 2. Classroom uses of technology by surveyed teachers.

While the method of presenting data in the graphs of Figures 1 and 2 can appear overwhelming, it can help to determine trends in gathered information. For example, in both home and classroom use, the greatest level of expertise is reported for e-mail and Web browsing software. This means that, not only did a greater number of respondents feel they had expert skills at software and technology that fell into the broad category, but they selected a higher frequency of programs which they used with expertise. To continue highlighting trends in the data, word processing software represented another key part of home and classroom technology use with Microsoft Office Word at the forefront.

Several key points came to the forefront, when analyzing teacher attitudes and confidence regarding technology. First, 40% of teachers reported being extremely comfortable, 36% of

teachers responded with being very comfortable with utilizing technologies such as computers in their classrooms, 20% of teachers were only moderately comfortable, and 4% of teachers were uncomfortable. Given the increasingly technological nature of modern education, and the higher percentage of teachers that entered the field in the past decade, it would seem that teachers would be more receptive to technological integration.

Use of technology to instruct math-specific activities in the classroom pointed to similar results. While 68% of teachers were extremely to very comfortable with using instructional technology in math, 12% were uncomfortable and unable to feel successful in using such enhancements in their instruction. Overall use of instructional technology, with uses not specific to mathematics, such as e-mail, Web-browsing, and digitally-based research, received a far more positive response, with 40% of respondents very comfortable, 24% of respondents extremely comfortable, 36% of respondents moderately comfortable with using such non-specific technologies. There were no responses of uncomfortable.

Additional questions asked in the survey included the use of Tennessee technology standards, technology policies, classroom computers, and student access to computer labs within the school. Over 68% of teachers make an effort to integrate technology standards into instruction. Technology policies instituted by respondents' schools were split, nearly in half, with 44% of the schools having no clear or fully formalized technology policy of which the surveyed teachers were aware. Sixty-four percent of surveyed teachers' classrooms had computers, but most had fewer than five computers. Several teachers responded that these classroom computers were not functioning properly. Student access to a computer lab was high. Over 76% of the teachers reported that their students were able to easily and frequently access a computer lab.

Analysis of technology use data was separated into two different, broad groups. The first was that of teacher-centered uses. This was defined as activities a teacher engages in to prepare for, and complete, instruction in their mathematics classroom, that do not directly involve students. Figure 3 presents the broad subgroups of teacher-centered activities queried. These included use of a mobile lab pre-, during-, or post-instruction; presentation software to aid in lectures or preparation; creation of a class Web page; using software and other technologies to track student progress and maintain records; using puzzle, test, or worksheet generation programs to create classroom activities; and using interactive whiteboards during instruction. The highest percentage of use, 26%, was that of presentation software, closely followed by 25% use for recordkeeping.

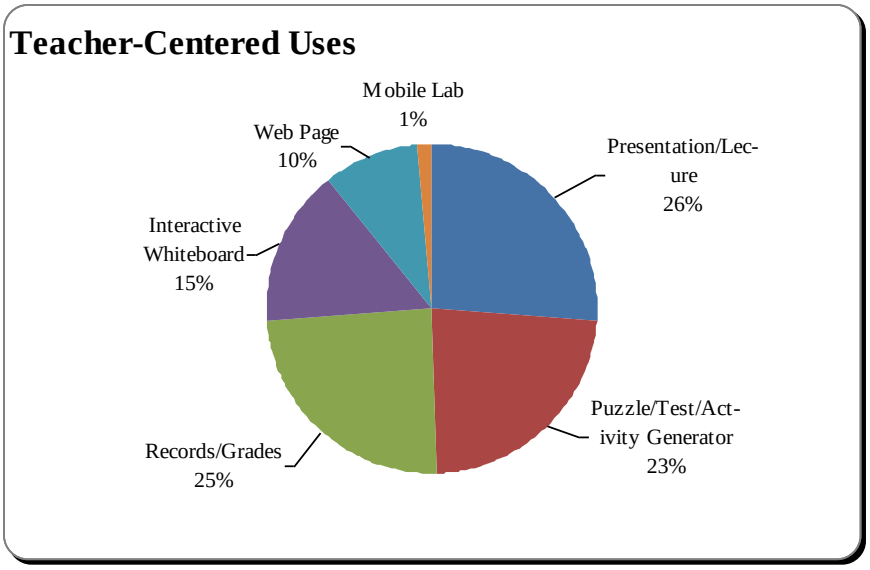

Figure 3. Teacher-centered uses of technology in mathematics classrooms.

The second broad group was that of student-centered uses. A visual representation of the findings in this group is presented in Figure 4. This group is defined as all technologies that are directly used by students during instruction during the study of mathematics. Five major subgroups represent the highest percentages of use in student-centered activities in math

classrooms. The first is that of online research, where 16% allowed students to investigate and support mathematical thinking. Student-generated presentations and virtual manipulatives for lesson activities each represented of 15% of uses. Fourteen percent of queried teachers reported using virtual manipulatives to supplement learning, and digital or online games in their instruction. While calculators play a major role in student-centered technologies, they were not included in this survey.

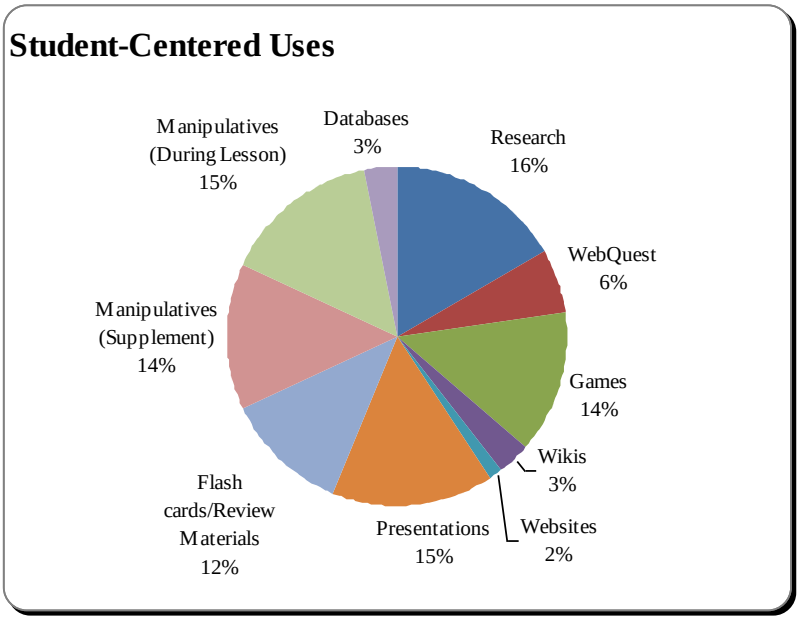

Figure 4. Student-centered uses of technology in mathematics classrooms.

The final dimension analyzed by the survey was that of teacher experience in instruction and in the field of mathematics. While the question requesting experience was optional, 88% of teachers responded to overall teaching experience and 76% of teachers responded to teaching in math-specific fields. Given this rate of response, the median number of respondent teachers' experience for overall instruction, regardless of subject, was 6-10 years with a mean of 9.7 years. Teaching experience for math-specific instruction also had a median of 6-10 years, and a mean of 9.7 years.

Conclusions and Recommendations

Conclusions

While the limited rate of return on surveys hinders the levels of assumptions and generalizations that can be made regarding the findings, they reveal several major trends. The first was that of an inverse correlation between teacher experience in overall instruction and comfort levels with technology, both in and out of the classroom. Therefore, as teacher experience rises in years, the general level of comfort with, and frequency of, classroom technology use tends to decrease. The fewer years of teaching experience the respondent had, the more comfortable they were with using instructional technology. As the survey did not provide for the age of each respondent, the research cannot draw any conclusions based on age-related, generational differences that may make younger teachers more receptive to technology.

The second major trend was that all teachers were required to use technology, to some degree, both in and out of the classroom. In some classrooms, higher proliferations may exist, allowing instructors to use digital projectors, laptops, and interactive whiteboards to enhance and modify instruction. Often, when this was the case, the teachers reported greater confidence in using the technologies.

The third trend focuses on the personal technological skills of the instructors. The teacher's home situation may also have higher or lower proliferations of technology, and, this, in turn, may affect how they are able to utilize it during instruction. Many of the teacher that reported expert to frequent levels of use with computers, specific software, and peripherals at home, often reported similarly high levels of skill and use in their classroom implementations.

With mathematics instruction, a fourth trend emerged. Use of technology to instruct math-specific activities in the classroom pointed to surprising results. Teacher-centered

technology, used during actual instruction represented the largest group, meaning that instructors were using peripherals such as projectors and interactive whiteboards as a backbone for their lessons. This is technology that can aid with instruction, but is not directly accessed by the students. Student-centered technologies were utilized most frequency to help with research and develop understandings in mathematics, through methods such as online problem generators and manipulatives.

Recommendations

The recommendations that can be offered through this study may be closely linked to the central ideas provided in the related literature. First, mathematics instructors must have timely and beneficial support. Teachers must be trained on how to properly use instructional technology in their classroom in a way that provides for flexibility, innovation, consistency, and close contact with Tennessee curriculum standards. In the same way that teachers instruct their students, teacher training for technology needs to be done to create self-efficacy. This will help them build their esteem and comfort levels when dealing with current and incoming technologies, and may help to improve their willingness to use it in instruction.

While the information was not provided as to current numbers of in-school technology coordinators, having one such employee would create major benefits toward teacher and student development. This position would provide each school with support and maintenance of all instructional technologies, and do so in a timely manner. Indeed, it is often the waiting on repairs or training for classroom devices that creates resistance and frustration in teachers. This may, also, be enhanced by encouraging every district school to create clear, in-house technology policies, and demonstrating to each instructor ways that technology can be integrated into their particular subject, on a frequent basis. Fourteen of the responses verified a school technology

policy, but it may be likely other schools have these policies. But the teachers may be unaware of such policy due to a lack of enforcement, poor support, or policy guidelines being too broad for them to apply in classroom instruction. Principals may, also, play a major role in instituting, encouraging, and helping teachers to use technology and technological policies, provided by the school, to their advantage.

At this juncture, the use of technology in the mathematics classrooms of Hamilton County is heavily teacher-driven. In most situations, technology is serving as an excellent aid for teacher efficiency, especially for record keeping for grades and student progress. Related literature argues that this may represent mere mechanization of pre-existing, traditional teaching methods, and can prove detrimental, over time, to both students and teachers. While opinions exist on both sides, in some districts it is far more useful to make incremental changes and insertions of technology. This can help teachers avoid developing negative perceptions, due to having too many new technologies pushed on them, at one time. Such is a wise move, and is supported by numerous studies.

However, given the ongoing need of students to be exposed to technology, at higher rates, earlier in life, there needs to be more student-centered technology use in the classroom. This task is far easier said than done. Limitations exist far and wide, the largest of which is that of curriculum and standards that press instruction to move at a regimented pace. It does not often allow for the insertion of emergent technologies or new technology-based activities that may help to motivate students or teach them a new skill, above and beyond mathematics. Budgetary limitations play another major role in hindering integration, especially given the economic issues surrounding public school funding. It is difficult to integrate technology into instruction, if the money is not present to obtain the technology, and, more so, if the funding is not present to

maintain the technology. Additionally, when using or encouraging the use of new technologies for students or teachers, training may be required, and that may represent another expense to a strapped district.

Regardless of these limitations, the district has made movements towards greater student-centered technology. Over 76% of the instructors surveyed reported that their students were able to easily and frequently access a computer lab. This may be due to the use of an online component called Cognitive Tutor, that factors into students' middle school math grades. While the format of this lab component is not too far of a stretch beyond traditional teaching, it does help students experience a new way of thinking about math, and certainly helps them be less afraid to take risks, and more likely to complete their work, in a timely manner. In essence, these students may be able to take greater ownership of their learning, when using this online lab format.

Technology is not going away. Regardless of the fearful perceptions of some teachers, instructional technology will continue to become more and more a part of the K-12 classroom. This is supported by programs of the STEM Innovation Network of Tennessee, increased technology standards, and the growing need for a more technically-trained workforce.

While this research does not correlate student performance with technology, and there is little current research to find a beneficial correlation, if any, it seems inevitable that mathematics and technology are best to be intertwined in learning to generate student success. Students that are exposed to technology in classroom settings will become more comfortable with its presence, and, in turn, may translate this comfort into the specific subject to which it is applied. Both classroom technology and mathematics may represent keys to academic and economic success in Tennessee in the future.

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Appendix A

Technology in the Mathematics Classroom – Educator Survey Form

Technology in the Mathematics Classroom – Educator Survey Form

*Please return this survey by **November 20, 2010**. Please complete the following survey to the best of your abilities and return it in the provided self-addressed stamped envelope. Thank you for your participation.*

Please check the box that best applies to the frequency and type of **Personal** technology use.					
	Expert *(multiple times per day)*	**Frequent** *(at least once per day)*	**Moderately** *(several times per week)*	**Rarely** *(3 or fewer times per month)*	**Never**
I use e-mail to communicate with parents, family, co-workers, etc.	☐	☐	☐	☐	☐
I use a computer to complete tasks for home.	☐	☐	☐	☐	☐
I USE THE FOLLOWING SOFTWARE OR DEVICES FOR **PERSONAL** *(NON-EDUCATIONAL)* USE:					
Word Processing Programs					
Microsoft Office Word	☐	☐	☐	☐	☐
OpenOffice (Word processing, etc.)	☐	☐	☐	☐	☐
ClarisWorks	☐	☐	☐	☐	☐
Microsoft Works (Word processing, etc.)	☐	☐	☐	☐	☐
Apple Works	☐	☐	☐	☐	☐
WordPerfect Word Processor	☐	☐	☐	☐	☐
Clicker5	☐	☐	☐	☐	☐
Write OutLoud	☐	☐	☐	☐	☐
Writer's Companion	☐	☐	☐	☐	☐
Windows Notepad	☐	☐	☐	☐	☐
Windows WordPad	☐	☐	☐	☐	☐
Google Documents	☐	☐	☐	☐	☐
Other					
Spreadsheet Programs					
Microsoft Office Excel	☐	☐	☐	☐	☐
Cruncher	☐	☐	☐	☐	☐
InspireData	☐	☐	☐	☐	☐
Google Spreadsheets	☐	☐	☐	☐	☐
QuattroPro	☐	☐	☐	☐	☐
Open Office (spreadsheets)	☐	☐	☐	☐	☐
AppleWorks (spreadsheets)	☐	☐	☐	☐	☐
Microsoft Works (spreadsheets)	☐	☐	☐	☐	☐
Scholastic Keys	☐	☐	☐	☐	☐
Other					
Desktop Publishing, Photography, and Graphic Designs					
Microsoft Office Publisher	☐	☐	☐	☐	☐
Quark Xpress	☐	☐	☐	☐	☐
Adobe PageMaker	☐	☐	☐	☐	☐
Adobe InDesign	☐	☐	☐	☐	☐
Adobe Photoshop	☐	☐	☐	☐	☐

Adobe Illustrator	☐	☐	☐	☐	☐
Word Perfect	☐	☐	☐	☐	☐
Pages	☐	☐	☐	☐	☐
Microsoft Photo Gallery	☐	☐	☐	☐	☐
Adobe Photoshop Elements	☐	☐	☐	☐	☐
Corel Snapfire	☐	☐	☐	☐	☐
Roxio Easy Media Creator	☐	☐	☐	☐	☐
ACDSee Photo	☐	☐	☐	☐	☐
iPhoto	☐	☐	☐	☐	☐
Corel Painter / Corel Digital Studio	☐	☐	☐	☐	☐
Microsoft Paint	☐	☐	☐	☐	☐
GIMP	☐	☐	☐	☐	☐
Pixia	☐	☐	☐	☐	☐
Inkscape	☐	☐	☐	☐	☐
PhotoPlus SE	☐	☐	☐	☐	☐
Adobe Flash	☐	☐	☐	☐	☐
SolidWorks	☐	☐	☐	☐	☐
Other					
Database Software					
Microsoft Office Access	☐	☐	☐	☐	☐
Microsoft Office Excel	☐	☐	☐	☐	☐
File Maker Pro	☐	☐	☐	☐	☐
Hypercard	☐	☐	☐	☐	☐
Other					
E-mail, Web Browsing, & Other Communication					
Microsoft Office Outlook	☐	☐	☐	☐	☐
Web-based e-mail (Yahoo, Hotmail, etc.)	☐	☐	☐	☐	☐
Client e-mail access (America Online, NetZero, etc.)	☐	☐	☐	☐	☐
Netscape Browser	☐	☐	☐	☐	☐
Google Chrome	☐	☐	☐	☐	☐
Mozilla Firefox	☐	☐	☐	☐	☐
Internet Explorer	☐	☐	☐	☐	☐
Safari	☐	☐	☐	☐	☐
Opera	☐	☐	☐	☐	☐
Konqueror	☐	☐	☐	☐	☐
Lynx	☐	☐	☐	☐	☐
Other					
Multimedia and Video Software					
Microsoft Office PowerPoint	☐	☐	☐	☐	☐
Microsoft Office OneNote	☐	☐	☐	☐	☐
Kidspiration	☐	☐	☐	☐	☐
QuickTime	☐	☐	☐	☐	☐
HyperStudio	☐	☐	☐	☐	☐

Keynote	☐	☐	☐	☐	☐
Adobe Premiere	☐	☐	☐	☐	☐
Other					
Peripheral Devices					
Digital Camera	☐	☐	☐	☐	☐
Scanner	☐	☐	☐	☐	☐
Printer	☐	☐	☐	☐	☐
Webcam (video recorder)	☐	☐	☐	☐	☐
Other					

Please check the box that best applies to the frequency and type of **Educational** technology use.

I have student computers in my classroom *(please write in how many).*	YES	☐	NO	☐	How many?
My students can easily access a school computer lab.	YES	☐	NO	☐	
I have a computer in my classroom for teacher-specific use.	YES	☐	NO	☐	
My school has a technology policy for education (*beyond that of the county*).	YES	☐	NO	☐	
I use technology standards in my classroom instruction often.	YES	☐	NO	☐	
I have mobile computers/technology centers at my school.	YES	☐	NO	☐	
What operating system do most frequently use? *(please write in type).*					
	Extremely Comfortable	**Very Comfortable**	**Moderate**	**Uncomfortable**	**Do not use**
How would you rate your comfort with computers?	☐	☐	☐	☐	☐
How would you rate your comfort with other instructional technology?	☐	☐	☐	☐	☐
How comfortable are you using other operating systems (ex: Macintosh to Windows, etc.)	☐	☐	☐	☐	☐
How do you feel about using technology (computers, etc.) in the classroom to teach math?	☐	☐	☐	☐	☐
	Expert *(multiple times per day)*	**Frequent** *(at least once per day)*	**Moderate** *(many times per week)*	**Rarely** *(3 or fewer times per month)*	**Never**
I use the <u>computer lab</u> for classroom activities/projects.	☐	☐	☐	☐	☐
I have students use classroom computers for activities/projects.	☐	☐	☐	☐	☐
(*optional*) Gender:	MALE	☐	FEMALE	☐	
(*optional*) I have been teaching <u>mathematics</u> for (*please circle your answer*):	0-2 years	3-5 years	6-10 years	11-15 years	20+ years
(*optional*) I have been teaching (all subjects) for: *(please circle your answer)*	0-2 years	3-5 years	6-10 years	11-15 years	20+ years

I USE THE FOLLOWING SOFTWARE OR DEVICES FOR **<u>EDUCATIONAL</u>** PURPOSES.

Word Processing Programs	**Expert** *(multiple times per day)*	**Frequent** *(at least once per day)*	**Moderate** *(many times per week)*	**Rarely** *(3 or fewer times per month)*	**Never**
Microsoft Office Word	☐	☐	☐	☐	☐
OpenOffice (Word processing, etc.)	☐	☐	☐	☐	☐
ClarisWorks	☐	☐	☐	☐	☐

Microsoft Works (Word processing, etc.)	☐	☐	☐	☐	☐
Apple Works	☐	☐	☐	☐	☐
WordPerfect Word Processor	☐	☐	☐	☐	☐
Clicker5	☐	☐	☐	☐	☐
Write OutLoud	☐	☐	☐	☐	☐
Writer's Companion	☐	☐	☐	☐	☐
Windows Notepad	☐	☐	☐	☐	☐
Windows WordPad	☐	☐	☐	☐	☐
Google Documents	☐	☐	☐	☐	☐
Other					
Spreadsheet Programs					
Microsoft Office Excel	☐	☐	☐	☐	☐
Cruncher	☐	☐	☐	☐	☐
InspireData	☐	☐	☐	☐	☐
Google Spreadsheets	☐	☐	☐	☐	☐
QuattroPro	☐	☐	☐	☐	☐
Open Office (spreadsheets)	☐	☐	☐	☐	☐
AppleWorks (spreadsheets)	☐	☐	☐	☐	☐
Microsoft Works (spreadsheets)	☐	☐	☐	☐	☐
Scholastic Keys	☐	☐	☐	☐	☐
Other					
Desktop Publishing, Photography, and Graphic Designs					
Microsoft Office Publisher	☐	☐	☐	☐	☐
Quark Xpress	☐	☐	☐	☐	☐
Adobe PageMaker	☐	☐	☐	☐	☐
Adobe InDesign	☐	☐	☐	☐	☐
Adobe Photoshop	☐	☐	☐	☐	☐
Adobe Illustrator	☐	☐	☐	☐	☐
Word Perfect	☐	☐	☐	☐	☐
Pages	☐	☐	☐	☐	☐
Microsoft Photo Gallery	☐	☐	☐	☐	☐
Adobe Photoshop Elements	☐	☐	☐	☐	☐
Corel Snapfire	☐	☐	☐	☐	☐
ACDSee Photo	☐	☐	☐	☐	☐
iPhoto	☐	☐	☐	☐	☐
Corel Painter / Corel Digital Studio	☐	☐	☐	☐	☐
Microsoft Paint	☐	☐	☐	☐	☐
GIMP	☐	☐	☐	☐	☐
Pixia	☐	☐	☐	☐	☐
Inkscape	☐	☐	☐	☐	☐
PhotoPlus SE	☐	☐	☐	☐	☐
Adobe Flash	☐	☐	☐	☐	☐
SolidWorks	☐	☐	☐	☐	☐

Other					
Database Software					
Microsoft Office Access	☐	☐	☐	☐	☐
Microsoft Office Excel	☐	☐	☐	☐	☐
File Maker Pro	☐	☐	☐	☐	☐
Hypercard	☐	☐	☐	☐	☐
Other					
E-mail, Web Browsing, & Other Communication					
Microsoft Office Outlook	☐	☐	☐	☐	☐
Web-based e-mail (Yahoo, Hotmail, etc.)	☐	☐	☐	☐	☐
Client e-mail access (America Online, NetZero, etc.)	☐	☐	☐	☐	☐
Instant Messaging Client (Yahoo, etc.)	☐	☐	☐	☐	☐
Online Chat Client (ex.: Bb, IRC, etc.)	☐	☐	☐	☐	☐
Netscape Browser	☐	☐	☐	☐	☐
Google Chrome	☐	☐	☐	☐	☐
Mozilla Firefox	☐	☐	☐	☐	☐
Internet Explorer	☐	☐	☐	☐	☐
Safari	☐	☐	☐	☐	☐
Opera	☐	☐	☐	☐	☐
Konqueror	☐	☐	☐	☐	☐
Lynx	☐	☐	☐	☐	☐
Other					
Multimedia and Video Software					
Microsoft Office PowerPoint	☐	☐	☐	☐	☐
Microsoft Office OneNote	☐	☐	☐	☐	☐
Kidspiration	☐	☐	☐	☐	☐
QuickTime	☐	☐	☐	☐	☐
HyperStudio	☐	☐	☐	☐	☐
Keynote	☐	☐	☐	☐	☐
Adobe Premiere	☐	☐	☐	☐	☐
Other					
Peripheral Devices					
Digital Camera	☐	☐	☐	☐	☐
Scanner	☐	☐	☐	☐	☐
Printer	☐	☐	☐	☐	☐
Webcam (or other video recorder)	☐	☐	☐	☐	☐
Joystick	☐	☐	☐	☐	☐
Optical Mark Reader	☐	☐	☐	☐	☐
Smart Board	☐	☐	☐	☐	☐
Promethean Board	☐	☐	☐	☐	☐
Other interactive whiteboard	☐	☐	☐	☐	☐
Digital projector	☐	☐	☐	☐	☐
iPods	☐	☐	☐	☐	☐

Clickers	☐	☐	☐	☐	☐
e-Readers (Kindle, etc.)	☐	☐	☐	☐	☐
Other					
Computer-Assisted Instruction and Computer-Managed Instruction Software					
Math Pathways	☐	☐	☐	☐	☐
MathAdvantage	☐	☐	☐	☐	☐
Voice Recognition Programs (Dragon Live Text, etc.)	☐	☐	☐	☐	☐
Virtual Manipulatives (NLVM, etc.)	☐	☐	☐	☐	☐
Simulation Programs	☐	☐	☐	☐	☐
Drill and Practice Programs	☐	☐	☐	☐	☐
Brain Ware	☐	☐	☐	☐	☐
Intellimathics	☐	☐	☐	☐	☐
Game programs (ex: Crazy Machines)	☐	☐	☐	☐	☐
Classworks	☐	☐	☐	☐	☐
Puzzlemaking programs	☐	☐	☐	☐	☐
Worksheet generators	☐	☐	☐	☐	☐
Statistical programs	☐	☐	☐	☐	☐
Others					

Please check the boxes corresponding with ways you may have or plan to use technology in your mathematics instruction, including teacher planning, classroom management, student activities, etc.

	Teacher-Centered Uses: (Recordkeeping, worksheet generation, etc.)		
☐	Voice Recognition programs for recordkeeping.	☐	Software for generating worksheets
☐	PowerPoint presentations for teaching	☐	Interactive white board during class
☐	Puzzlemaking / Puzzle Generators	☐	Creating/maintaining a class web page
☐	Test/Activity generators attached to textbooks.	☐	Using a mobile technology lab
☐	Online portfolio generation/storage.	☐	Interactive white boards for instruction
☐	Student recordkeeping – database	☐	Grade keeping using spreadsheet software
☐	Student recordkeeping – spreadsheet	☐	Grade keeping using database software
☐	Student recordkeeping – other software	☐	Grade keeping using other type of software
☐	Other uses not listed *(please describe here)*:	☐	Other uses not listed *(please describe here)*:
	Student-Centered Uses: (Activities, projects, etc.)		
☐	Online research (library sources, web searches, etc.)	☐	Computer generated/run games
☐	WebQuests	☐	Community Math Modules

☐	Students using the internet to research or obtain tutorials for problem solving.	☐	Websites (creating)
☐	Students doing spreadsheet calculations	☐	Wikis
☐	Students using databases (including what-if analyses)	☐	Blogs or podcasts
☐	Online virtual manipulatives during class/lesson	☐	PowerPoint presentations (including interactive)
☐	Online virtual manipulatives to supplement lesson (computer lab)	☐	Writing tutorials or databases (or contributing to pre-existing ones)
☐	Online virtual manipulatives for at-home work	☐	Creating flash cards, concept cards, or other types of documents for students to review with.
☐	Other uses not listed *(please describe here)*:	☐	Other uses not listed *(please describe here)*:

Perceptions of Fourth-Grade Math Students on Computer-Based Homework

Amanda I. H. Legge

Education 5900, Fall 2010

The University of Tennessee at Chattanooga

The Institutional Review Board of The University of Tennessee at Chattanooga (FWA004149) has approved this research project # 10-108.

Introduction to the Problem

Hamilton County Department of Education (HCDE) continues to invest resources into educational technology. This includes online programs, data and benchmarking tools, projection boards, etc. Beginning with the 2010-2011 school year, teachers were required to use DiscoveryEducation.com (formerly Think Link) for progress monitoring of students who perform at the at-risk level. DiscoveryEducation.com also includes a program that allows all students to practice standards-based skills online. Teachers can use this program for homework assignments.

In addition, beginning with the same school year, teachers were asked to implement Power School, another digital resource. This program allows for online record-keeping, which also grants immediate access to grades by parents. Power School makes the lines of communication almost immediate between teachers and parents, as it allows comments and responses to be posted, as well.

Because HCDE is placing a significant emphasis on digital resources, the fourth-grade teachers at the school feel it is important to not only implement these, but to find out if students are interested in computer-based work. Whether or not students are positive about computer-based work will guide how teachers begin implementing these initiatives.

Therefore, this researcher is investigating whether or not students prefer computer-based homework. The study will be based upon the following thesis: There is a positive difference between perceptions of computer-based homework and pencil-and-paper homework for fourth-grade math students at the school.

Because this research is specific to one grade at one elementary school, the results are not assumed to be transferrable to other elementary schools or other grades.

The researcher assumes that all fourth-grade students will be able to read and comprehend the survey, that most parents will allow the students to take the survey, that most students are willing to take the survey, and that students understand the difference between doing homework on the computer and doing homework by pencil and paper.

The data needed are opinions from the school's fourth-grade students concerning their perceptions of computer-based homework. After filling out a questionnaire, the answers will be tallied in a database as quantitative data.

Review of Literature

Some sources argue that homework no longer has a place in our educational system, while others argue that the way homework is delivered must change to accommodate today's students, who have only known education within the technical age.

Kralovec and Buell argued, in *End Homework Now*, that homework no longer has a place due to the teacher's accountability for student learning and lack of family time. In addition, the authors interviewed 45, at-risk students, who attended schools with high drop-out rates, who blamed an "inability to complete homework" as a reason for dropping out of school (Kralovec & Buell, 2001, p. 39).

Interestingly, a formal study of a similar population is cited by Slaughter that concluded that nearly half of drop-outs in the U.S. blame boring classes for their reason to leave (Slaughter, 2009). Naussbaum-Beach (2008) said that studies reveal that less than 25% of students believe what they learn in school is "meaningful" and less than half believe what they learn impacts "their success in life" (A New Kind of Student section, ¶ 1). Further, at least two studies conclude that students, of all ages, find computer-based work (class or homework) more engaging (Strom, Strom, Wing, & Beckert, 2009; Teeter, 1997), and one study showed that

students learned significantly more when using Web-based homework with an online program that provided tutorial feedback (Mendicino, Razzaq, & Heffernan, 2009). Therefore, one possible way to re-engage students with learning is for teachers to implement strategies allowing computer-based work.

One article caught this researcher by surprise. Davis and Ash (2009) reported, in *Education Week*, that the federal government and several school districts are working to implement on-line access for students so that they can continue learning even when school shuts down or students are absent. This is the direct effect of the H1N1 flu virus, which caused many school systems to shut down for several days. A partnership formed between the education leaders at the federal government level and technology companies to create and implement a strategy to ensure continuity of learning in the face of school closures would make use of technology like online homework, video lessons, digital resources, webinars, phone conferencing, virtual classrooms, and how to make sure all students have Internet access and computers in their homes.

For the student who does not have a computer in the home, this is referred to as the digital divide, and is usually thought of as a socioeconomic problem. Tucker, at Pepperdine University, did a study to look at why parents did not have a computer at home. She found that the number one reason was "financial constraint" (Tucker, 2005, Abstract ¶ 2).

Teeter reported the comparison of teaching online versus in the traditional classroom at the University of Arkansas at Little Rock. The study reported that the students who took the online course had higher motivation, and that the quality of their discussion and writing assignments was better than that of the students taking the same course in the traditional sense. The latter is thought to be attributed to the ability to critically think and write before presenting

thoughts to the class. Both groups performed about the same on the four exams. Additionally, the online group followed extended resources through hyperlinks, which provided more related resources than the textbook (Teeter, 1997).

The news media is interested in this topic, as well. *St. Petersburg Times* reporter Perez talked with a fourth-grade teacher who received a grant to purchase an iPod Touch for each of her students. The students used the applications to do their math homework. The biggest complaint from the students and parents was that the battery does not last long enough. This is because the students were doing more than the requested amount of homework, and family members were using the learning applications, too (Perez, 2010). *The Washington Times* reporter Timpf (2009) talked with an educational game programmer, Jessica Hsu, who said the important thing is to "make the games fun first…97 percent of America's elementary school children already play video games…it makes sense to use the medium to help them learn" (p. 3). Ms. Hsu cites positive outcomes for computer-based work as students preferring to play the games versus completing traditional homework, receive immediate feedback, and the teachers receive instant assessments (Timpf, 2009).

Strom et al. (2009) looked at student engagement. They found that engagement increased through online assignments that focus on self-directed learning. Students were asked about the way they learn best. Students reported "interest in multiple ways of learning" including internet (25%), discussion with classmates (24%), direct instruction (24%), print sources (13%), and watching TV/DVD (14%) (p. 116). Students answered what makes "internet learning beneficial" with "because it allows individuals to proceed at their own pace (29%)" and "helps them discover information (26%)" (p. 116-117). Their justifications for Internet homework were "increase their understanding of curriculum topics (43%), facilitate independent learning (25%),

and allow practice with research skills (24%)" (p. 117). In addressing what students wish schools would teach them about the Internet, they said "to improve research skills (44%), to evaluate credibility of web sites (29%), to understand how to block inappropriate material (15%), and to know how to deal with cyber bullies (12%)" (Strom et al., 2009, p. 119).

Interesting citations included The Pew Internet and American Life Project, which found that "most students…describe the internet as a virtual reference library that helps them quickly locate information…and satisfy curiosity. Adolescents and their parents believed that the internet has enormous potential to improve study habits and schoolwork." However, only "5% of students credit school for teaching them how to apply technology" (Strom et al., 2009, p. 112).

One study was particularly close to what this researcher would like to look at on a localized level. *A Comparison of Traditional Homework to Computer-Supported Homework* takes the research a step further, and found that students do learn more with Web-based homework when the program provides immediate feedback for errors, as compared to traditional homework. The study was performed using the ASSISTment online system (Mendicino et al., 2009).

There is a good start of literature on computer-based school work; however, there is still work to be done. Teachers need to be armed with the proper research to guide their work and strategies. Until more research is available, teachers should move forward with implementing computer-based school work, and search for training opportunities, with regard to using technology in the classroom.

Methodology

Participants of this study will be selected from the population of fourth-grade math students at an elementary school in Chattanooga, TN. The population is anticipated to contain

approximately 150 students. Because the entire population is accessible, a census survey will be attempted. Uncontrollable factors would be student attendance at the time of the survey, student assent, and parent permission for each student to participate.

According to the HCDE, the school's student body is composed of 737 students: 1.1% Hispanic students, 8.4% Asian students, 10.7% African-American students, and 79.7% Caucasian students. It is evenly divided by gender with 50.2% female students and 49.8% male students. Economically disadvantaged students represent 16.7% of the student body. The school continues to remain in good NCLB standing and scores "A" in every subject, which is based upon the state's standardized test scores (TCAP) (2008 School Profile, 2008). Most parents work in professional careers.

The perceptions of the population, concerning computer-based homework versus pencil-and-paper homework, will be collected via census survey. See (Appendix A.) The survey includes nine questions, which are multiple choice, and should take no more than 15 minutes to complete.

The survey will be conducted within each fourth-grade classroom. While computer-based testing is ideal, the classrooms do not have access. Therefore, questionnaires will be pencil-and-paper-based. Teachers will ask students to answer the questions based on how they feel. Students will be told that there are no right or wrong answers. Teachers will collect the surveys, which do not have names on them.

Results will then be tabulated in an Excel spreadsheet, based on the answers given, and reported as percentages. See (appendix B.)

This study is action cross-sectional survey research. All students will be asked to take the same survey. Questions will ask students to compare how they view computer-based homework versus paper-and-pencil homework.

Data Collection and Results

Fourth-grade teachers at the school were asked to distribute parental consent forms to 145, fourth-grade students. Approximately 71% of the parental consent forms were signed and returned. All 104 students then signed student assent forms and participated by completing the survey.

The first question in the survey is, "Is it FUN to do your math homework on the computer?" This is the most basic question this researcher wanted answered. Most students (83%) answered that they do find math homework on the computer to be FUN. See Figure 1.

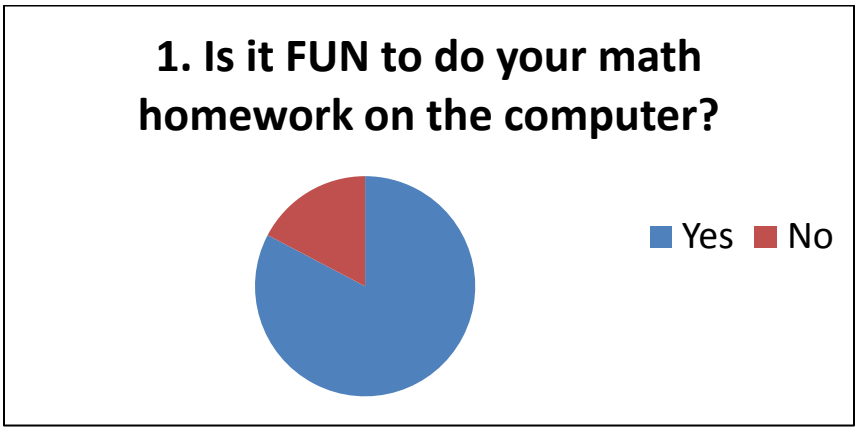

Figure 14. Most students believe that math homework is fun on the computer.

In an attempt to ask for more in-depth information, the question was asked, "Is it EASIER to do your math homework on the computer or with a paper and pencil?" One concern expressed by fourth-grade teachers was that math homework might be harder on the computer. The survey shows that this might be an initial problem for the 32% of students who responded

that paper and pencil are easier. The error reflects the one student who did not answer this question. See Figure 2.

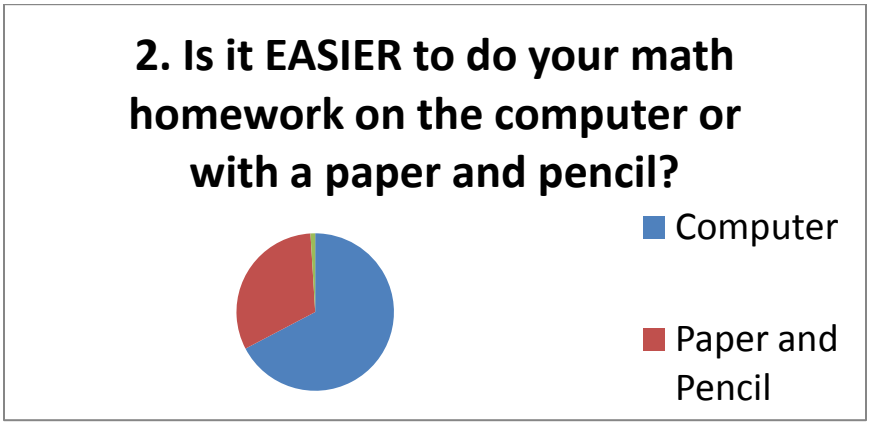

Figure 15. Most students believe that it is easier to do math homework on the computer.

Question number three asked students to compare the idea of continuing the Everyday Math Journal pages, which is what they are currently using, to the idea of working on the computer. The students responded almost identically to the previous question with 33% of students expressing that they like using journal pages (paper and pencil) over computer-based math homework. See Figure 3.

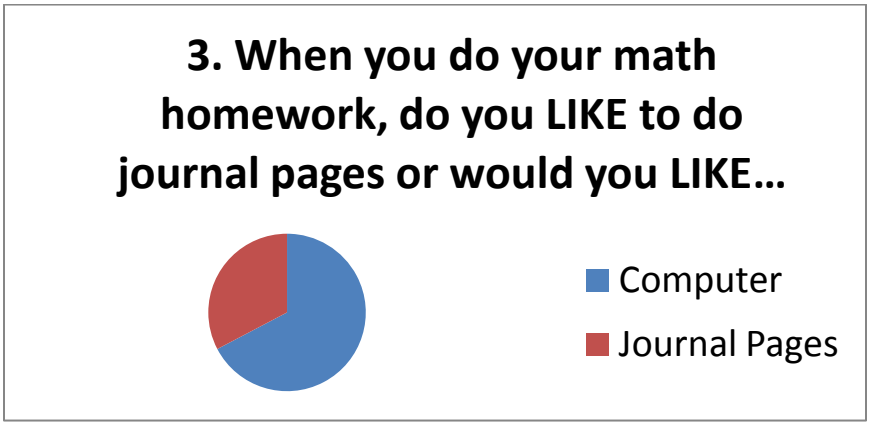

Figure 16. Most students like to do math homework on the computer.

It is important to keep in mind that not all students enjoy using a computer, under any circumstances. To ensure that this would not skew results, question number four asked, “Do you

LIKE using a computer?" Most students responded that they like using a computer, while only 5% responded that they do not like using a computer. See Figure 4.

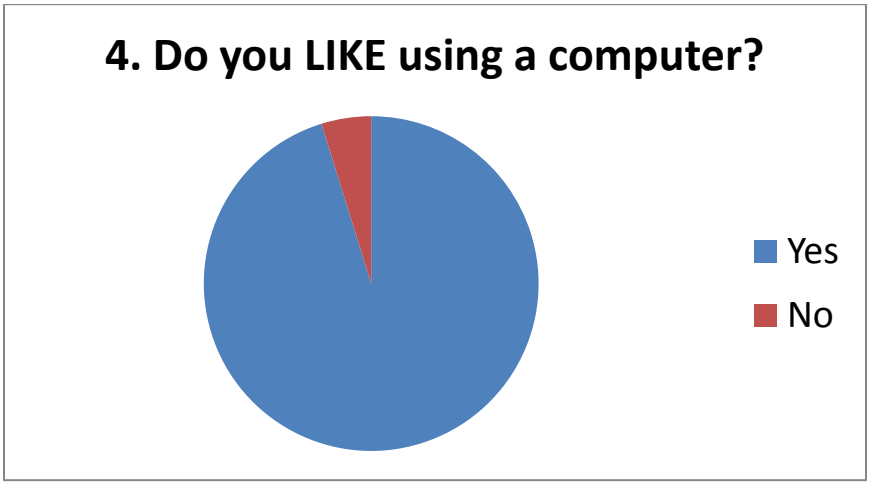

Figure 17. Almost all students like using a computer.

To address why students might like or not like using a computer, question five asked, "Is using a computer more like WORK or more like PLAY?" Most students (68%) responded that using a computer is more like play. See Figure 5.

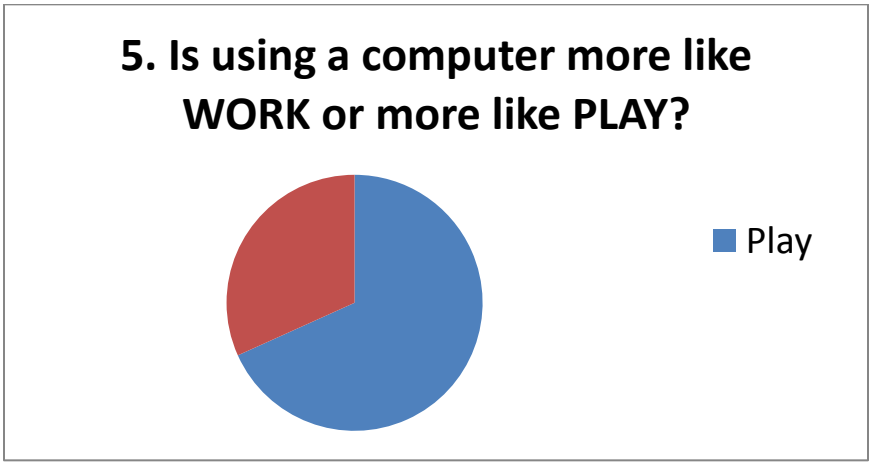

Figure 18. Most students believe the computer is more like play than work.

At several workshops, many teachers have expressed concern over transitioning to computer-based homework because their students may not have access to computers with Internet capability at home. This is why the survey included questions six and seven. The vast

majority of respondents shared that they do have access to computers at home and have parental permission to use the home computer. See Figures 6 and 7.

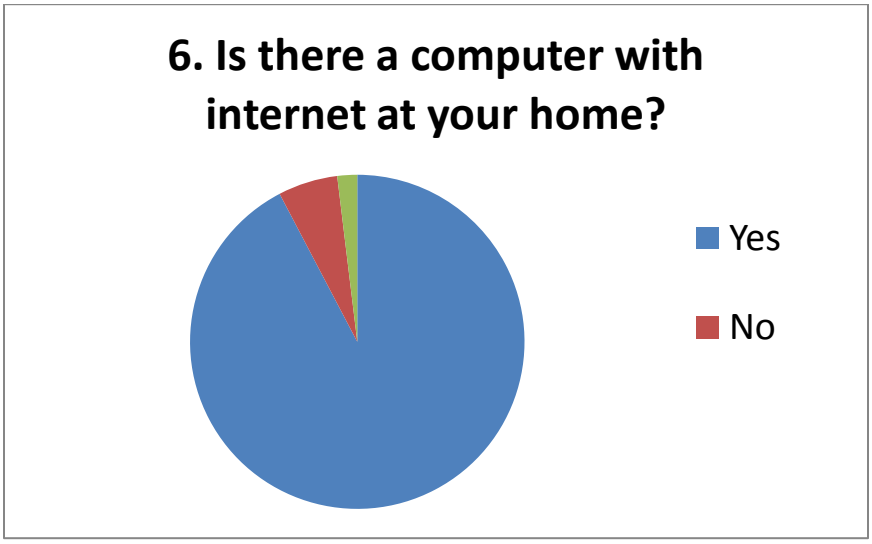

Figure 19. Almost all students have computers with Internet access at home.

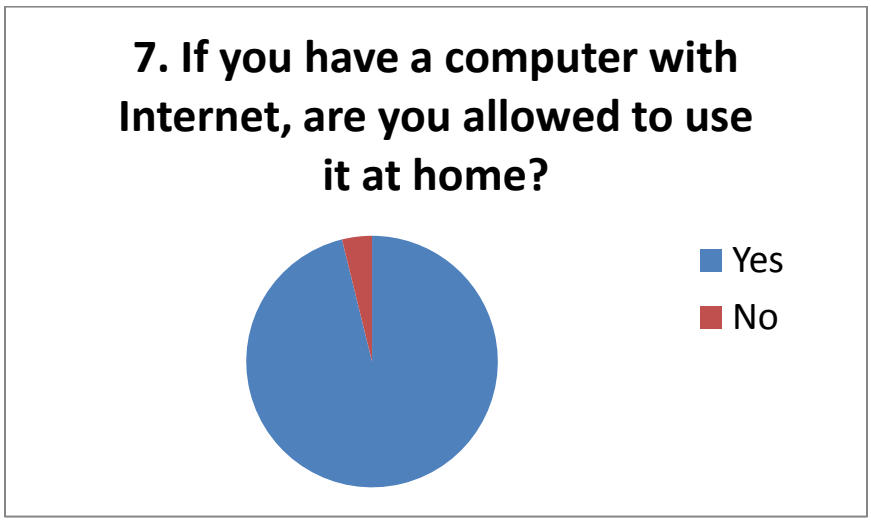

Figure 20. Almost all students are allowed to use their home computer.

The intent behind question number eight was to make sure that most students felt comfortable using a computer. The results show that most students find using a computer as easy. See Figure 8.

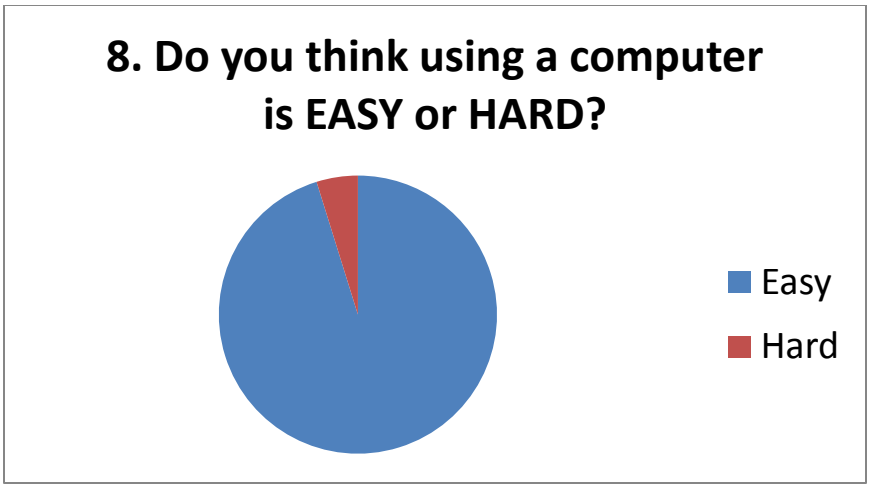

Figure 21. Almost all students believe it is easy to use a computer.

While fourth graders should be able to read the text that was presented to them within the survey, it is wise to ask if young survey takers have difficulty reading the survey. If so, their results are likely invalid. Only one student responded that the survey was hard to read. See Figure 9.

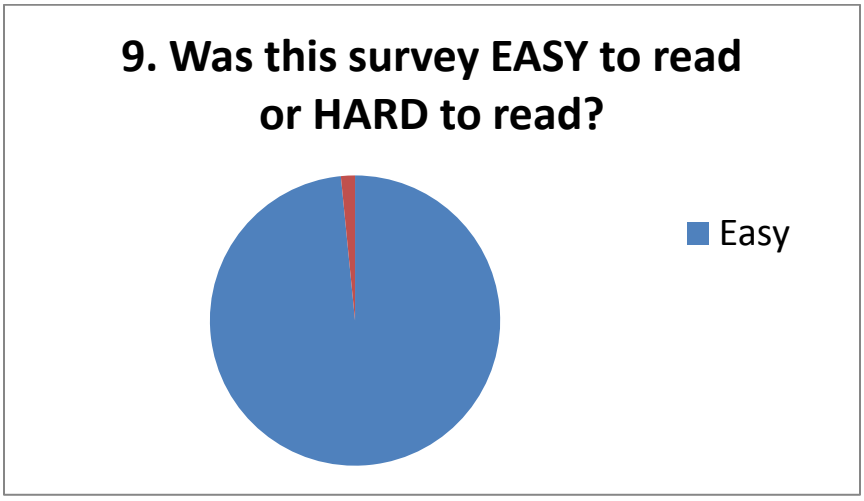

Figure 22. Almost all students thought that the survey was easy to read.

A summary of positive and negative responses is presented in Figure 10.

	Positive response to computer-based work	Negative response to computer-based work
1	86	18

2	70	33
3	70	34
5	71	33

Figure 23. These are responses that support a positive computer reaction.

Conclusions and Recommendations

This research was based upon one main goal. Because HCDE is placing such emphasis on teachers and students using technology, teachers need to know how students currently feel about using computers. This empowers teachers with information to make decisions about how to transition from a paper-and-pencil-based classroom.

Questions one, two, three, and five were written to address the issue of whether or not students perceive computer-based math homework as a positive possibility. The responses to questions two, three, and five are indeed positive, and the responses match, almost exactly. This means that teachers can proceed with the transition, without fear of significant backlash from the students.

However, question number one definitely deviates from the responses of the other three. While the actual reason for this cannot be proved without further research, the researcher believes this is due to the question's placement as number one and that the question asks if the student currently believes that computer-based math homework is fun. However, the students are not all currently using computers for any homework, and may not have any current experiences from which to draw. If this is the case, the student must make a speculation, and cannot answer based upon actual experience. Because questions two, three and five are so closely linked, this researcher does not believe the response to number one is accurate, but cannot make a determination, without further study.

Questions four and eight were written to discover how students feel about computers, in general. Because students may not have actual experiences of completing homework on the computer, this researcher wanted to take math out of the equation to see if a different picture formed. Indeed, that is the case. Both questions received the exact same results. Ninety-five percent of students said that they like using computers and that they were easy to use. Only five percent of students responded that they did not like using computers and that they were hard to use. This may show that the students are more than ready to proceed with this transition. The difference between the responses of this set of questions, as compared to the questions that point out math specifically, is probably due to the fact that the students may not be sure what computer-based math homework is actually like.

Questions six and seven were written to address the teachers' concern about holding students accountable for computer-based homework if they have no computer/Internet access at home. As a group, this should not be a concern. However, for the 6% of students (six students in this group) without a computer at home, alternate arrangements would need to be made. The study showed that there was approximately one student per classroom without access at home. This researcher believes there are at least three realistic solutions for these students:

1. Because each classroom has four student computers, these students should be given opportunities within the school day to complete computer-based homework
2. These students could perform their assignments during their weekly computer lab.
3. The teachers could approach administration about the possibility of opening the computer lab for 30 minutes at the end of the school day.

Question number nine was intended to ensure that each student could easily read the survey. Only one student responded that the survey was difficult to read. The researcher does not believe that reading the survey was an issue for the sample.

Teachers who are uncomfortable or who do not know how to make this transition should actively pursue further training, regarding the use of technology in the classroom. If the HCDE is not providing such training, teachers may consider discussing this research with the school administration to see if further training can be provided.

Teachers might also consider finding outside resources or funding for their own professional development. HCDE emails grant/funding opportunities to each teacher. One example is the Leadership Book Club Grants, funded by PEF Chattanooga. This provides $1,000 to purchase books to "enhance the school's professional learning community" (Hamilton County Department of Education, personal communication, September 14, 2010). Applications in 2010 were due in September. The Junior League of Chattanooga supplies "Mini-Grants" to teachers each year for general purchases. The application in 2010 was due in October (Hamilton County Department of Education, personal communication, August 5, 2010).

The National Education Association's Web site includes an article, "Put an End to Homework Horror" (Bafile, 2000). The author says that homework should meet the students on their level. Computer-based homework does this because it is easily individualized by assigning practice that focuses on a child's particular weaknesses. Bafile discusses the importance of assigning work that engages each student. This can be accomplished by asking a student if a particular assignment held their interest. If it did not, the Internet holds almost endless possibilities of alternatives to try, until a student is engaged in the practice. This research shows that these students are interested in using computers, and open to seeing what possibilitiesthe

computer holds for making homework engaging. As teachers, we are to open these doors for our students, and make such opportunities for growth available.

Because this research is based on a specific group of fourth graders at one elementary school, do not assume that the conclusions can be generalized to students in other grades or at other schools. This researcher also believes that no further research is needed on this topic with this sample.

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Appendix A

Student Survey

Directions: Please answer the following questions based on how you FEEL. There is NOT a right or wrong answer for each question. Do NOT put your name on this paper. No one will know how YOU answered, so please answer truthfully.

1.) Is it FUN to do your math homework on the computer?

    a.) Yes

    b.) No

2.) Is it EASIER to do your math homework on the computer or with a paper and pencil?

    a.) Computer

    b.) Paper and Pencil

3.) When you do your math homework, do you LIKE to do journal pages or would you LIKE to do your homework on the computer?

    a.) Journal Pages

    b.) Computer

4.) Do you LIKE using a computer?

    a.) Yes

    b.) No

Please turn paper over to finish questions on back.

5.) Is using a computer more like WORK or more like PLAY?

a.) Work

b.) Play

6.) Is there a computer with internet in your home?

a.) Yes

b.) No

7.) If you have a computer with internet, are you allowed to use it at home?

a.) Yes

b.) No

8.) Do you think using a computer is EASY or HARD?

a.) Easy

b.) Hard

9.) Was this survey EASY to read or HARD to read?

a.) Easy

b.) Hard

Please make sure that your name is NOT on the paper. Thank you for answering these questions!

Appendix B

Summary of Data Collected

1 Is it FUN to do your math homework on the computer?

Yes	86
No	18
# Responses	104

2 Is it EASIER to do your math homework on the computer or with a paper and pencil?

Computer	70
Paper and Pencil	33
Error	1
# Responses	104

When you do your math homework, do you LIKE to do journal pages or would you

3 LIKE to do your homework on the computer?

Journal Pages	34
Computer	70
# Responses	104

4 Do you LIKE using a computer?

Yes	99
No	5
# Responses	104

5 Is using a computer more like WORK or more like PLAY?

Work	33
Play	71
# Responses	104

6 Is there a computer with internet at your home?

Yes	96
No	6
Error	2
# Responses	104

7 If you have a computer with internet, are you allowed to use it at home?

Yes	100
No	4
# Responses	104

8 Do you think using a computer is EASY or HARD?

Easy	99
Hard	5
# Responses	104

9 Was this survey EASY to read or HARD to read?

Easy	103
Hard	1
# Responses	104

Do Students Retain More Information through Real Life Images or through Clip Art Cartoon Images?

Courtney Sloane Phillips

Education 5900, Fall 2010

The University of Tennessee at Chattanooga

The Institutional Review Board of The University of Tennessee at Chattanooga (FWA004149) has approved this research project # 10-113.

Introduction

Visual materials can add life to any lesson or project. Including visual images such as diagrams, graphs, animations, cartoons, or real-life images can enhance the learning of any individual. Students who can visually view and/or visually represent can comprehend information through a variety of ways. A teacher's job is to discover and implement ways in which students can learn best, and ways in which they can absorb the most information.

This study was thought of when the researcher entered a kindergarten classroom in an urban school setting. Many of the students had never been to school before and seemed to be "blank slates" and ready to learn anything and everything. The unit of focus was "community helpers" and what the helpers did in the community. The researcher decided that, because many of the students could not read and could obtain the most information through visual images, it would be a good opportunity to see what type of images the students could retain to comprehend the most information.

Area of Focus Statement

The purpose of this study was to compare information comprehension and retention of students through the use of real-life photographs and clip art images. In comparing the two uses of visual resources, research showed if students could retain and comprehend information more though real-life photographs or clip art cartoon images. Research showed if the students could apply more information to the real-life photographs or the clip art images, and if students related more to the clip art images or to real-life photograph images.

Limitations

Four primary limitations occurred in the study. The students had never been in school before. Therefore, some students had never taken a written assessment. Some students did not understand exactly what to do for the first pre-test given.

Another limitation of research was the amount of parental consent forms returned to the researcher. In the school setting where the research took place, the parental involvement was limited.

The different images that were on the assessments are the third limitation in the study. It was a possibility that some of the images on the assessments could have been confusing to the students. For example, two images on an assessment both used a stethoscope. Because both community helpers used it, it could have caused confusion to the students.

The fourth limitation is a lack of student interest in particular images in the study. Some students were more interested in some subjects than others. Some students could also relate more to some subjects than others. For example, many students could relate more to a police officer than they could to a baker. Therefore, the students were more interested in learning about a police officer.

Research Questions

1. How do students comprehend information by using only clip art images compared to their comprehension of information by using only real-life images?
2. Do students retain information more through cartoon images through literary books or more through informational texts?
3. Do students relate more to real-life images compared to clip art images?

Review of Literature

A definition of literacy, according to The London Group, is an understanding and competent control of representational formats that are becoming increasing significant in the

overall communications environment, such as visual images and their relationship to the written word (Riesland, 2005). The job of a teacher is to provide students with visual explanations of the world around them. Environments today are very rich in visual and media resources. By educating students through visual methods, teachers help students of all ages (Riesland, 2005).

There have been many studies in which photography and images were readily used in the classroom to facilitate learning. Studies began, primarily, to increase students' language and literacy skills, but researchers soon found that other skills such as vocabulary, stories, and retelling strategies increased through the use of pictures (Byrnes & Wasik, 2009). By using visual images, a teacher can increase a student's literacy through learning, thinking, and communicating. A literate person can understand the basic codes, symbols, and syntax of learning, however, visual information can help students understand and evaluate information. Visual images can often serve as their own language (Abilock, 2008). Some studies have shown that beginning readers often struggle to decode new words, and will often turn to pictures for help. Graphic novels are being introduced to young students to provide the students and teachers with scaffolding techniques for beginning readers (Stanley & Sturm, 2008). Hassett and Schieble (2007) argue that, in order for literacy instruction to be beneficial to students, print and visual images must work together. This study, in particular, showed different ways in which readers extended three cueing systems to negotiate multiple levels of meaning in visual texts.

Through a social studies study, classrooms explored ways in which photography could help students analyze and evaluate all forms of information and communication. Students learned how to recognize how images represented diverse perspectives, connected to disparate pieces of information, and could be manipulated to alter the authenticity or reliability of

information (Bearson, 2004). Incorporating images into a learning environment can add to a motivating learning environment.

Using images in the classroom to help students make connections with literature is not new. Living in an image-rich world does not mean students naturally possess sophisticated visual literacy skills. “Visual literacy involves the ability to understand, produce and use culturally significant images, objects and visible actions” (Felten, 2008, p. 1). Skills can be learned in ways comparable to textual literacy. Students can develop the ability to recognize, interpret, and employ the distinct syntax and semantics of different visual forms. The process of becoming visually literate continues through a lifetime of learning new and more sophisticated ways to produce, analyze, and use images.

Data Collection and Results

Data Collection

Subjects. Participants for this study were 15 kindergarten students, ranging from 5 to 7 years old. The students were studied in an urban setting in their kindergarten classroom. The researcher consulted with the cooperating teacher to obtain information about the students and their background knowledge.

Methodology. During this study, the researcher studied the comprehension and retention rates of students through the use of two forms of images, real-life photographs and clip art cartoon images. The study was 2 weeks in length; each week had an emphasis on a type of visualization.

There were two pre-tests and two post-tests given in this study. The pre- and post-tests consisted of five, colored, clip art cartoon images and five, colored, real photographs of individual community helpers and their tools. On both tests, the researcher instructed the

students to match the “community helper” to the tool used. One side of the test had real-life photographs and the other side of the test had clip art images. The test for the second week was the same format, except the community helpers were different.

The study began with the researcher administering “week 1” pre-test to the kindergarten students. The students sat at tables in the classroom and were instructed to match the community helper to his/her tool. The community helpers that were studied during week 1 were a teacher, a baker, a postal worker, a builder, and a farmer. During the first week of the study, the researcher used only clip art images in the classroom. There was a bulletin board that was decorated with the five community helpers on which the study was focusing during the first week of study. The community helpers were clip art images with clip art tools. The students did an art project that consisted of the students decorating a hand-made portrait of the community helper they wanted to be. The students also were instructed to draw and color the tool that community helper used. The students had a writing activity in which they copied the sentence, “A _____ helps my community.” The students had to select what community helper they wanted to use to complete the sentence. The name of the community helper was next to a clip art image. The students participated in a variety of activities using the clip art community helper images. For example, the students played a matching game, in which the students matched certain clip art images to the correct community helper. Both the matching cards and the community helper board displaced clip art images. The researcher did a mini- lesson, each day, using a fictional cartoon book. Each book chosen was about one of the community helpers that was focused on during week 1, and told a fictional story. At the end of the week, the researcher administered the same test that was given as the pre-test.

During the second week of research, the researcher gave the "week 2" pre-test. The pre-test was in the same format as that of week 1, however, different community helpers were being tested. The community helpers that were being tested for week 2 were a doctor, a dentist, a police officer, a firefighter, and a veterinarian. Again, the students were instructed to match the community helper to their tool. During the second week of study, the researcher used only real-life photographic images in the classroom. The students did another art project in which the students made a collage using real photographs. The students used a graphic organizer and categorized the different community helpers to the different tools used. The students did the same type of writing assignment where they completed the sentence, "A _____ helps my community." The community helpers they chose from were the ones being studied during week 2. The name of the community helper corresponded with a real photographic image. The students participated in a variety of other activities. They used the same matching game, except with the use of real photographs. They also had a group of cards with the community helpers being studied and the tools used. The students used a pocket chart, and sorted the cards according to community helper and tool. The researcher continued with mini-lessons during the second week of study. However, the researcher read only informational texts, with real photographs, during the second week. The texts came from a series called, "A Day in the Life of…," by Heather Adamson. Each book corresponded with the community helper discussed each day. At the end of the week, the post-test was given, which was the same as the pre-test.

Results

Week 1. The pre-test average for week 1, based on a 100-point scale, was 72%. The average score for the clip art images on the pre-test was 69.3% and the average score for the real photograph images was 62.67%. There were more scores of 0% than the researcher expected.

Many students circled each individual item and did not draw any lines to match the community helper. The most common clip art image and tool missed was the farmer. A majority of students did not draw the farmer to any tool that was given. The answers varied for the real image portion of the pre-test. Pre-test results are presented in Figures 1-3.

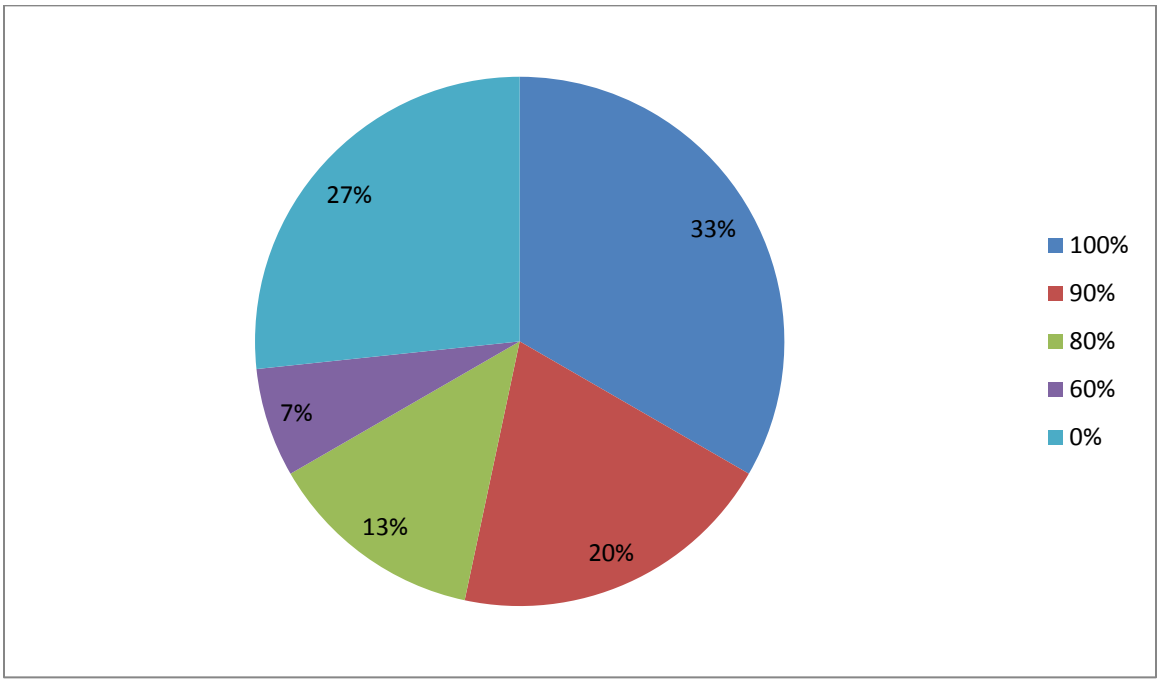

Figure 1. Percentages of the results from the pre-test by percentage of the students' scores.

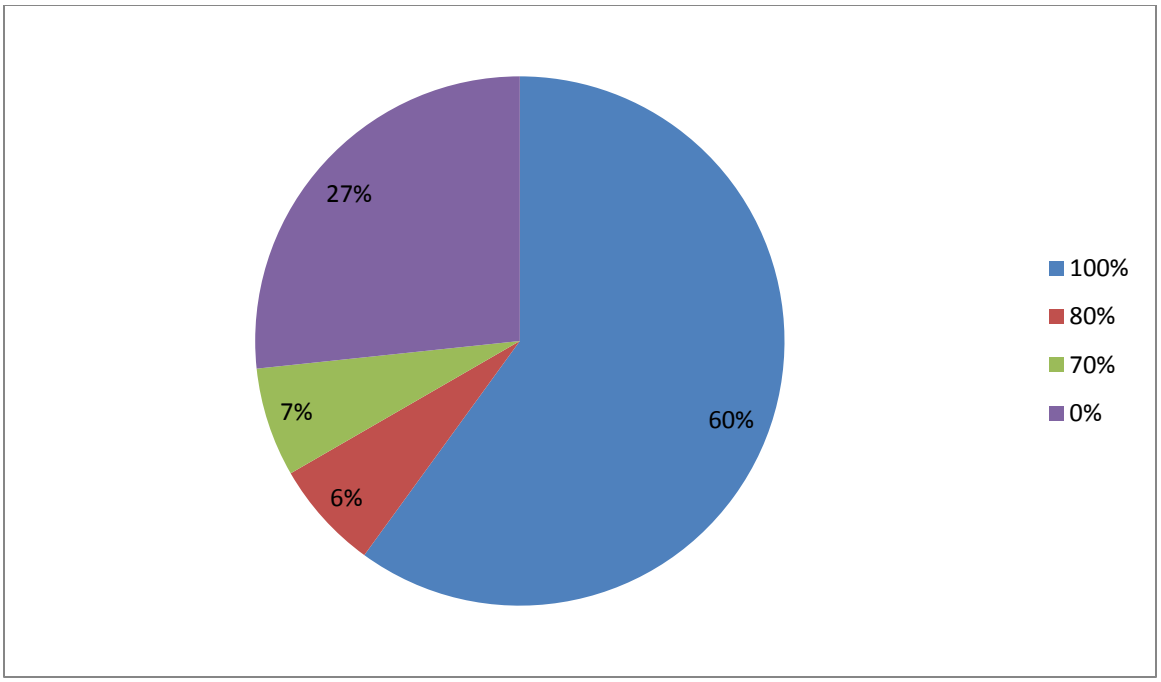

Figure 2. Percentages of the students' scores from the clip art images of the pre-test.

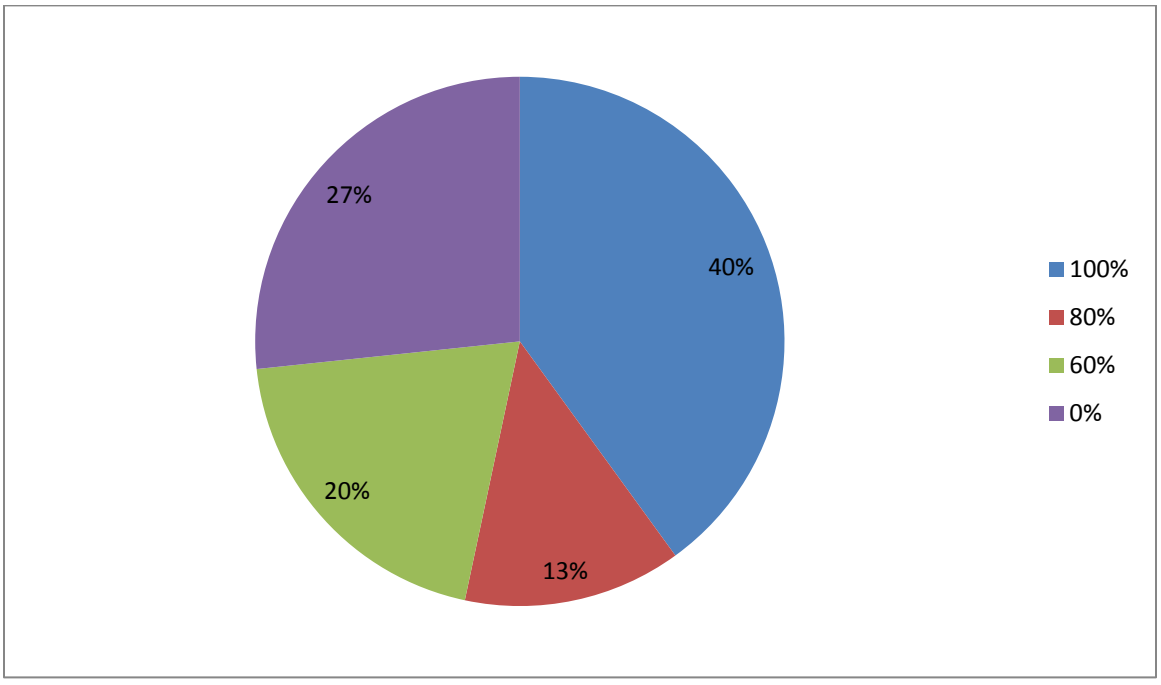

Figure 3. Percentages of the students' scores from the real photograph portion of the pre-test.

The post-test showed a 10% improvement from the pre-test. The average of the post test was 82%. The clip art portion of the post-test had an improvement rate of 12.7% and the average

score was 84%. The real image portion average was 80% and had an improvement rate of 17.33%. Post-test results are presented in Figures 4-6.

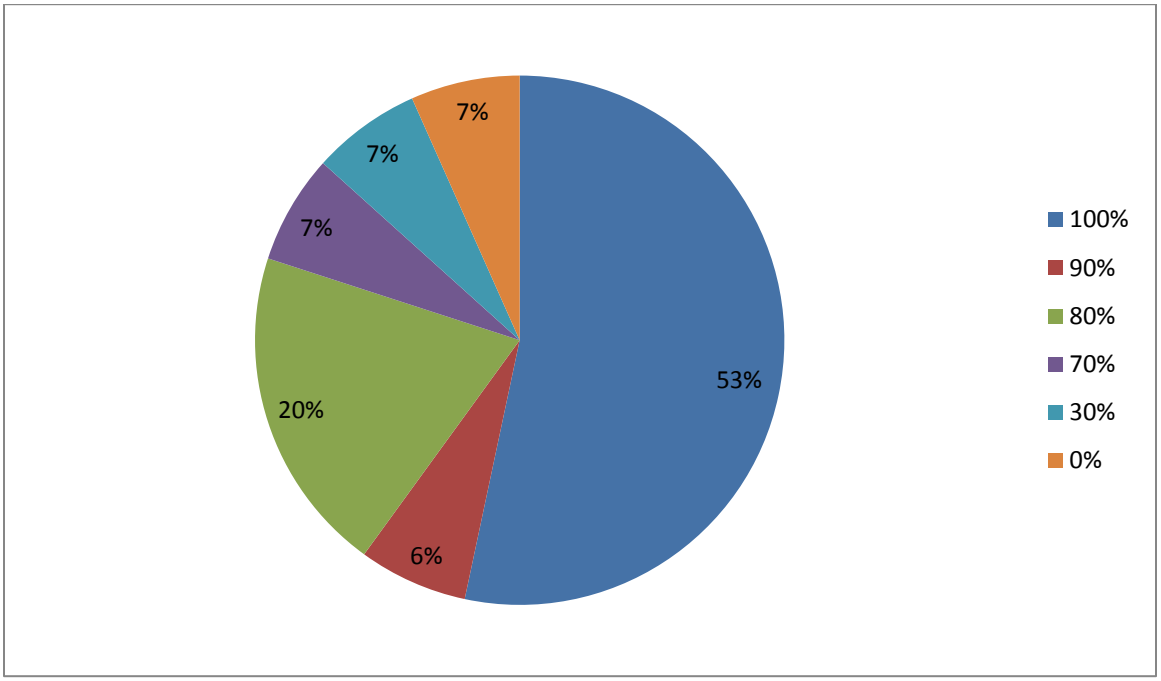

Figure 4. Percentages of the students' scores from the clip art images on the post-test.

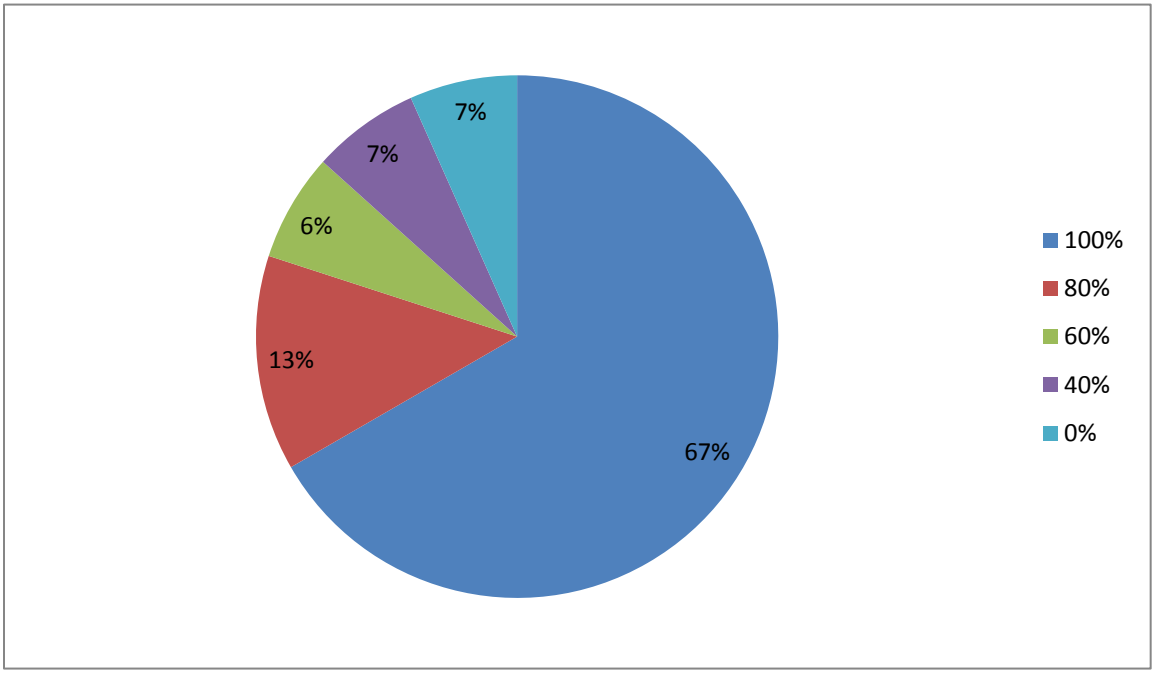

Figure 5. Percentages of the students' scores from the real photographs on the post-test.

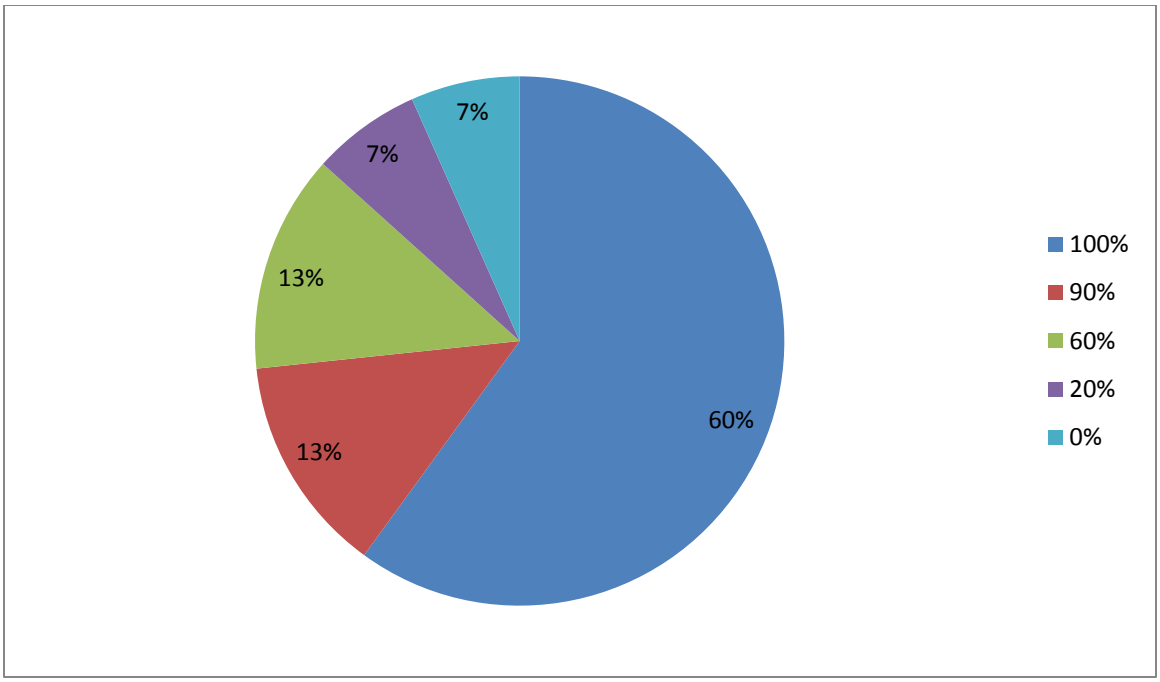

Figure 6. Percentages of the students' scores on the post-test, as a whole, for both the clip art portion and the real photograph portion of the post-test.

Week 2. The average score for the pre-test for week 2, based on a 100-point scale, was 59.33%. The average for the clip art images for the pre-test was 65.33% and the average for the real photographs was 53.33%. The common matching question missed was the police officer. Many students drew a line from the police officer to the dog leash. Pre-test results are presented in Figures 7-9. There was more of a variety of scores, when compared with the pre-test from the Week 1.

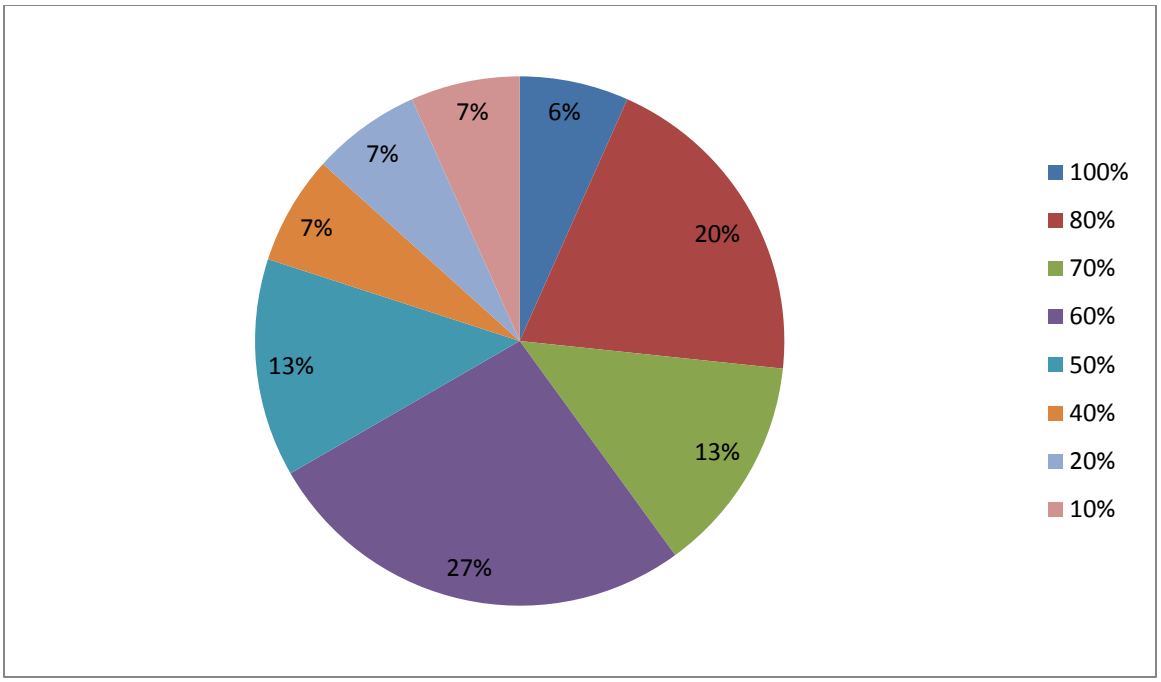

Figure 7. Percentages of the results from the pre-test by percentage of the students' scores.

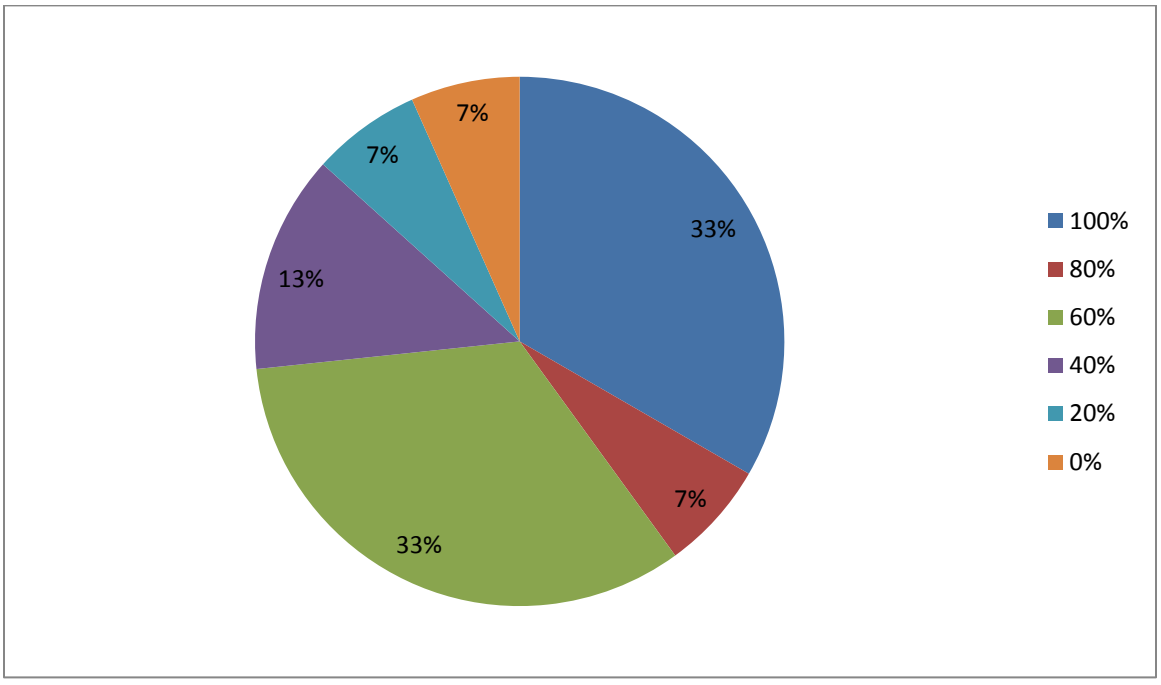

Figure 8. Percentages of the students' scores from the clip art images of the pre-test.

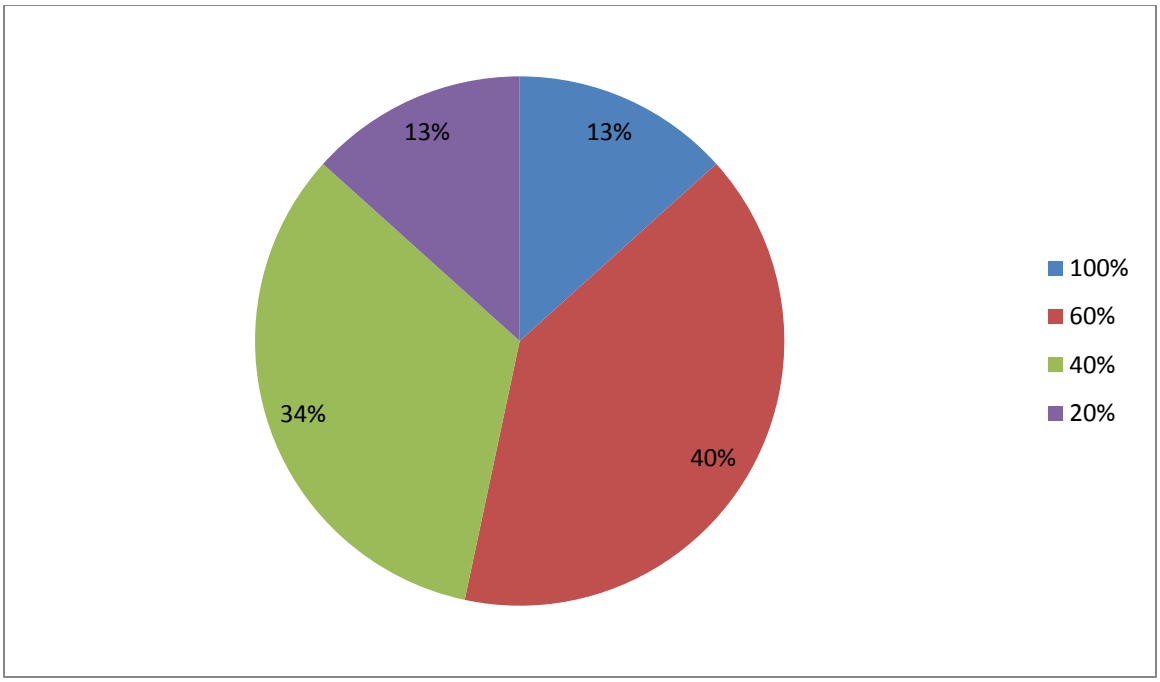

Figure 9. Percentages of the students' scores from the real photograph portion of the pre-test.

There was a 28.67% improvement from the pre-test to the post-test. The average of the post-test was 88%. The average of the clip art portion of the post-test was 78.7%, with an improvement of 13.34%. The real image portion of the real photograph portion of the test averaged to be 97.33%, with a 44% improvement rate. Post-test results are presented in Figures 10-12.

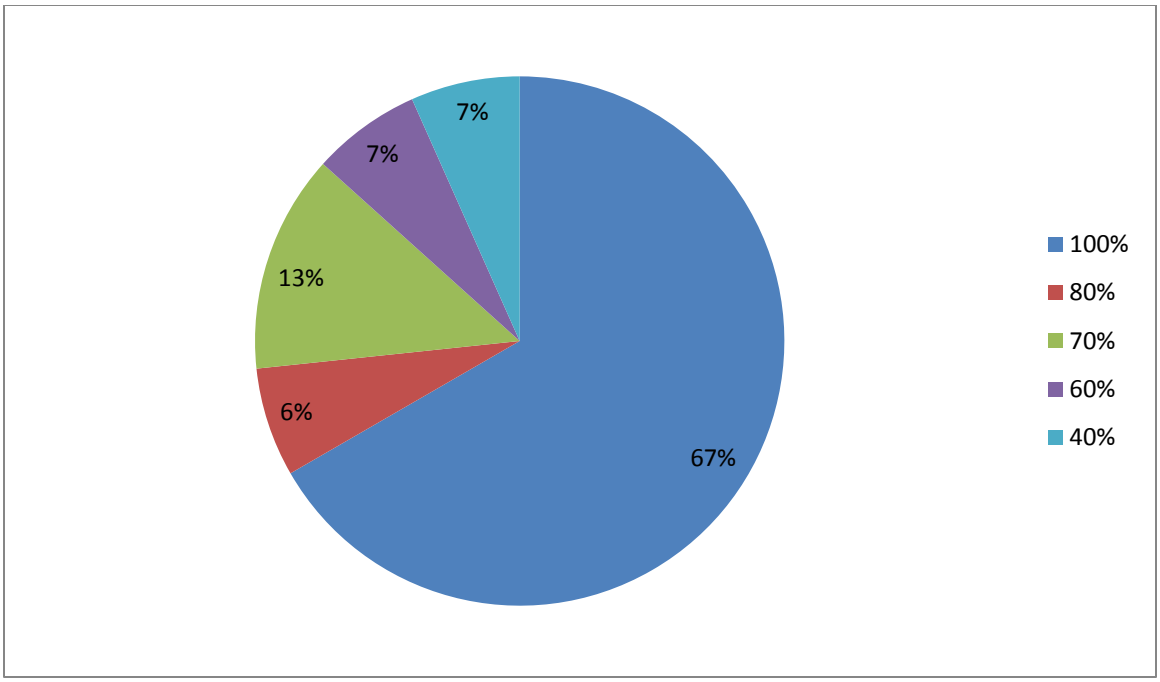

Figure 10. Percentages of the students' scores on the post-test, as a whole, for both the clip art portion and the real photograph portion of the post-test.

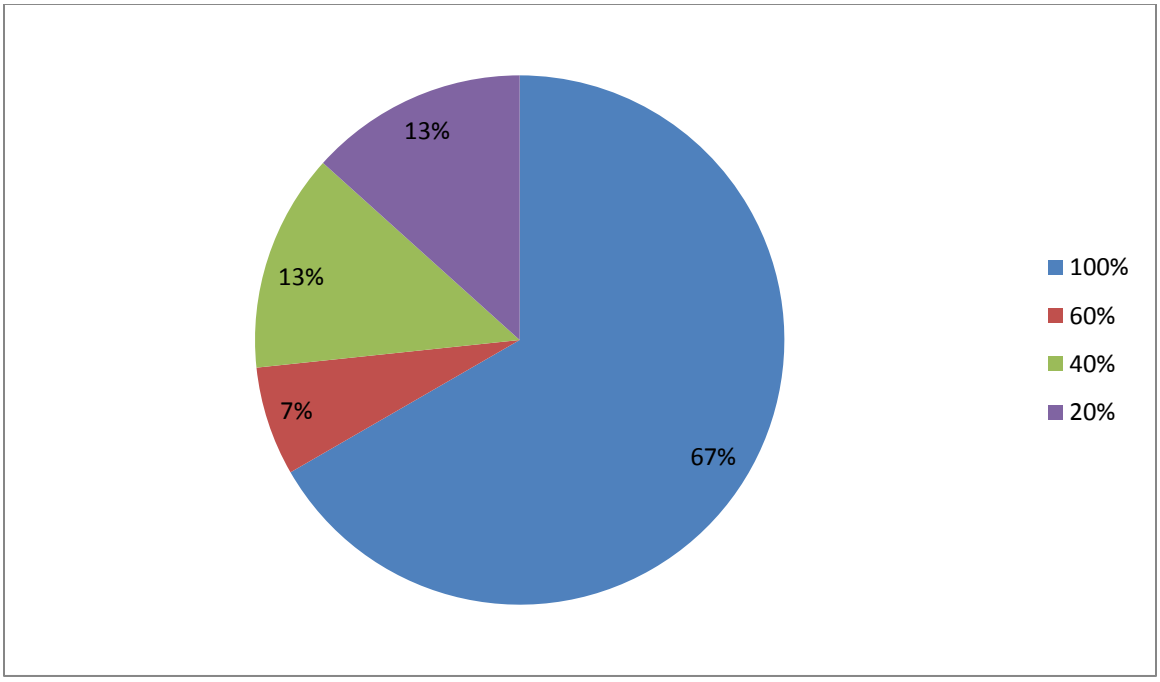

Figure 11. Percentages of the students' scores from the clip art images on the post-test.

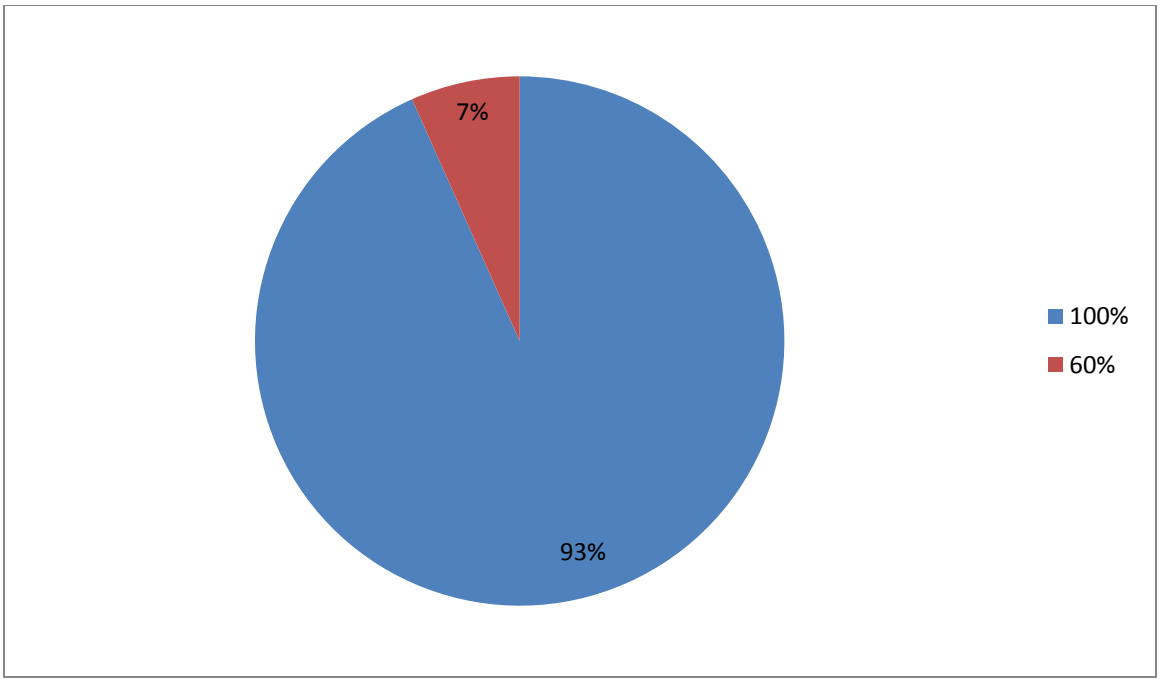

Figure 12. Percentages of the students' scores from the real photographs on the post-test.

Conclusions and Recommendations

Conclusions

The researcher hypothesized that the students could comprehend and apply more information to the images during the use of only the real-life images. The researcher hypothesized that the students could apply what they learned from the real-life images to the clip art images during the second week. The researcher also hypothesized that the students would not be able to match the real-life pictures as well, at the end of the first week, as they could at the end of the second week.

Throughout the research and based on the results, the researcher found that students could apply more information after being exposed to only real photographic images. The students seemed to retain and apply the most information when only exposed to nonfictional texts. The students applied what they learned from real photographic images and nonfictional texts to the

clip art portion of the post-test during week 2. The scores increased, and the overall scores of the test were better.

Based on the results, that students should be exposed to an equal amount of clip art and real photographic images, along with fictional and nonfictional texts. During the research, the researcher found that the students could relate to the clip art images and give examples of people in their everyday lives (e.g., Bob the Builder) when clip art images were shown to the students. However, for the students related to more of the real photographic images when they were showed to them (e.g.,. police officers, firefighters). However, the images the students were not as familiar with, the researcher found that the students could apply the real photograph images to the clip art images easier than they could apply the clip art images to the real photographs.

Recommendations

The researcher would recommend that all teachers and professionals in education should expose students to equal amounts of cartoon and real photographic images. The researcher believes that the overall scores of both weeks would have been higher if the students had been showed and used manipulatives containing both types of images. The researcher also recommends that the study be replicated in higher grades with different subjects. The researcher is unaware of any grant money for further research with this study or topic. Technology was used during this study and could be applied and used during future studies. The researcher would recommend technology for this study such as WebQuests, student-based research, and/or use in mini-lessons each day.

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The Visual Aspect of Vocabulary: Increasing Comprehension and Retention

Nicole Pinkerton

Education 5900, Fall 2010

The University of Tennessee at Chattanooga

The Institutional Review Board of the University of Tennessee at Chattanooga (FWA00004149) has approved this research project # 10-111.

Introduction to the Problem

This investigation is motivated by my background in, and passion for, the visual arts. I am interested in the relationship between visual images, language, and thought. Photographs are strong forms of *non verbal* communication, yet, we all know that "a picture is worth a thousand *words.*" Albert Einstein is quoted as saying, "If I can't picture it, I can't understand it." How and why do images help us to understand, comprehend, and remember? With these thoughts in mind, I seek to understand if, and how, visually viewing and visually representing might support the comprehension and retention of vocabulary.

Students are typically tested on vocabulary, after having only been provided with a verbal definition. From my experience, I believe it to be rare that students are provided with a visual definition of a word. This action research project focuses on the objective of teaching word identification strategies through a lesson called *Visual Vocabulary.* The lesson was designed to assist students in building their vocabularies by providing them with visual concepts for words. Visualization is a major comprehension strategy, and, I believe, that, if a child can relate a new word to a meaningful visual image, the chances of the child comprehending and retaining the word's meaning will increase.

Review of Literature

We can see, long before we learn to speak (Ehrenworth, as cited in Williams, 2007). To teach children about their environments, caretakers point to an object and provide the child with a verbal label. As a result, children begin "reading" images and pictures before they learn to read words. The images from our environments are filed in our minds, and serve as visual aides for thoughts. However, the concept of "reading" is widely viewed by students, parents, teachers,

administrators, and lawmakers as recalling vocabulary and translating printed text (Williams, 2007).

In the No Child Left Behind Act of 2001, reading is defined as "the making of meaning from print, with an emphasis on phonemic awareness, vocabulary, phonics, fluency, and comprehension." Visual literacy is not mentioned, and, so, according to national law, is not considered "reading." Nonetheless, humans have used images to communicate ideas and pass down important cultural information for thousands of years (Graham, as cited in Pantaleo, 2008).

Though not yet acknowledged by law, our understanding of "reading" is slowly progressing to include visual elements (Williams, 2007). Visual literacy is growing more and more essential in our culture. Williams (2007) argues that "images continue to evolve as the dominant text of our society" (p. 641). Because children are ever-increasingly exposed to "multimodal forms of texts," they are in need of a more advanced set of literacies (Kress, as cited in Williams, 2007, p. 636). However, to this day, "classroom literacy curriculum, as well as standardized testing, is overly concerned with the printed text" (Williams, 2007, p. 636).

It is becoming increasingly necessary for the definition of "reading" to become more than merely the decoding of words (Williams, 2007). Place, Hillyard, and Thomas (2008) argue that, "when visual images help students connect their own lives to classroom content, abstractions become tangible and student learning is deeper and longer lasting" (p. 74). Visual literacy, like written and spoken text, draws from prior knowledge to help process new information (Bisland, 2008).

Research indicates that viewing and creating visual images increases comprehension, and that imagery is actually essential to the act of thinking. Arnheim, author of *Visual Thinking*,

claims that "visual perception is not a passive recording of stimulus material but an active concern of the mind . . . mental images are a necessary precondition for thought" (Arnheim, 1971, abstract). His groundbreaking theory points to the idea that words are not essential to thought *but actually serve as labels for images.* When it comes to learning, words and images go hand-in-hand. Naughton (2008) explains that pictures assist learning because they "create a graphic representation of the overall point or meaning" of an idea or concept (p. 67). The literature, overwhelmingly, points to the certainty that using images will undoubtedly increase the chance that vocabulary will be tied to schema, and, therefore, tied to memory.

If a concept can be visualized, it becomes more palpable. We commonly say, "picture this" or "can you imagine?," when we want others to comprehend a novel idea. Essentially, this *is* "visualization." Onofrey and Theurer (2007) define visualization as "the ability to create mental images and associations using background knowledge" (p. 681). The memory must be activated, in order for a learner to internalize new vocabulary. If a word can be learned using images, it is more likely that it will be remembered (Holden, 1999).

Data Collection and Results

Data Collection

Subjects. This study was conducted in a kindergarten classroom in an urban museum magnet school. Permission for participation in this study was obtained for 15 out of the18 students. Included in this study were 13 Caucasian children (5 boys, 8 girls), 1 African American child (1 boy), and 1 Asian American child (1 boy). Their academic, cultural, and socioeconomic backgrounds were widely varied. Their ages ranged from 5 to 6 years old.

Of the 15 students, there was one with an established IEP. This student attended speech therapy on Mondays, Wednesdays, and Fridays, and had a personal assistant (included in IEP), due to physical disabilities.

Methodology. Prior to presenting this technique, I selected three words that I believed would be novel to kindergarten-aged students: ecstatic (very happy, very excited), ensemble (in this case, an outfit, or costume; clothes), and delicate (something breakable, fragile). Though the words chosen for this investigation were compiled from the popular children's book, *Fancy Nancy*, the students' performance on the oral section of the pre-test confirmed their general unfamiliarity with the definition for each word.

Each vocabulary word was represented by multiple images. Photographs and illustrations were selected from online sources. It was important that each image selected for use in this study be of high aesthetic caliber, as well as correlate to the specific concept. It was critical that each picture provide a visual description of the word it was designated to represent. Photographs were used for the pre- and post-tests. I created a montage of photographs and illustrations for each vocabulary word. These montages were presented to the children during the instructional portion of the study.

Students were assessed before, and after, I taught the new vocabulary. Two forms of assessment were utilized. First, for each vocabulary word, the students were presented with three photographs. Each student received a printout of these images, and was prompted to circle the image that they believed to best represent each vocabulary word. This portion of the assessment provided the students with an opportunity to identify the "pictorial description" of each word. Next, I collected individual student's verbal description of each word. I provided each student

with an opportunity to tell me what they thought each word meant. I recorded their verbal responses for each word.

Approximately 1 1/2 weeks after the pre-test, I administered the *Visual Vocabulary* lesson. I read the children's book, *Fancy Nancy*, to small groups of students during literacy center rotations. During the read-aloud, I stopped to focus on the three vocabulary words that were chosen prior to the reading: ecstatic, ensemble, and delicate. After the read-aloud, I showed the children a montage to visually describe each of these words, while integrating short verbal definitions. The students were given a chance to analyze each montage image, prompted to explain what they saw in these pictorial descriptions, and asked to close their eyes and "see" the vocabulary image their minds. I reminded them of details from the images, as they were visualizing. The students were provided with drawing materials, and asked to illustrate their own image for each word.

The applied strategy utilized all six language arts: listening, speaking, reading, writing, visually viewing, and visually representing. Students listened to instructions, viewed images, verbally described what they saw, read the words, wrote the words on their papers, and created original images. In addition, students were asked to visualize the presented images in their minds.

The post-test was identical to the pre-test. The students were, again, asked to identify the photograph that "looked" like each word. As with the pre-test, I asked each student to tell me what each word meant. Again, their answers were recorded.

Time Commitments. This study took place over the course of 1 1/2 weeks. Students were pre-tested on a Thursday morning. The aforementioned lesson was taught 11 days later, on a

Monday morning. The students were post-tested that Monday afternoon. The lesson, including the read-aloud, took approximately 45 minutes.

Results

Test Scores. Figure 1 presents the results from the pre-test given to the students prior to the lesson in visual vocabulary.

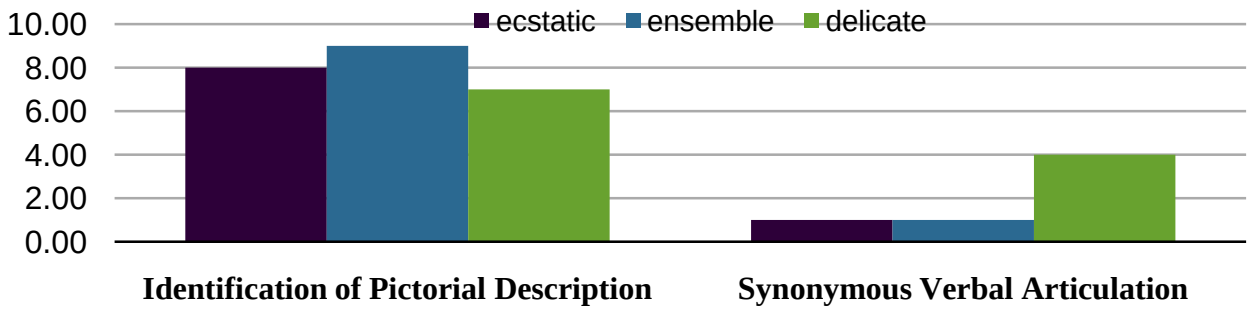

Figure 1. Visual vocabulary pre-test results.

When pre-tested on the vocabulary word "ecstatic," 8 out of 15 students circled a picture of a young boy, with an excited look on his face, leaping into the air. The seven other students circled a picture of a somber looking girl smelling a flower, a boy who appeared to be thinking, or nothing at all. One student replied with "excited," a synonym for ecstatic, when asked what he thought this word meant.

When pre-tested on the vocabulary word "ensemble," 9 out of 15 students circled a picture of a dress and three pairs of shoes. The six other students circled a picture of a coat hanger, a potted plant, or nothing at all. When asked for an oral description of the word, one student responded with a phrase relatively synonymous to the concept of ensemble (an outfit, or costume; clothes): "to dress up."

When pre-tested on the vocabulary word "delicate," 7 out of 15 students circled a picture of

a bunny next to a basket of eggs. The eight other students circled a picture of a stalking tiger, a weight lifter, or nothing at all. When asked for an oral description of the word, four students responded with words or phrases synonymous with delicate. Two students responded by saying "fragile," one student responded, by saying, "breakable," and the other student said, "if something breaks." One student responded, "happy."

Figure 2 presents the results from the post-test given to the students after the lesson in visual vocabulary.

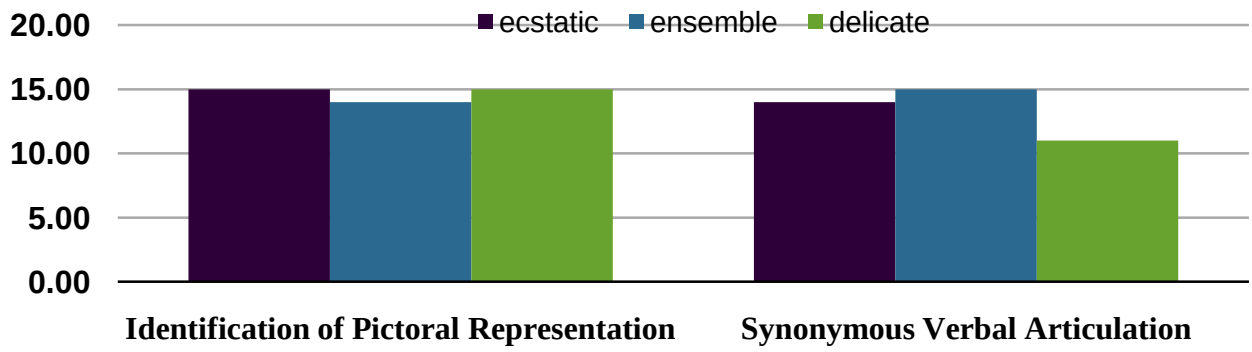

Figure 2. Visual vocabulary post-test results.

When post-tested on the vocabulary word "ecstatic," 15 out of 15 students circled a picture of a young boy, with an excited look on his face, leaping into the air. When asked what they thought this word meant, 14 out of 15 students replied with a synonymous word or phrase. One student responded, "jumping and having fun;" other responses were either "happy" or "very excited." Many students smiled and raised their eyebrows to demonstrate their understanding of "ecstatic."

When post-tested on the vocabulary word "ensemble," 14 out of 15 students circled a picture of a dress and three pairs of shoes. When asked what they thought this word meant, 15

out of 15 students responded with a synonymous word or phrase. Thirteen students responded, "clothes;" one student responded, "skirt." The one student who did not circle the correct picture (he circled a picture of a potted plant) replied with the most accurate verbal response: "a whole outfit" and "costume."

When post-tested on the vocabulary word "delicate," 15 out of 15 students circled a picture of a bunny next to a basket of eggs. When asked what they thought this word meant, 11 out of 15 students responded with a synonymous word or phrase. These responses included "very fragile," "easy to break," "breakable," and "if you drop/squeeze it, it will break." Of the four students who responded with a word or phrase that was not synonymous, one student replied, "happy;" one replied, "clothes;" one replied, "small baby;" one replied, "baby rabbit."

Figure 3 presents the mean number of students who correctly identified the pictorial representation of the vocabulary words, and who provided an accurate verbal articulation of the vocabulary words.

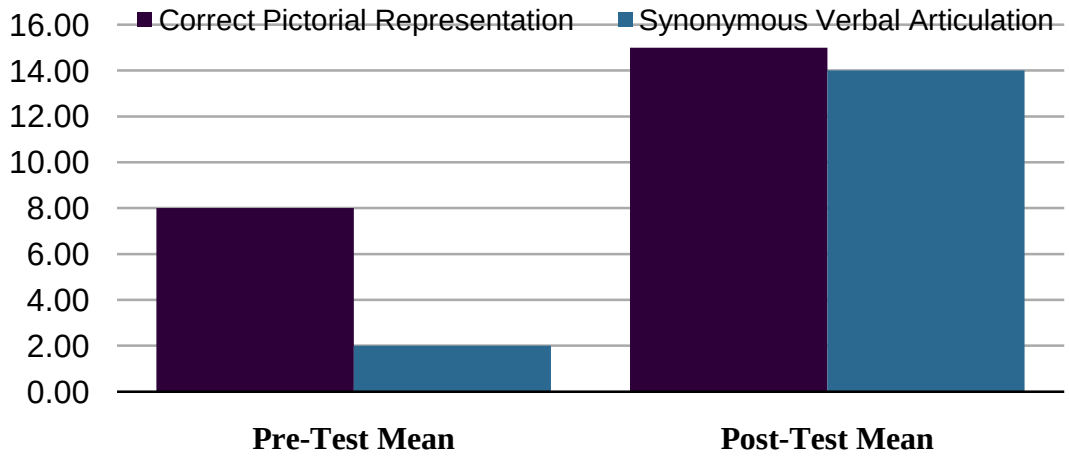

Figure 3. Visual vocabulary pre- and post-test class mean.

According to the results from the pre-test, an average of 8 out of 15 students were able to

correctly identify the pictorial representation of each vocabulary word. After the *Visual Vocabulary* lesson, 15 students were able to demonstrate knowledge of each word. It has been determined that approximately seven students gained an understanding of each vocabulary word, and demonstrated this understanding by correctly identifying the pictorial representation of each vocabulary word.

According to the results from the pre-test, an average of two students demonstrated knowledge of the vocabulary word by providing synonymous verbal articulations of each word. After the *Visual Vocabulary* lesson, 14 students were able to demonstrate knowledge of each word. It has been determined that approximately 12 students gained an understanding of each vocabulary word, and demonstrated this understanding by providing a synonymous verbal articulation of each word.

Conclusions and Recommendations

Conclusions

The findings from this study confirm my belief that, if a child can relate a new word to a meaningful visual image, the chances of the child comprehending and retaining the word's meaning will increase. Furthermore, the general opinion of professionals in this area of study supports the theory that comprehension and retention of linguistic information is increased through the use of highly aesthetic, and concept specific, visual representations.

After the lesson in *Visual Vocabulary,* the majority of students tested were able to demonstrate a clear understanding of each word's meaning. I surmise that, because students were *shown* what each word meant, as well as provided with a brief verbal definition, they were better able to articulate the overall concept of a word. This strategy provided students with a mental visual aide for a linguistic concept.

Recommendations

Though it is clear that this lesson dramatically increased students' understanding of the vocabulary, the extent to which the images *alone* increased comprehension and retention is debatable. Without having had a control group of any kind, it is unclear as to whether the students would have been able to provide a description of each word after having only viewed the images. Therefore, I would recommend that further research be conducted using a control group and two experimental groups: a control group to be taught the vocabulary using words alone, an experimental group to be taught vocabulary integrating images and words, and another experimental group to be taught vocabulary using only images. This study took place over the course of approximately 11 days with a group of 15 children. In order to gather a larger data set, I recommend that further study into this area be conducted over the course of 1 school year, and with a population of at least 30 students.

Based on my findings, I recommend that professional development activities for educators focus on the benefits of using quality images to tie linguistic information to schema, and, therefore, to memory. Caldecott Award-winning children's books, online image banks, and photographs from *National Geographic* are examples of quality image sources that can provide students with a visual concept base. I urge professional educators to provide their students with opportunities to be creative by incorporating new linguistic information with the visual arts. I encourage teachers to allow students the opportunity to regularly view and create visual material in an effort to broaden their understanding of abstract concepts. I recommend that this strategy not be limited to teaching topics in the language arts, but, rather, expanded for use in subjects across the curriculum.

Technology can be of great assistance for teachers who want to use visuals to enhance abstract linguistic information, such as novel vocabulary. Online image banks provide teachers with access to countless quality images that can be used to enhance a vocabulary lesson. In addition, a classroom Flip video camera can be utilized to allow students to record vocabulary videos that feature student-created performances, costumes, and illustrations. Teachers can also insert illustrations and photographs, or student-created images, into an interactive PowerPoint lesson designed to teach vocabulary, or other abstract linguistic information. Furthermore, computer programs exist that allow students to draw and print images. This digitally-produced student work can accompany and enhance a vocabulary definition. In today's classroom, teachers should strive to incorporate technology daily to encourage creativity and enhance linguistic information in lessons across the curriculum.

This study focused on the importance of incorporating visual images to enhance understanding of vocabulary, and other abstract linguistic information. This study also accented the importance of recognizing visual literacy as a legitimate literacy in the classroom, as well as in educational policy. Grant money is available to support further research into how and why viewing and creating visual images support student understanding. The Spencer Foundation (2010), for example, provides funding of up to $50,000, for studies that ask questions "that are grounded directly in teaching practice, as well as in research about important aspects of teaching and learning processes that hold promise for enriching opportunities to learn and for guiding informed policymaking." Furthermore, the National Art Education Foundation (NAEF, 2011) offers the Mary McMullan grant of $2,500 for projects that promote art education as an integral part of the curriculum. In addition, ING, provider of retirement and insurance products and services, awards grants of $2,000 to $25,000 to educators who have initiated or would like to

pursue projects that are innovative, are creative, and have the ability to positively influence the students.

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Increasing Grammar Accuracy in the TPRS Classroom

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Education 5900, Fall 2010

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The Institutional Review Board of The University of Tennessee at Chattanooga (FWA00004149) has approved this research project # 10-121.

Introduction

Subject-verb agreement and proper verb conjugation are indicators of fluency in the Spanish language, yet many native English-speakers have trouble applying correct grammar in speech and writing. In traditional foreign language textbooks, grammar exercises such as fill-in-the-blank drills are implemented, and students must memorize grammar rules by rote. However, few students are able to internalize these rules and apply them in real-life situations, as these exercises are inauthentic.

As a Spanish teacher, I watched my students struggle with traditional language instruction, and so I turned to a method known as Teaching Proficiency through Reading and Storytelling, or TPRS. The purpose of TPRS is to use storytelling as a means to help students hear, process, and use more authentic language. High-frequency vocabulary and structures are used, along with student input, to create funny and interesting stories, and are instilled through a system of repetitious questioning. My Spanish classes were more lively, engaging, and successful than before, yet I still saw lots of basic errors in subject-verb agreement and verb conjugation in my Spanish II classes.

Statement of the Problem and Context

The purpose of this study is to determine which method, if any, of grammar instruction would increase both subject-verb agreement and proper verb conjugation in Spanish II students. This project will explore increasing accuracy through point-of-view exercises, which are recommended by TPRS experts, and grammar drills, more common in the traditional foreign language classroom.

Research Questions

- How will perspective exercises, in which students retell a story from another point of view, affect grammar accuracy?

- How will grammar drills affect grammar accuracy?

Review of Literature

The state of Tennessee requires that every high school student pass at least 2 consecutive years of a foreign language, in order to graduate. This means that foreign language instruction must be designed to cater to a wide variety of student skill levels and abilities, which is a challenge for any teacher. With the advent of No Child Left Behind legislation, foreign language teachers now find that they have less instruction time, as well, especially amongst high-minority schools (Rosenbusch, 2005). Recent national surveys have indicated a similar disparity in professional development for foreign language teachers:

> Principals of low-minority schools were more likely to report increases in the number of teachers and amount of time devoted to FL (foreign language) professional development; however, principals of high-minority schools reported more decreases than increases in both numbers of teachers and professional development time. (p. 252)

Because more students of differing abilities must be taught a foreign language in less time, teachers must seek new and more efficient ways to teach foreign languages. Research shows that the traditional approach to foreign language instruction, which focuses on textbook exercises and memorization, is neither efficient nor enjoyable. "Grammar was the most important part of learning Spanish or any other foreign language and students were forced to memorize hundreds of vocabulary words and word tenses before they practiced the actual language," (p. 9) reported Kariuki and Bush, in their 2008 study, questioning the effectiveness of traditional foreign language instruction.

A 1994 study revealed that the goal of developing oral proficiency in foreign languages was not being met in Illinois. Conner found that oral proficiency increases as a result of teachers

speaking the target language more often in the classroom. “The percent of teacher talk in the target language that is used in the classroom needs to increase, particularly in junior high and first- and second-year high school classes” (Conner, 1994, p. 1). While the study did not indicate which methods Illinois teachers were using, it does focus on the importance of hearing the target language.

Total Physical Response

In the 1970s, Dr. James Asher (2009) developed and popularized a method of foreign language instruction called Total Physical Response (TPR), in which a teacher demonstrates vocabulary in the target language using gestures, props, and commands. For example, the teacher would teach the word *lápiz*, which means “pencil,” in Spanish, by holding a pencil and saying the word, and then giving the pencil to students and instructing them to point the pencil, bite the pencil, drop the pencil, and other actions, both mundane and unusual. The repetition of the word reinforces vocabulary acquisition, and the demonstrations maintain a high level of interest (Kariuki & Bush, 2008).

Storytelling

Other foreign language professionals have found that storytelling is an effective method of instruction. Setsuku Toyama, an education expert in Japan, advocates telling stories to teach children and adults English. "Sometimes I use a story from the English Time textbook [of which Toyama is a coauthor]. Sometimes I use real picture books like *The Very Hungry Caterpillar*. Sometimes I just make up a story off the top of my head” (Mizui and Matsuzawa, 2006, p. 15). Toyama also recommends retelling familiar fairy tales in the target language.

Garcia’s study reveals that storytelling is an effective method of instruction for college students. When she assigned readings from children’s books in Spanish, rather than textbook

readings, she found attitudes improved. Student surveys revealed that the juvenile texts were perceived as more simple than, yet just as challenging as, readings from the text book (Garcia, 2004).

TPRS is a method of foreign language instruction, developed by Blaine Ray, which is based upon Asher's TPR method. In TPRS, students read, interpret, and act out short stories in the target language, that use a high level of repetition to build vocabulary, and bizarre, surprising scenarios to add entertainment value to make a story, and its vocabulary, more memorable (Ray & Seely, 2003).

In Zucker' study of foreign language teachers' attitudes and practices involving grammar, she found that most teachers "tend to teach grammar concepts explicitly (often in English), and treat grammar as course content, rather than as a means to an end---i.e., communicative competence" (Zucker, 2005, p. 1). The teaching of grammar in English runs contrary to Conner's assessment that developing oral proficiency involves the teacher speaking more often in the target language. (Conner, 1994). TPRS, however, softens the emphasis on grammar in favor of vocabulary acquisition. "It is highly unlikely the (grammar) rules learned will help much in monitoring speech unless the student has already acquired a lot of language," (Ray and Seely, 2003, p. 118). Because students listen to more of the target language, Ray says, they develop a "feeling of correctness" (Ray and Seely, 2003, p. 118) for the proper grammar of the target language, and are able to produce the language more correctly than their traditionally-instructed peers.

TPRS Research

TPRS has been useful outside the classroom, as well. In a 1999 conference, Cantoni advocates using the method to teach Native Americans their native languages, which lack typical

textbooks. “TPR-S emphasizes a positive, collaborative, and supportive classroom climate in which Native children can develop increasingly complex skills in speaking, reading, and writing their tribal language” (Cantoni, 1999, p. 1).

Kariuki and Bush explore the differences between a two high school Spanish I classrooms: one taught through traditional foreign language methods, which emphasize memorization of vocabulary and grammar rules, and one taught through the TPRS method developed by Ray. They found that not only did the TPRS class have higher scores on tests, but that they also had better attitudes about learning. “The students were excited to enter the classroom and volunteered new gestures for the new vocabulary words and volunteered to be a part of the mini stories that were acted out. They were not afraid to fail” (Kariuki & Bush, 2008, p. 19).

In a similar study, among students learning Italian, however, Perna came to a different conclusion. Perna’s research did not just cover traditional and TPRS methods, however. She also compared the two methods to instruction based on a student’s particular learning style. “These findings supported the effectiveness of learning-styles instruction over two popular methods of foreign-language instruction-traditional and TPRS” (Perna, 2007, p. 1). While students do tend to succeed when a teacher targets their specific learning styles, it is doubtful that the approach is practical in the foreign language classroom, especially when one teacher must accommodate a variety of learning styles.

In a 2003 action research project, Skala compared TPR, TPRS, the literature approach, and grammar exercises from a text book in a first-year, high school French class to determine which method improved student attitudes and achievement the most. She measured not only student achievement and enjoyment levels, but also student perception of the effectiveness of

each method. “The students reported their lowest satisfaction levels with their test scores at the end of the grammar unit and perceived the method as the least effective way to learn French” (Skala, 2003, p. 39). Meanwhile, TPR and TPRS earned high marks among students. “It was a surprise at how effective and enjoyable TPRS scored on student self-reports,” Skala wrote (p. 50). “Unlike many of the other techniques used to teach French, TPRS involves multiple steps and often takes a significant amount of time for a teacher to gain mastery.”

Data Collection and Results

Participants

The study will take place at a small, suburban middle/high school in a rural area of East Tennessee. The researcher will focus on one Spanish II classroom, consisting of 21 students in Grades 9-12. The students are primarily from a middle-class background. Nineteen students are white (90.5%) and 2 students are black (9.5%). One student has an Individualized Education Plan (IEP) for a learning disability (4.8%) and one student is classified as gifted (4.8%).

Methodology and Intervention

The classroom contains an 18-foot-long verb wall, in which each verb tense is spatially arranged (past, present, and future), and regular and irregular verb endings are color-coded, according to subject pronoun. This visual representation of Spanish grammar is used in all discrete grammar explanations, whether as part of a grammar side note during storytelling, or a longer lecture on a particular tense. Students may also refer to the verb wall during writing assignments and other classroom activities.

The study will examine two types of grammar intervention: discrete grammar instruction, accompanied by verb drill practice, and point-of-view exercises, in which students rewrite a story from another perspective. These interventions will take place, along with regular

storytelling and reading activities, over a 6-week period. The class will meet daily for an 85-minute block.

Data Collection

Students will take a pre- and post-test, consisting of a grammar assessment and writing prompt (see Appendix A). The pre-test will be administered, and then the two interventions will be implemented alongside normal TPRS instruction. Scoring for the pre- and post-assessments will include finding and counting errors in agreement, conjugation, usage, and irregular verbs on the writing prompt and grammar assessment. Examples of usage errors include using a pronoun as a stem, instead of part of the infinitive, and using –AR endings instead of –ER endings. Examples of irregular verb errors include not using an irregular stem, and applying regular verb rules to wholly irregular verbs such as *ir*.

Results

While the students had become familiar with the past tenses in speech, they were not accustomed to using the past tenses in writing, at the time of the pre-test. Because of this, many test items were not attempted. After intervention, students significantly improved in the areas of verb conjugation and subject-verb agreement. However, their errors in usage and irregular verbs increased slightly. They also became more confident in conjugating verbs, attempting almost all the items.

The writing pre-test results show that students have more agreement errors when using the language holistically, rather than in a formulaic way. However, they are far more likely to use irregular verbs correctly in all tenses in their writing. Students improved slightly in verb conjugation and subject-verb agreement after intervention, but usage errors increased slightly. Results are presented in Figures 1 and 2.

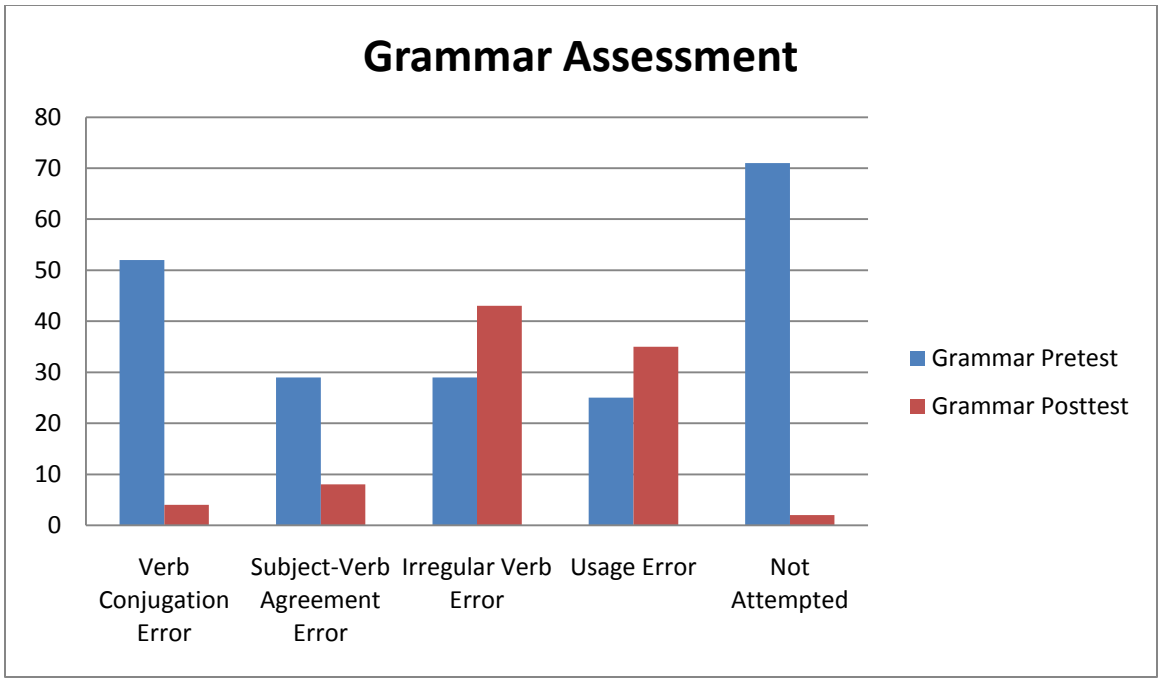

Figure 1. Grammar assessment pre-test and post-test results.

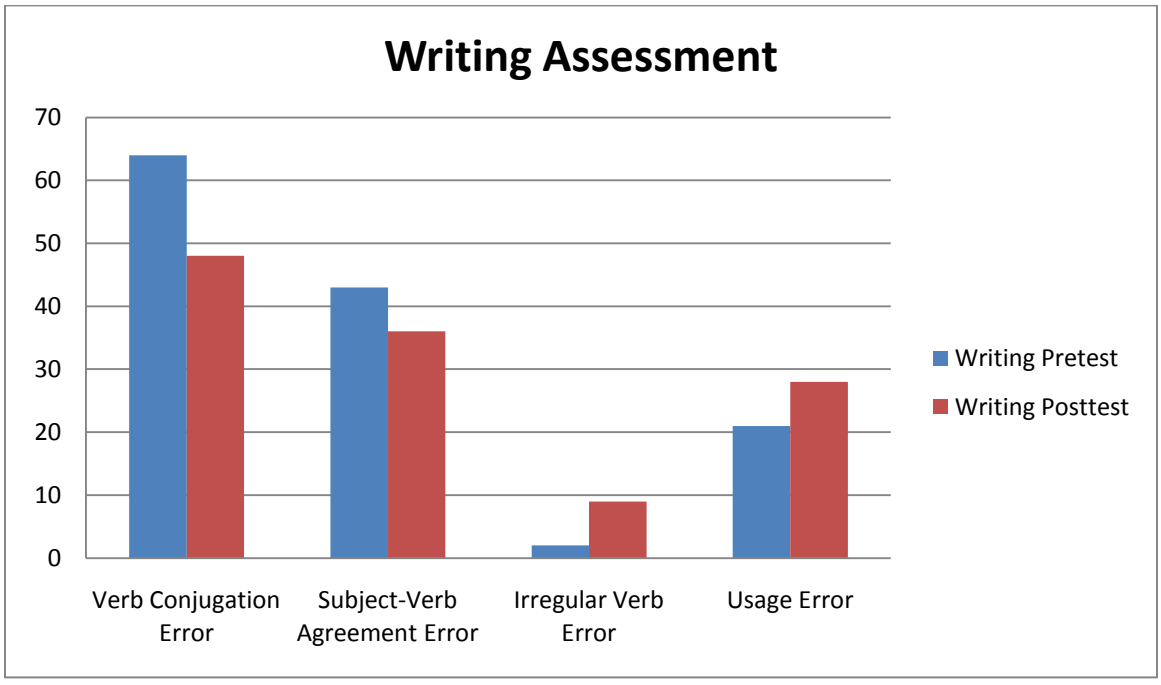

Figure 2. Writing assessment pre-test and post-test results.

Conclusions and Recommendations

Conclusions

While discrete grammar instruction seems to have improved students' ability to correctly conjugate verbs according to a given subject, those improvements did not translate to the students' writing samples. Throughout the study, the participants were extremely reliant on the classroom's color-coded verb wall, and remained prone to errors in applied language, despite having access to this resource. This suggests that, even though they are in their second year of language study, they are not yet capable of consistently applying grammatical rules to verbs.

However, the students' correct use of irregular verbs in their writing samples suggests that students gradually acquire an "ear" for language, and for what sounds right. For example, while many students, relying on the verb wall, failed to produce the irregular form of *decir* (to say) in the preterit tense, those same students would accurately use the irregular form *dijo* in writing. This is probably because, in both oral and written stories, they had only seen and heard the irregular form. The word *deció,* as the verb would appear if one were to follow the conjugation rules for regular verbs, does not exist for them, and so they do not produce it.

It is more difficult to judge the effect that perspective retells had on students' verb accuracy. Changing point-of-view is a common grammar strategy in TPRS classrooms, yet retelling or rewriting an entire story from another perspective seemed confusing for students. The preponderance of subject-verb agreement errors in their writing pre-test and post-test shows that students do not yet connect with the fact that verb endings affect verb meanings.

Recommendations

Foreign language teachers should strive to bring as much comprehensible input to students, as possible. It is essential that students develop an ear for the language before they be taught the rules behind it. Traditional verb drills and worksheets are not recommended, as they

do not provide any meaningful source of input or practice. Perspective retells should be very short and frequent, with a focus on how different verb forms convey different meanings.

Future researchers may look into other strategies to improve verb accuracy. For example, the tendency with storytelling is to always use the third person singular forms of verbs. Rather than expecting students to make the jump from third person singular to other perspectives, researchers could study the benefits of telling stories from other points of view. Another strategy that is common in TPRS is the grammar pop-up, in which the teacher emphasizes grammar meaning in quick, 5-second explanations, during storytelling. An example might be: "How would you say *I want*?" Research could be conducted about the frequency or quality of grammar pop-ups, and how they affect verb accuracy. However, nothing is a substitute for students' internalizing grammar through comprehensible input.

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Appendix A

Grammar Assessment Pre- and Post-test

Directions: Write the correct conjugation of the verb.

Present tense:

1. yo + caminar _____
2. tú + ver _____
3. nosotros + pasar _____
4. Ustedes + bailar _____
5. ella + tocar _____
6. él + cantar _____
7. yo + querer _____
8. Usted + saltar _____
9. ellos + estar _____
10. tú + tener _____

Preterit tense:

1. ella + comer _____
2. yo + ir _____
3. ellas + bailar _____
4. nosotros + saltar _____
5. tú + beber _____
6. Usted + hablar _____
7. ella + decir _____
8. nosotras + vivir _____
9. Ustedes + nadar _____
10. yo + mirar _____

Imperfect tense:

1. nosotros + pagar _____
2. yo + beber _____
3. él + salir _____
4. tú + correr _____
5. Ustedes +dar _____
6. tú + estudiar _____
7. Usted + bailar _____
8. yo + ir _____
9. ella + jugar _____
10. nosotros + escribir _____

Writing Prompt: Pre- and Post-test

Write an original story in the past tense in Spanish. Your story must include at least two characters, and at least two instances of dialogue.

Effective Differentiated Instructional Strategies of Middle Grades' Mathematics Instructors

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Education 5900, Fall 2010

The University of Tennessee at Chattanooga

The Institutional Review Board of The University of Tennessee at Chattanooga (FWA004149) has approved this research project # 10-148.

Introduction to the Problem

As a graduate student seeking initial licensure for middle grades curriculum and instruction, I am interested in differentiated instructional methods as they are designed to inspire thinking, facilitate learning, and enhance academic performance in all students. Karp and Voltz (2000) advocate differentiation strategies because of the flexibility in selecting instructional methods to support students' diverse learning needs. Strategies include pre-testing to assess knowledge in order to present an effective lesson, grouping students based on mixed-abilities, designing assessments that vary in complexity, and continually assessing students' progress (Karp & Voltz, 2000; Tomlinson, 2005).

The objective of differentiated instruction is to create lessons and assignments to benefit students' learning styles and developmental readiness (Karp & Voltz, 2000; McGhie-Richmond, Underwood, & Jordan, 2007; Rock, Gregg, Ellis, & Gable, 2008; Voltz, 2003). Tomlinson's (2005) research reveals that, through differentiated techniques, students learn the basic elements of a concept by completing an assessment which elevates their understanding to grade-level standards; some students advance beyond grade level because they are ready for accelerated, thought provoking assignments to maintain their interest and attention. Most students' progress falls between these levels; teachers must provide challenging instruction and assignments to expand the students' learning scope.

The purpose of this study is to understand effective, differentiated instruction strategies in teaching middle grades mathematics. A study by Rock et al. (2008) found that students not exposed to differentiated instruction performed at a 79% proficiency rate on statewide standardized tests. However, students scored at a 94.8% proficiency level after differentiation techniques were implemented and used over a 5-year period, thus reinforcing the importance of

using diverse methods to teach all students. According to the National Council of Teachers of Mathematics (2000), middle school students need a strong foundation in mathematical concepts in preparation for higher level courses (Flores & Kaylor, 2007). By studying techniques now, I will become familiar with the process and comfortable in using these strategies in my first years as a new teacher. This will allow me to motivate and meet the academic needs of the various levels of learners.

Research question

Which differentiated instructional methods support academic growth in mathematics, within the broad developmental ranges of middle grades students?

Limitations

The reader should consider that other schools' environments may present a unique set of circumstances in which other differentiation techniques may be required. Additionally, similar differentiated instructional and assessment methods were administered in three Algebra I classes. Distinctions in assessment results may be more noticeable by comparing scores over the same material from previous years' data.

Review of Literature

No Child Left Behind legislation holds teachers accountable for all students mastering high curriculum standards; the 1997 Individuals with Disabilities Education Act integrates learning-disabled students into general classrooms (Rock et al. 2008; Voltz, 2003). Differentiated methods are tools for teachers to meet the instructional needs of advanced, grade-level, learning-disabled, and low-achieving students in mixed-ability classrooms that help them accomplish their learning goals (Karp & Voltz, 2000).

In the quest to understand how middle grades mathematics instructors vary instruction, an examination of differentiation's components and techniques must be explored. Various researchers agree that instructors must focus on a lesson's central concept and skills to meet grade-level curriculum standards on national, state, and district levels before modifying instruction to low-performing students and to advanced learners (Reed, 2004; Rock et al. 2008; Tomlinson, 2005). In planning instruction, teachers should consider the strengths, abilities, and the demographics of students (Rock et al. 2008). They must select activities that reinforce concepts by implementing varied instructional methods to accommodate the learning opportunities for all students (Rock et al. 2008). This is exemplified by having students complete graphic organizers of vocabulary terms, tactically construct models, and write about concepts to promote learning at varied levels of complexity (Rock, Gregg, Ellis, & Gable, 2008).

Continual formative assessments measure student understanding and mastery of content, as well as monitor the effectiveness of instruction, while detecting academic needs (Ohlson, 2007; Rock et al. 2008; Tomlinson, 2005). The Rock et al. study determined that formative assessments informally measure knowledge and monitor comprehension with unit pre-tests, oral questions, exit slips, guided practice, and writing about skills and concepts during the instructional period of a unit (2008). Instructors monitor learning activities with observations and questions to assess students' knowledge, and then adjust content and assignments to accommodate individual abilities (Rock, Gregg, Ellis, & Gable, 2008; Tomlinson, 2005). Summative assessments are formal measurements of students' performance against states' curricular benchmarks in the form of unit examinations and standardized tests (Rock et al. 2008). Grouping students by mixed academic abilities exposes lower-performing students to higher level thinking strategies used by advanced learners (Rock et al. 2008). Voltz's (2003) study

indicates that instructors should monitor progress when grouping mixed-ability students to ensure that all contribute ideas to finding a solution. Instructors group by integrating students of different academic levels with the objective that everyone participates in the problem solving process (Tomlinson, 2005).

Constructivist instruction is synonymous with inquiry learning, whereby students form knowledge by exploring the problem and relating knowledge to solve open-ended activities designed by the teacher, while interacting with a group of peers. The instructor offers guidance but the goal is to promote independent learning (Karp & Voltz, 2000; Rock et al. 2008). The case studies of Karp and Voltz (2000) found that constructist instruction, where teachers design activities for students to actively discover knowledge and draw conclusions, supports independent learning, which facilitates students' advancement to higher levels of thinking. Karp and Voltz (2000) discovered that, while some students are capable of independently forming knowledge, other students need explicit instruction to solve problems. Karp and Voltz (2000) and Voltz (2003) found that characteristics of direct instruction, such as clearly explaining concepts and procedures, as well as demonstrating examples, increased understanding with positive academic results for learning-disabled students because content and procedures are organized and structured. Flores and Kaylor (2007) assessed a direct instruction intervention for remedial lessons on fraction skills for middle grades students who were at-risk for failure in the general education mathematics class. They found effective direct instruction techniques, such as clear communication, systematic modeling, and providing guided and independent practice, increased academic performance of at-risk students.

Research on teaching in inclusive classrooms indicated that effective teaching strategies blend elements of direct and inquiry instruction methods (McGhie-Richmond et al. 2007). The

results of the study included stating expectations, defining routines for the beginning and ending of the lesson, circulating among students during practice, modeling procedures to correct errors, and providing practice until students mastered the problems. The information obtained from this literature review leads to the understanding that elements of direct instruction, as well as components of constructivist instruction, should be implemented alternatively to educate mixed-ability students in the general classroom setting.

Data Collection and Results

Data Collection

Participants and setting. The researcher, as a component of student-teaching, instructed Algebra I lessons to three classes of students at a Paideia magnet school of approximately 700 students enrolled in Grades 6 through 12 in a mid-sized, southeastern city. The school's demographic profile indicates the student body is 52% female and 48% male, as well as 42% African American, 52% White, 4% Asian, and 2% Hispanic. The principles of Paideia seek to incorporate 10% of instructional time on didactic transfer of facts, 45% of class time on intellectual coaching of skills, and 45% of class time on discussion of concepts. Seventy-one students receive Algebra I instruction daily in 85-minute blocks. The classroom is equipped with a Promethean interactive board, document camera, graphing calculators, and individual dry-erase boards. The technologies allow for PowerPoint or flipchart presentations of lessons, interactive practice, and educational games.

In the quest to determine how mathematics teachers effectively implement differentiated instructional techniques with middle grade students, parents and students were provided information about the study's purpose and benefits. Sixteen of 24 students in Block I, 15 of 23 students in Block II, and 11 of 24 students in Block III agreed to participate in the research.

Mathematics accommodations for students with Individual Education Programs (IEP) for low-performing students specify employing visual models and cooperative learning strategies, while providing succinct directional steps and checking often for understanding.

Instruments. The researcher invited the cooperating teacher to complete a survey to determine effective differentiated methods to be implemented into instruction. Tools for collecting data on differentiated instructional strategies included a unit pre-test to determine students' background knowledge and allow the researcher to design meaningful instruction for the unit. Upon completion of the unit, a post-test was administered to ascertain students' mastery of skills specified by the Tennessee curriculum standards.

Methodology. The researcher conducted a study by implementing differentiated instructional methods in a unit termed the "Building Blocks of Equations" with three Algebra I blocks over a 2-week period. The unit was developed around the Tennessee curriculum standards, and the Saxon *Algebra I* textbook which introduces new concepts and skills while reinforcing the practice of previous skills within each lesson's problem set. The unit emphasized practice with one-step and two-step equations with whole numbers, integers, and fractions by applying the additive and multiplicative propeties of equality. Additionally, the unit focused on solving equations with the distributive property, as well as practicing the product rule for exponents, fractional parts of numbers, and functional notation.

Before initiating the unit, the researcher surveyed the cooperating teacher regarding strategies that support diverse students in an inclusive classroom. The cooperating teacher agreed that utilizing graphic organizers facilitates comprehension of mathematical concepts and terms, especially with the implementation of daily word wall activities. The researcher provided vocabulary templates for students to write the definition and give examples of algebraic

properties. When the researcher modeled example equations, she would query students about which property was applied to solve a particular step.

The cooperating instructor strongly agreed with the statement that presentations on the Promethean interactive board, lesson activity sheets, and exit slips aid students with a visual learning preference. The researcher introduced unit concepts with a PowerPoint presentation and modeled problems for students to write on activity sheets. The cooperating teacher agreed with the statements that open-ended questions support learners with an auditory preference and educational manipulative objects assist students with a tactile preference. The researcher continually asked open-ended, probing questions, throughout the lesson, about concepts and problem solving to support auditory learners and to determine whether students comprehend the concept. The researcher used the Promethean interactive board for students to engage in educational games, such as "Pan Balance" on the *Illuminations* Web site and "Equation Match" on the *BBC* Web site, where students learn tactically and kinesthetically.

The cooperating teacher strongly agreed with the statement that practicing problem solving on individual dry-erase boards facilitates formative assessment of students' comprehension and application of skills. Each student practiced examples on an individual wipe-off board while the researcher circulated around the classroom to assist students. The cooperating teacher agreed with the statement that mixed-abililty cooperative groups facilitate development of skills, but cautioned that excess grouping causes some students to lose focus. The researcher formed cooperative groups three times within the eight-lesson unit: once to construct equations with algebra tiles, later to complete an activity sheet, and to solve equations on a study guide.

Results

Figure 1 presents the graphic comparison between the pre-test and post-test scores. Forty-two out of 71 students assented to participate in the research, which is approximately 60% of the eighth-grade students. The pre-test scores for the "Building Blocks of Equations" unit for three Algebra I classes are represented in blue on the bar graph. No students scored in the A range, from 93% to 100%; one student scored in the B range, from 85% to 92%. Four students, less than 10%, scored in the C range, from 75% to 84%; no students scored in the D range, from 70% to 74%. Thirty-seven students, which is over 90% of the participants, scored below 70% on the pre-test, which is failing.

The post-test results for the "Building Blocks of Equations" for Algebra I blocks are indicated in red on the bar chart. Twenty-three out of 42 participants, approximately 55%, attained an A on the post-test, scoring within the range of 93% to 100%. Fourteen students out of 42 students, 33.3%, scored in the B range from 85% to 92% on the post-test. Two out of 42 students, 5%, scored in the C range, between 75% to 84%. Two students scored in the D range of 70% to 74%. Two students failed the post-test by scoring below 70%.

Figure 2 offers a table comparing the mean score or class average, as well as the maximum and minimum pre-test and post-test scores for each block. The mean pre-test scores for Blocks I, II, and III were 51%, 37%, and 50%, respectively; the mean post-test scores were 96%, 90%, and 93%, respectively. The minimum pre-test scores for Block I, II, and III were 0%, 20%, and 28%, respectively; the maximum pre-test scores were 92%, 76%, and 68%, respectively. The minimum post-test scores for Block I, II, and III were 85%, 61%, and 71%, respectively; the maximum post-test score for each of Blocks I, II, and III was 106%.

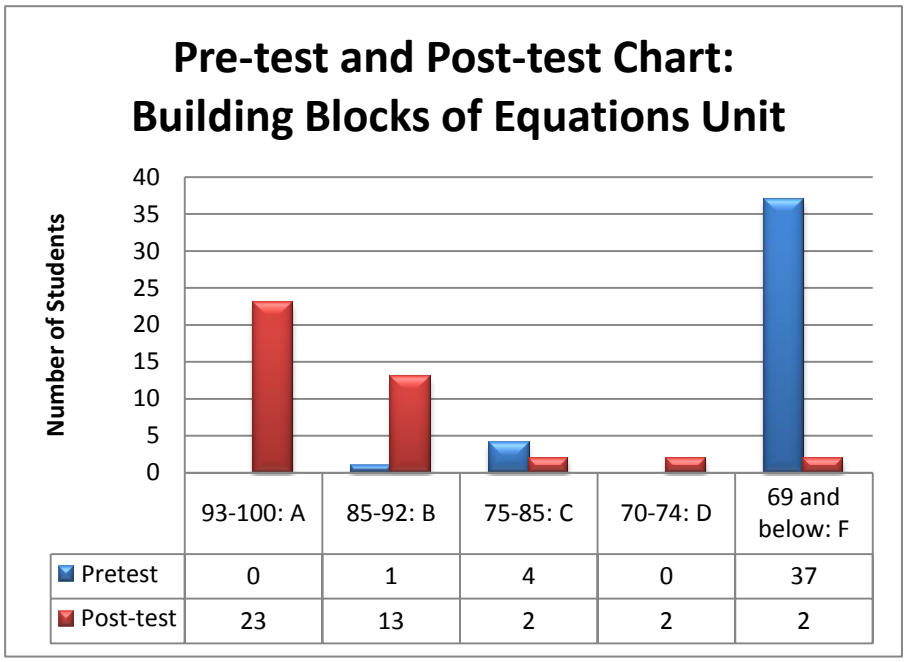

Figure 1. Bar chart of pre-test and post-test score level comparisons.

	Block I Pretest 100 points	**Block I Post-test 106 points**	**Block II Pre-test 100 points**	**Block II Post-test 106 points**	**Block III Pre-test 100 points**	**Block III Post-test 106 points**
Mean	51.0	96.0	37.0	90.0	50.0	93.0
Maximum	92.0	106.0	76.0	106.0	68.0	106.0
Minimum	0.0	85.0	20.0	61.0	28.0	71.0

Figure 2. Pre-test and post-test mean, maximum, and minimum scores for Algebra I.

Assessment documents are contained in Appendices A, B, and C.

Conclusions and Recommendations

Conclusions

The results of the pre-test were surprising since eighth-grade Algebra I students have been exposed to various forms of equations during elementary grades through the *Everyday Math* series, which is the primary tool of elementary mathematical instruction. The pre-test results indicated that all students could benefit from practice with one-and two-step equations of whole numbers, integers, and fractions. The cooperating teacher mentioned that students did not perform well on the pre-test because of its level of difficulty. The pre-test was administered upon the first day that students returned from a week-long school break; many students did not complete the pre-test. The results of the pre-test directed the researcher to develop instructional content with varied methods that offered brief, but clear, explanation, and demonstration, due to the accountability of spending 8 to 10 minutes of class time on direct instruction, 34 minutes of class time on discussion, and 34 minutes of time coaching students in skills.

The pre-test/post-test procedure allowed students and the teacher a measure by which to note improvement on, and mastery of, the "Building Blocks of Equations" unit. Students noted weakness, as well as individual progress, of performance from the pre-test to the post-test, which provided a sense of accomplishment. The researcher was better able to guide students through the unit by modifying instruction to focus on less-developed areas of solving two-step equations with fractions, applying the product rule for exponents, and understanding functional notation.

From Figure 1 and analysis of scores, students improved their scores from failing to the A and B ranges on the post-test. Figures 1 offers comparisons of students' pre-test and post-test scores which reveal scholastic improvement following differentiated instruction. The "Building Blocks of Equations" unit promoted student development of skills for advanced algebraic topics

which they will encounter in the near future, such as solving complex equations, systems of equations, and word problems with variables. While IEP modifications and accommodations for four students were provided, the remaining students who scored below 70% are students who do not receive academic coaching. After the post-test, the researcher asked the students who scored in the D and F ranges to practice with the researcher in a small group. The students benefitted because of increased individual instruction and additional review of skills.

Recommendations

Differentiating instructional methods allows instructors of classrooms populated with high-level thinkers, as well as students with learning disabilities, to support students' mastery of state curriculum standards. The researcher recommends having students demonstrate understanding by solving problems on individual dry-erase boards for guided practice. The researcher suggests forming mixed-ability groups, to complete a skill activity or construct equations for guided practice, while the instructor works with a small group for remediation. Certainly, the instructor must regularly provide opportunities for lower-performing students to participate in mixed-ability cooperative groups.

The researcher suggests employing visual reinforcements by using PowerPoint presentations to demonstrate concepts and examples. Offering activity sheets, especially for IEP students, facilitates learning in a diverse classroom. The researcher advises asking open-ended questions throughout the lesson, regarding concepts and problem solving, to support auditory learners and to determine whether students comprehend the concept. The researcher recommends using the Promethean interactive board or classroom computers for educational games in order for students to move around the room.

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Appendix A

EDUCATIONAL RESEARCH SURVEY:
DIFFERENTIATED INSTRUCTIONAL TECHNIQUES IN MATHEMATICS

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Read each statement. Please check the box that most accurately reflects your experience.					
Graphic Organizers					
1) Graphic organizers/vocabulary templates help students to understand math concepts.					
2) Word wall activities reinforce students' mathematical vocabulary.					
Learning Centers					
3) Learning center activities, which reinforce the unit's skills, improve math scores.					
Instructional Techniques					
4) Worksheets, outlines, study guides, and PowerPoint's assist visual learners.					
5) Open-ended oral questions support auditory learners.					
6) Math manipulative objects help tactile/kinesthetic learners understand the concept.					
7) Working in cooperative groups, helps all levels of students develop skills.					
Formative Assessment					
8) Authentic projects, such as creating a math poster or a game, reinforce higher order thinking skills?					
9) Having students solve guided practice problems on wipe-off boards facilitates formative assessment.					
Writing					
10) When students respond by writing about the lesson, they develop understanding of mathematical concepts and skills.					

Appendix B
Algebra I Pre-test Lessons 21-28

Simplify using the product rule for exponents.

1) $px^2yx^4y^2p$

Simplify like terms with exponents:

2) $2y^4x^2 + yx - 3x^2y^4 - 9xy$

3) What is another word for a mathematical solution? _____

4) Does 4 or -4 satisfy the equation $x^2 + x = 12$? _____

Additive Property of Equality

5) Solve for p and check work : $p + \frac{9}{4} = \frac{1}{4}$

Multiplicative Property of Equality

6) Solve for x and check work: $\frac{x}{1} = 9$

2

Solutions of Equations

7) Solve for x and check work: $\frac{1}{2}x - \frac{1}{4} = \frac{3}{4}$

8) Simplify and solve for x: $4x - 3 - x = 5 + (-2x) + 12$

9) Use the distributive property to expand: $6yx^2(3mxy + 2yx^2)$

10) Simplify and solve the decimal equation for k: $0.9k + 0.2k = 7.7$

11) $\frac{1}{5}$ of 125 is what number?

12) If $f(x) = x^3 + 1$, find $f(2)$.

Appendix C
Algebra I Post-test Lessons 21-28

SHOW ALL WORK. WORK COUNTS AS HALF THE CREDIT FOR SOLVING EACH PROBLEM.
Each problem is worth 5 points, 3 points for showing the correct work and 2 points for the correct answer.

Word Bank:	
Multiplicative Property of Equality	Additive Property of Equality
Equation	Solution
Root	Distributive Property

Simplify using the product rule for exponents.

1) $x^2yx^4y^2$

2) $y^2x^3yxy^3$

Simplify like terms.

3) $7xy + 5z – 2xy – z$

4) $5p^3n^2 -3pnnp^2 + 2n^2ppp$

5) What is another word for a mathematical solution? _____

6) Does 4 and / or -4 satisfy the equation $x^2 + x = 12$? _____

7) Solve for x and prove by checking the solution: $13 = x + 5$

8) Solve for x and prove by checking the solution: – –

9) Which property is applied to solve equations in problems 8 and 9?
_____

10) Solve for x and check work: $\frac{x}{2} = 9$

11) Solve for x and check work: ¼ x = 11

12) Which property is applied to solve equations in problems 11 and 12?

_____

13) Solve for x and check work: – –

14) Solve for n and check work: –

15) Simplify and solve for x: $4x – 3 – x = 5 + (-2x) + 12$

16) Use the distributive property to expand: $6y(3xy + 2x^2)$

17) Simplify and solve the decimal equation for y: $0.1y – 0.02 = 0.38$

18) ¼ of 160 is what number?

Solve each function. Showing work counts as half credit.

19) $f(x) = 12x - 14$ if $f(-1)$

20) $f(x) = -3(x - x^2)$ if $f(1)$

Vocational Education: Is It Meeting the Needs of the Community?

Stephen Tompkins

Education 5900, Fall 2010

The University of Tennessee at Chattanooga

The Institutional Review Board of The University of Tennessee at Chattanooga (FWA00004149) has approved this research project # 10-135.

Introduction to the Problem

In July of 2008, Volkswagen announced that a $1 billion automotive manufacturing facility would be built in Chattanooga, Tennessee. More importantly, it has been stated that the new plant will employ approximately 2,500 individuals by the time it initiates automobile production in 2011. Hamilton County's elected officials have been quick to inform the area's citizens that additional technical jobs will also be created, as additional industrial suppliers will be needed to satisfy the new Volkswagen plant's needs. Similarly, The Tennessee Valley Authority (TVA) estimates that thousands of new workers will be needed as the federal power producer begins to construct the nation's next generation of nuclear power plants in the area. The TVA also estimates that hundreds of skilled workers will be needed to replace retiring employees during the upcoming years. The TVA has specifically recognized its future need for certified electricians and welders. The federal utility has also documented an ever-increasing need for skilled employees specializing in the radiation protection technologies. Also, in Chattanooga, Alstom is searching for technically-trained employees to retrofit new technology into existing power production facilities. These technical employment opportunities are just a few specific examples that illustrate the Chattanooga area's economic and manufacturing rebirth.

Because of its ability to educate and prepare students for the Chattanooga area's technical employers, the high school must constantly evaluate its technical and vocational education curriculum. The school must strive to offer technical programs that meet the needs of students and the area's employers. To meet the community's needs, the high school must educate students efficiently, and offer employers technically-trained individuals who satisfactorily fit job requirements. This study will look at data and information obtained through surveys, and

interviews. The surveys and interviews are completed by students, parents, teachers, and administrators currently associated with the vocational programs at the high school.

Background and Problem Statement

Throughout the United States, technical job opportunities are constantly changing. High school vocational education programs must keep "up to date" with the ever-changing technology. As new job opportunities become available, new vocational programs should be created. For example, in the last decade, Cisco Networking Education Programs have been developed to prepare students for computer networking and computer science careers. Traditional programs must also change as technology advances. To be more specific, automobile/transportation repair programs have surely altered to better prepare students to repair today's hybrid fuel/computerized cars and trucks. The high school must constantly reevaluate the feasibility and practicality of its vocational programs. When necessary, a new vocational program must be created. Similarly, antiquated vocational education programs should be eliminated. The purpose of this study is to assess information and assure that the high school is training students for careers that adequately support the needs of the students and needs of the Chattanooga community.

Research Questions

In order to evaluate the school's current vocational programs and investigate the need to modify existing vocational programs, the following research questions have been developed to guide this study:

1. Do current students (and the parents of current students) report high satisfaction with the ability of vocational programs currently being offered at the high school to enable them to pursue a desirable career?

2. Do surveys of current students (and the parents of current students) reveal that new vocational programs are needed, or, do certain programs need to be replaced or eliminated?
3. Do surveys and interviews of current teachers reveal that any specific modifications to the school's vocational education programs are needed?
4. Do surveys and interviews of administrators, specifically associated with the high school, reveal the perception that additional vocational programs are needed , or, that existing vocational programs should be altered?
5. Do interviews of area employers reveal that the high school adequately prepares students for technical careers?
6. Do any of the groups interviewed and surveyed have similar opinions, or do the interviews and surveys indicate that the groups' opinions differ?

Review of Literature

Public Education – Changing to Satisfy the Needs of a Nation

Throughout the business community of the United States, every sustainable business and producer must be willing to alter their services or products to fit their customers' ever-changing needs. Similarly, public education must constantly evolve and reform, in an attempt to meet the needs of the nation.

According to Ornstein and Levine (2008), "The New England colonies of Massachusetts, Connecticut, and New Hampshire were crucibles for the development of American ideas and institutions" (p. 123). In these specific colonies, America's first instructors taught pupils Puritan theology, simply because the citizens of this specific era deemed Puritan religion and theology important, necessary, and crucial to education. Because the citizens in these colonies deemed Puritan theology a critical component of education, the educators are an example of the nation's first teachers working to meet specific demands, early in American history.

Several significant events, acts, and publications have initiated change for America's educators. In his book, *The Troublemaker*, Finn (2008) stated, "In 1957, the launch of the Sputnik satellite signaled to America that the country's scientific edge was dulling" (p. 8). Similarly, Reynolds (2004) stated, "On October 4, 1957 Russia launched Sputnik I. Americans were told the Russians had beaten them into space because our school system was failing" (p. 6). In response to the launch of the Sputnik satellite, the United States Federal Government dramatically increased the amount of funds it allocated for education (Ornstein & Levine, 2008). The nation's citizens, the federal government, and the nation's educators specifically focused on improving the science, mathematics, and foreign language instruction for the United States' public schools (Ornstein & Levine, 2008). These reforms and funding increases were specifically supported by The National Defense Education Act of 1958. Because of the Sputnik launch, the federal government became much more involved with public education in America. Elected officials specifically demanded that educators react to meet the nation's needs.

In 1983, *A Nation at Risk* was a publication released in by the National Commission on Excellence in Education (Finn, 2008). This report argued that the United States no longer led all the world's nations in service, technology, commerce, and innovation (Ornstein & Levine, 2008). The report concluded that The United States had lost its preeminence due to a "rising tide of mediocrity" in our schools (Ornstein & Levine, 2008). Legislators and the education systems responded to *A Nation at Risk*. Higher standards for individuals wishing to enter the teaching profession were established. In addition, legislators and education administrators proposed reforms to assure that, throughout the United States, all current teachers were adequately trained.

More recently, the No Child Left Behind Act (NCLB) of 2001 signaled the need for addition education reform to fit the ever-changing demands of America and the nation's

lawmakers. This act specifically focused on the need to enhance student performance and to assure that all pupils were being taught by a "highly qualified teacher." According to Ornstein and Levine (2008), "In 2001, teacher quality-improvement activities became an integral part of the national school reform movement" (p. 22). The NCLB Act also ignited an explosion in the number of "standardized" tests teachers and students are required to take. These additional tests were needed to properly measure current competencies, assess teacher performance, and evaluate the effectiveness of programs. Arends (2007) states,

> This legislation, called No Child Left Behind (NCLB) requires schools to test children every year in grades 3 through 8 and stipulates that schools that have high proportions of failing students be put under special surveillance and allows parents of children in these schools to send them to a school of their choice. (p. 209)

The No Child Left Behind Act emphasizes teacher "accountability." This Act has obviously required educators to, again, alter their practices and techniques to meet new demands and requirements.

Currently, the State of Tennessee is seeking funds (subsequently funded) from the United States Department of Education to initiate education improvements within the Volunteer State. The Race to the Top plan is a proposal designed to improve the nation's schools and train teachers. The Race to the Top plan is part of federal government's American Recovery and Reinvestment Act (ARRA) of 2010 that will offer the nation's states a portion of $4.35 billion. According to Rutenberg (2009), "Race to the Top grants are intended to improve student achievement – especially among lower achieving students – by supporting states that are making progress" (p. 6). The states are to use RTTT funds to implement additional improvements and

more school reforms. Through this legislation, the federal government will, once again, instruct educators to modify their education tactics to meet new demands.

Like all successful business leaders, individuals associated with public education in the United States must keep up with technological advances, and alter their "product and techniques," whenever necessary, to satisfy the desires of lawmakers, their community, and their "customers."

Vocation Education – Also Changing to Meet the Needs of a Nation

The history of vocational education in the United States parallels the changing American economy, history, and society. Threeton (2007) stated,

> If one looks at the history of vocational education, now termed Career and Technical Education, it is obvious that federal legislation has played a significant role in shaping the climate. This critical federal support serves as a key element to meeting the needs of students, as well as our society. (p. 67)

In its earliest iterations, the nation's vocational education programs were developed and designed to simply train individuals to meet the nation's agrarian needs. Finch (1998) reports that, in 1917, the nation passed the Smith-Hughes Act. This act was the first legislation designed to provide federal assistance for states to establish vocational education in the nation's secondary schools. This act specifically supported agriculture, industry, and home economics programs. Educational Clubs, such as The Future Farmers of America, also helped prepare students for the vocations associated with the nation's farms. However, when the manufacturing expansion occurred in the United States, additional vocational programs were desperately needed. To meet the need for skilled workers, these industrial education programs were added to the nation's secondary schools. Finch (1998) states,

> As the need for skilled workers increased, industrialists and labor leaders believed that a new national policy (and secondary schools) could be the starting point to improve quality in preparing for skilled positions in the workplace. (p. 37).

As the need for agricultural skills diminished in many areas of the United States, mechanical and industrial vocational programs soon replaced the school's agricultural education programs. During this era, most vocational educational programs were completely separated from traditional, academic education.

In 1963, The Vocational Education Act was passed. During the1960's, The United States was competing with the Soviet Union in a "space race" or "the race to the moon." This act reaffirmed the federal government's commitment to support vocational education (Finch, 1998). More specifically, the act allocated federal funding specifically intended to improve the nation's scientific knowledge, mathematics skills, and vocational education programs.

The Perkins Vocational and Applied Technology Education Act of 1990 was specifically designed to ease the work-to-school transition for secondary school students. Once again, this act attempted to address the notion that the United States was falling behind other nations in scientific knowledge and scientific curriculums. This act also re-joined vocational and academic education programs in an attempt to better prepare students to compete globally (Finch, 1998). In a journal article specifically written about the history of vocational education in the United States Finch (1998) writes,

> the focus of educational reform was initially on students: how could they learn more in school and be better prepared for their futures. As a great number of reports were released describing the need to change what students were taught and how they were taught, it was

> quickly recognized that if changes in school reform were to be successful, the preparation and continuing development of teachers also had to change. (p. 36)

This article specifically recognizes how vocational teachers also changed to satisfy needs.

All of the legislation passed to aid vocational education was initiated by changes and needs within the American economy or workforce. Vocational educators recognized the nation's needs as the industrial revolution demanded that secondary schools help train skilled laborers for America's expanding factories. At this same time, administrators and educators realized the diminishing need for agricultural programs. Therefore, many agricultural programs were replaced by industrial education programs at our nation's vocational secondary-education institutions. In a similar manner, during the past decade, vocational educators and administrators realized the need for computer programmers and computer network specialists. To satisfy the nation's increasing need for highly-qualified health care specialists, many secondary schools have introduced vocational programs related to the health care professions. As the roles and goals of vocational teachers began to mimic those of academic teachers, administrators recognized the need to integrate the two programs. Ideally, integrating the academic and vocational programs offers students additional career opportunities and better prepares students to succeed after high school.

Effective Vocational Education

All high school teachers should strive to adequately prepare students for additional education opportunities or career opportunities. A recent report of the ACT's evaluation of 2009 secondary school graduates from the State of Tennessee stated,

> simply earning a high school diploma is not enough. High school graduates must be prepared to succeed at the next level – whether they choose to attend college or begin a

> career. The goal of high school should be clear: to prepare graduates for life after high school by teaching them the skills and knowledge that are essential to college and workforce training readiness. (p. 2)

In reality, it appears the goals of secondary school vocational and academic teachers should be similar. Therefore, many of the characteristics associated with "effective" academic teachers can also describe "effective" vocational education instructors. For example, to be effective, both vocational and academic teachers must possess a high level of knowledge of the subject(s) they are teaching. In addition, all effective educators must be able to share knowledge and adequately manage a classroom setting. To be effective, teachers should also attempt to gain the interest of their students.

To enter a specific secondary school vocational program, most students must typically demonstrate interest prior to being admitted into a vocational program. Reynolds (2004) states, "Each student is looking for something different from high school and each must be allowed to be successful in his or her quest for a prosperous future" (p. 2). In the 2004 U.S. Department of Education report assessing vocational education in the United States, Silverberg, Warner, Fong, and Goodwin stated, "In an era in which strong skills and lifelong learning are rewarded, the nature and impact of student experiences in vocational education could have important implications for the nation's workforce and America's place in the global economy" (p. 1).

Vocational and academic educators share many obligations. To be effective, vocational educators must (a) properly manage their classes and classrooms, (b) have the ability to effectively share knowledge and information with students, (c) help students develop skills and prove their competencies (and obtain certifications), (d) build upon their students' interests, and (e) display knowledge and adroitness for their specific subjects/area of expertise.

Academic and vocational teachers should share a common goal: adequately prepare students for success in college or in the modern-day workforce. If evaluations of a school or school program are necessary, the evaluations should strive to adequately and fairly ascertain information associated with efficient effectiveness. As stated by Booker and Isenberg (2008),

> Many commonly used measures of school effectiveness, such as average test score levels or percentage of students who meet state proficiency standards, do not provide an accurate measure of school effectiveness because they are likely to be altered by students' prior ability and accumulated achievement, and by current non-school factors like parents' socio-economic status. Better measures of school effectiveness focus on how much a school contributes to test score improvements for their students. (p. 2)

In a U. S. Department of Education report to Congress assessing vocational education, it is stated,

> It is important to recognize that two-thirds of America's young people do not obtain a four year college degree and at least 25 percent go to work directly after high school. The reality is that most young people must draw on skills learned outside of four year colleges to succeed in the workforce. That is where good career and technical education at secondary schools comes in. (p. 6)

In summary, vocational education in the United States continues to evolve. For example, today’s high school students can take college-preparation and vocation education classes. No longer, are students forced to select between either career technical institute or college-preparation paths.

The nation's vocational educational programs must remain flexible to meet specific and changing demands. Because of the variety and flexibility allowed, adequately evaluating each

school's programs creates monumental challenges. However, at the secondary education level, schools can evaluate their own specific programs by measuring (a) how many students participate in the various vocational programs, (b) how many student obtain certifications and/or postsecondary education employment based on the school's vocational programs, (c) how satisfied employers with recently hired students, and (d) if the recently hired employees have the skills necessary to properly meet the employers' needs. The reasoning and techniques used to evaluate a school's vocational programs are as diverse as the students and the programs. In a San Diego State University report on vocational education, Cooper (1974) writes,

> Schools are financed by the community in order to develop certain skills in the young people which enable them to assume a productive role in the community. The skills necessary to fulfill these roles include: adequate preparation to gain employment directly after graduation, information intended to be supplemented by instruction of a more technical nature at a trade school or community college, or the basic academic information and discipline necessary to earn the degree(s) that would make the individual of greater value to the community. (p. 1)
>
> Therefore, in order to prepare students to be valuable members of the community, the high school must periodically evaluate its vocational education programs, and the effectiveness of these programs, to assure that the school adequately supports the community.

Data Collection and Results

Setting

The high school has an extremely large percentage of students (95% + – 2%) enrolled in various vocational education programs. The school creates an appropriate venue to evaluate the

“effectiveness” of vocational education in the Chattanooga area. The high school has a total of 408 students. The high school contains Grades 9-12. While the school offers approximately 20 vocational education programs, the school also offers numerous, typical academic classes (English, mathematics, science, history, and foreign language classes). The population at the high school is 89.1% white and 10.9% African American. 51.3% of the school's students are female; 48.7% of the students are male. 49.3% of the students are classified as "economically disadvantaged". The school is classified as a Title 1 school. The student-to-teacher ratio at the high school is 8:1. All of the school's teachers are classified as "highly qualified," and meet the No Child Left Behind requirements. The school's graduation rate is currently 70.1%.

Study Participants

Participants in this study included approximately 55 students from the school who currently participate, or have participated, in the school's vocational education program(s) in the last 2 years. In addition, 40 to 45 teachers, administrators, and parents associated with the school’s vocational programs were included in this study. Four employers who have recently hired students from the school were, also, included in this study.

Methodology

This research project was designed to obtain opinions and evaluate how well the high school meets the needs of its community. By using interviews and surveys, this project asked individuals to evaluate their specific encounters with the high school. Triangulation, an action research technique designed to obtain data from numerous sources, was used to collect valid information. The surveys and interviews used to collect data were designed to assure factual accuracy. None of the questions were designed to distort the opinions of the participants. The

questions were designed to help the researcher obtain opinions, as well as suggestions. Informal ethnographic interviews also provided information for this project.

This study used Likert scale questions and open-ended questions to obtain responses. Specifically, this study used surveys and interviews to ascertain opinions related to the effectiveness of the high school to prepare students for postsecondary-education careers and/or postsecondary-education education. Participants were, specifically, asked to indicate whether they were very satisfied, satisfied, undecided, disappointed, or very disappointed with the school's effectiveness. The participants were also asked about their main interest. For their school interest, students, parents, and teachers were given the following options: Academic Education, Vocational Education, and Both - Academic and Vocational Education. Participants were allowed to omit any question they wished to skip. Participants were also allowed to omit any question they found confusing.

To assess the responses for certain questions, a point value system was used to evaluate the responses obtained. A positive point value on a positively developed statement indicated a positive attitude. Semantic differentials were specifically used to evaluate opinions. In addition, the surveys and interviews incorporated open-ended questions to assure that the participants were allowed to adequately express and share their opinions and suggestions. For example, a question included in the surveys was: Please list any vocational educational programs you feel should be added/eliminated from the school's current curriculum. Responses to the open-ended questions were also recorded and evaluated. The surveys, interview form, and data acquisition matrix are presented in Appendices A through F.

Results

When asked about the effectiveness of the high school, all four groups (students, parents, teachers, and administrators) indicated that they were very satisfied or satisfied with the school's ability to effectively prepare students for postsecondary opportunities. No individuals responded that they were disappointed or very disappointed. Figure 1 shows that a large majority of participants rated their opinions of the school's effectiveness at a "very satisfied" or "satisfied" level.

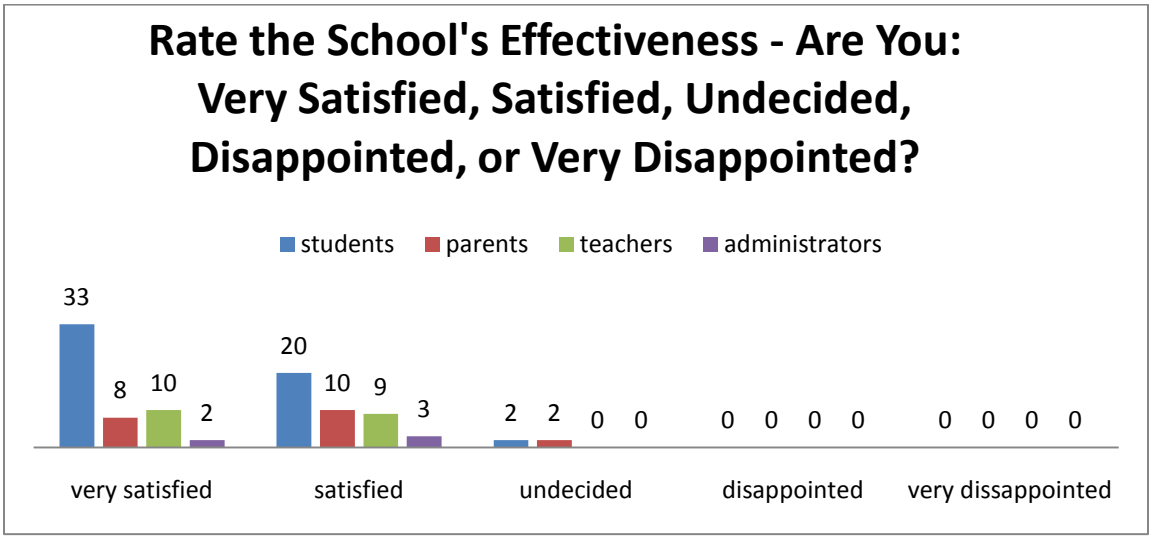

Figure 1. Question: Overall, how would you rate the high school's ability and effectiveness to prepare students for post-high school employment and/or education?

The students and their parents were asked about their main interest. Participants were given three interest opinions: Academics Education, Vocational Education, or Both. A majority of the students and parents indicated that they were mainly interested in vocational education, or both academics and vocational education.

Figure 2 shows that vocational education is a "priority" with a majority of the participants. Both groups (students and parents) gave somewhat similar responses. Fifty-three percent and forty percent of the parents of the students indicated that their interests/their child's interests were mainly associated with vocational education. Forty-five percent of the parents and 44% of

the students surveyed indicated that their child was they were most interested in both vocational and academic education programs. Only 4% of the students and 15% of the parents indicated that they (or their child/children) were mainly interested in academic education at the high school.

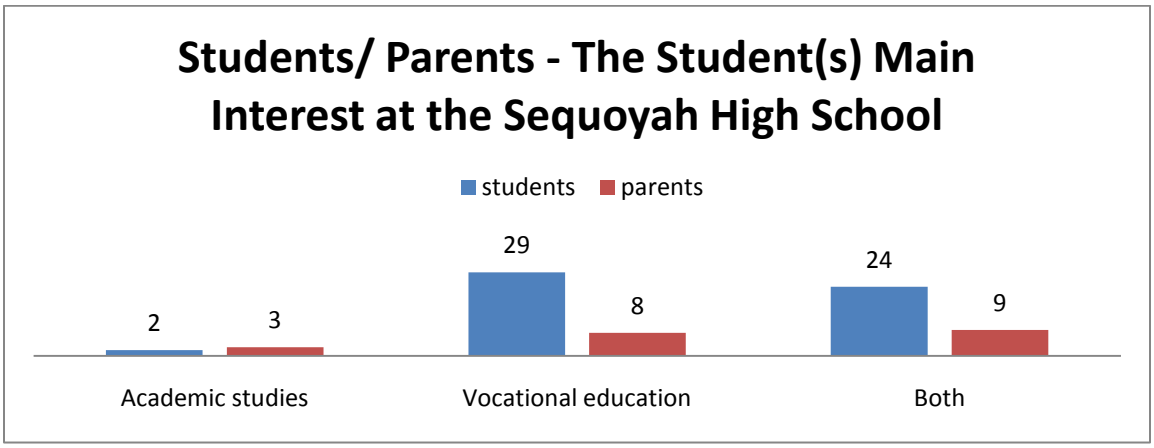

Figure 2. Question: At the high school, I am/the student is most interested in…

Eighty-seven percent of the participants responded positively when asked about the school's balance of academic and vocational classes.

Approximately 70% of this study's participants believed that additional vocational programs were needed at the high school. When asked to list any additional vocational programs needed at the school, the following responses represent and summarize the participants' responses:

> The Question: Please list any vocational education programs you feel should be added to the school's curriculum.
>
> The Response(s):
>
> - "An ROTC/military training program is needed"
> - "Criminology/crime investigation/Forensics classes are needed"
> - "More PE is needed"
> - "welding is cool – more is needed"

- “Sports”
- “A music/band program should be added”
- “HVAC repair classes are needed”

One student responded that larger vocational education classes were needed because some students were taking classes that they really did not originally want to take (because their first vocational education option was full).

Only two participants indicated that a specific vocational education program should be eliminated. The two participants suggested that two separate program be eliminated.

Teachers, administrators, and employers offered a significant and surprising response. Several agreed, that upon graduation, many students have been unable to obtain some specific certifications or documentation while in high school. In some cases, additional apprenticeships and training are required to obtain proficiency certifications. Some students are unable to obtain certifications, simply, because they are under 18 years old and cannot legally work in some potentially dangerous professions (welding/electrical studies). When interviewed, participants suggested that students should be presented some certificate or document (in addition to their high school diploma). Some participants indicated that students needed additional documentation to show potential employers that they have obtained substantial training in a specific technical / vocational area. One participant, a teacher, stated that students must actually leave high school to become certified, even though a majority of the training actually occurred at a high school campus.

The four employers’ surveys and interviews indicated that employers were very satisfied or satisfied with the school’s effectiveness. In addition, the same employers indicated that they were also very satisfied or satisfied with the abilities of the student recently hired.

Most importantly, when asked if the high school is meeting the needs of the community, Figure 3 was constructed from the responses obtained.

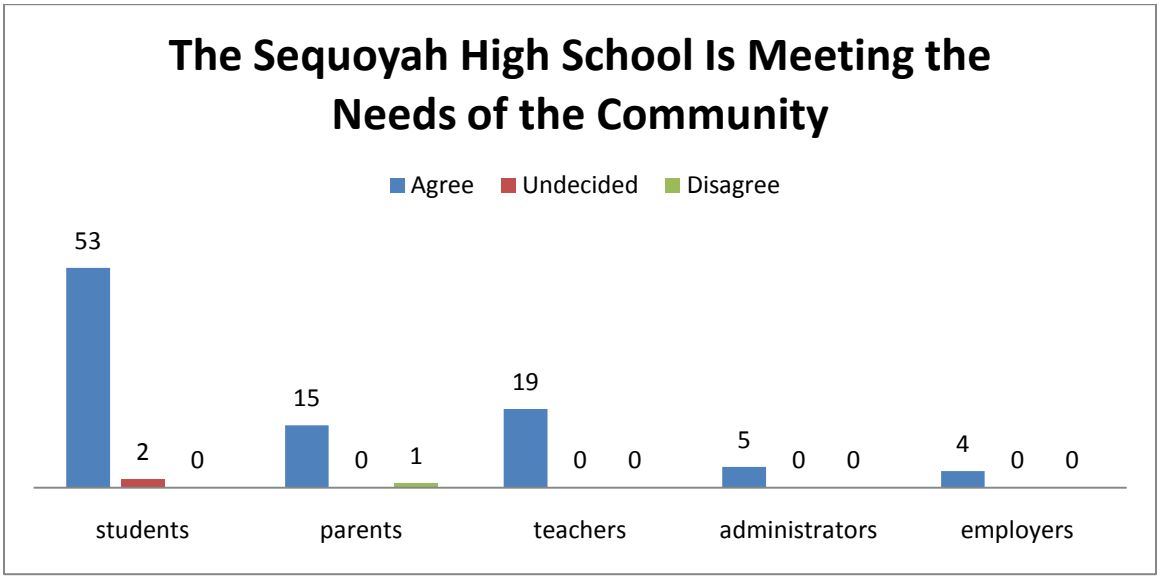

Figure 3. Question: The high school is meeting the needs of the community.

When all of the responses were evaluated, 97% of the participants indicated that they believed the Sequoyah High School was meeting the needs of the community. Two percent were undecided. One percent indicated that they believed the school was not meeting the community's needs.

Conclusions and Recommendations

This research project was designed to collect the opinions of individuals associated with the high school. The data obtained indicates that a majority of the individuals questioned have a positive attitude about the school's abilities and effectiveness. The responses indicate that the groups associated with this project share many similar opinions and similar satisfaction levels. In addition, this study offers some suggestions and modifications that may have previously been undiscovered. For example,

- Some additional vocational/school programs were suggested.

- A large majority of students, parents, teachers, administrators, and employers agree, and responded positively, when asked about the school's effectiveness.
- The need for additional documentation (for students) was suggested.
- A large majority of participants responded positively when asked about the school's ability to meet the community's needs.

While this study evaluated the opinions of a portion of individuals associated with the school, it is likely that the results reflect the opinions of a larger population. For this study, the participants were selected to be a representative portion of a larger population. The findings obtained in this research project will be shared with others to assure that opinions of the participants are considered when future curriculums are developed at the high school. It is possible that the number of participants associated with this project could be increased in future evaluations.

Ideally, this project should be repeated periodically to assure that the school's vocational educational programs stay "up to date" with the Chattanooga community's needs. It was a pleasant surprise to find that, as the area's employment opportunities are increasing, a large majority of the study's participants feel that the school is meeting the needs of the community.

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Appendix A

Sequoyah High School Satisfaction Survey (for students)

Instructions:

Please read and answer the following survey questions. Please add additional comments - if necessary.
Place a check mark in the box that best corresponds to your opinion for each question.
If a question does not pertain to you, feel free to skip the question.

1. Overall, how would you rate the Sequoyah High School's ability and effectiveness to prepare students for post-high school employment and / or post-high school education?

☐ Very Satisfied

☐ Satisfied

☐ Neither Satisfied nor Disappointed undecided

☐ Disappointed

☐ Very Disappointed

2. As a student at the Sequoyah High School, I am / was most interested in…

☐ Academic education - preparing for post-high school education.

☐ Vocational education - preparing for post-high school employment.

☐ Both academic and vocational education.

3. The current vocational programs at the Sequoyah High School adequately prepare students for careers.

☐ I agree with this statement.

☐ I disagree with this statement.

☐ I am undecided about this topic.

4. Additional vocational education programs are needed at the Sequoyah High School.

☐ I agree with this statement.

☐ I disagree with this statement.

☐ I am undecided about this topic.

Please list any vocational education program(s) you feel should be added to the school's curriculum

_____

5. Some of the school's current vocational education programs should be eliminated.

☐ I agree with this statement.

☐ I disagree with this statement.

☐ I am undecided about this topic.

Please list any vocational education program(s) you feel should be eliminated from the school's curriculum

_____

If you feel any vocational program(s) should be eliminated, why should the program(s) be eliminated?

_____

6. The Sequoyah High School offers a good balance of academic classes and vocational classes.

☐ I agree with this statement.

☐ I disagree with this statement.

☐ I am undecided about this topic.

7. Please add any comments pertaining to the vocational education programs currently available at the
Sequoyah High School.

_____

_____

_____

_____

8. The Sequoyah High School is meeting the needs of the community.

☐ I agree with this statement.

☐ I disagree with this statement.

☐ I am undecided about this topic.

Appendix B

Sequoyah High School Satisfaction Survey (for parents)

Instructions:

Please read and answer the following survey questions. Please add additional comments - if necessary.
Place a check mark in the box that best corresponds to your opinion for each question.
If a question does not pertain to you, feel free to skip the question.

1. Overall, how would you rate the Sequoyah High School's ability and effectiveness to prepare students for post-high school employment and / or post-high school education?

☐ Very Satisfied

☐ Satisfied

☐ Neither Satisfied nor Disappointed undecided

☐ Disappointed

☐ Very Disappointed

2. My son or daughter was most interested in the school's…

☐ Academic education - preparing for post-high school education

☐ Vocational education - preparing for post-high school employment.

☐ Both academic and vocational education

3. The current vocational programs at the Sequoyah High School adequately prepare students for careers.

☐ I agree with this statement.

☐ I disagree with this statement.

☐ I am undecided about this topic.

4. Additional vocational education programs are needed at the Sequoyah High School.

☐ I agree with this statement.

☐ I disagree with this statement.

☐ I am undecided about this topic.

Please list any vocational education program(s) you feel should be added to the school's curriculum.

_____

5. Some of the school's current vocational education programs should be eliminated.

☐ I agree with this statement.

☐ I disagree with this statement.

☐ I am undecided about this topic.

Please list any vocational education program(s) you feel should be eliminated from the school's curriculum.

_____

If you feel any vocational program(s) should be eliminated, why should the program(s) be eliminated?

_____

6. The Sequoyah High School offers a good balance of academic classes and vocational classes.

☐ I agree with this statement.

☐ I disagree with this statement.

☐ I am undecided about this topic.

7. Please add any comments pertaining to the vocational education programs currently available at the
Sequoyah High School.

_____

_____

_____

_____

8. The Sequoyah High School is meeting the needs of the community.

☐ I agree with this statement.

☐ I disagree with this statement.

☐ I am undecided about this topic.

Appendix C

Sequoyah High School Satisfaction Survey (for teachers and administrators)

Instructions:

Please read and answer the following survey questions. Please add additional comments - if necessary.
Place a check mark in the box that best corresponds to your opinion for each question.
If a question does not pertain to you, feel free to skip the question.

1. Overall, how would you rate the Sequoyah High School's ability and effectiveness to prepare students for post-high school employment and / or post-high school education?

☐ Very Satisfied

☐ Satisfied

☐ Neither Satisfied nor Disappointed undecided

☐ Disappointed

☐ Very Disappointed

2. As a teacher or administrator, I am most often associated with the school's…

☐ Academic education - preparing for post-high school education

☐ Vocational education - preparing for post-high school employment

☐ Both academic and vocational classes

3. The current vocational programs at the Sequoyah High School adequately prepare students for careers.

☐ I agree with this statement.

☐ I disagree with this statement.

☐ I am undecided about this topic.

4. Additional vocational education programs are needed at the Sequoyah High School.

☐ I agree with this statement.

☐ I disagree with this statement.

☐ I am undecided about this topic.

Please list any vocational education program(s) you feel should be added to the school's curriculum

_____

5. Some of the school's current vocational education programs should be eliminated.

☐ I agree with this statement.

☐ I disagree with this statement.

☐ I am undecided about this topic.

Please list any vocational education program(s) you feel should eliminated from the school's curriculum

_____

If you feel any vocational program(s) should be eliminated, why should the program(s) be eliminated?

_____

6. The Sequoyah High School offers a good balance of academic classes and vocational classes.

☐ I agree with this statement.

☐ I disagree with this statement.

☐ I am undecided about this topic.

7. Please add any comments pertaining to the vocational education programs currently available at the
Sequoyah High School.

_____

_____

_____

_____

8. The Sequoyah High School is meeting the needs of the community.

☐ I agree with this statement.

☐ I disagree with this statement.

☐ I am undecided about this topic.

Appendix D

Sequoyah High School Satisfaction Survey (for employers)

Instructions:

Please read and answer the following survey questions. Please add additional comments if necessary.

Place a check mark in the box that best corresponds to your opinion for each question.

If a question does not pertain to you, feel free to skip the question.

1. Overall, how would you rate the Sequoyah High School's ability and effectiveness to prepare students for post-high school employment?

☐ Very Satisfied

☐ Satisfied

☐ Neither Satisfied nor Disappointed undecided

☐ Disappointed

☐ Very Disappointed

2. Having hired a recent graduate of the Sequoyah High School, I am…

☐ Very Satisfied with the recent hire

☐ Satisfied with the recent hire

☐ Neither Satisfied nor Disappointed / Undecided

☐ Disappointed with the recent hire

☐ Very Disappointed with the recent hire

3. The graduate(s) we have recently hired from the Sequoyah High School was / were **adequately trained** to perform the tasks associated with their job / career opportunity.

☐ I agree with this statement.

☐ I disagree with this statement.

☐ I am undecided about this topic.

4. The Sequoyah High School graduate(s) we recently hired has / have the **CERTIFICATIONS** needed to perform the tasks that are associated with the job / career opportunity.

☐ I agree with this statement.

☐ I disagree with this statement.

☐ I am undecided about this topic.

5. Additional vocational education programs are needed at the Sequoyah High School.

☐ I agree with this statement.

☐ I disagree with this statement.

☐ I am undecided about this topic.

Please list any vocational education program(s) you feel should be added to the school's curriculum

_____

6. Please add any comments pertaining to the individual(s) recently hired or the vocational education programs currently available at the Sequoyah High School.

_____

_____

_____

_____

7. The Sequoyah High School is meeting the needs of the community.

☐ I agree with this statement.

☐ I disagree with this statement.

☐ I am undecided about this statement.

Appendix E

Interview Record Form

Name: _____

Date: _____

Topic: _____

Comments:

_____

Comments:

_____

Appendix F

Data Acquisition Matrix

Research Questions	Students	Parents	Teachers	Administrators	Employers
1	**Surveys**	**Surveys**			
2	**Surveys**	**Surveys**			
3			**Surveys and Interviews**		
4				**Surveys and Interviews**	
5					**Surveys and Interviews**
6	**Surveys**	**Surveys**	**Surveys and Interviews**	**Surveys and Interviews**	**Surveys and Interviews**

The Effect of Daily Quizzes on Student Scores and Class Participation:

A Study on High School Economic Students

Elizabeth Warren

Education 5900, Fall 2010

University of Tennessee at Chattanooga

The Institutional Review Board of The University of Tennessee at Chattanooga (FWA004149) has approved this research project # 10-119.

Introduction to the Problem

I am a high school economics teacher working in a public school setting. I want to learn more about my students and explore how I can help them understand and remember the subject matter. I am interested in this area of study because I have seen that many students, particularly in the area of the social sciences, do not engage in the class discussions because they have not read their homework or reviewed the information. I remember myself trying to "wing it" during many class periods when I had no incentive and no penalty in doing my homework. My approach to schoolwork began to change when, in graduate school, I had a professor who would quiz the following class session when reading assignments were given. I found the quizzes to be motivational, and an impetus in my keeping up with the class work since a "grade" was dependent on it. As a result of this technique and teaching strategy, I became a more responsible student. I am interested to see if this will translate to the high school level. I am hopeful that the brief quizzes will produce increased scores on chapter tests. A nice by-product would be for the quizzing to increase and stimulate meaningful discussion in class.

The problem is that my students are either not reading their homework assignments well enough to have comprehension or are not reading them at all. It has been my observation and experience that high school students, generally, do not fully engage in the subject matter of the social sciences such as history, government, and economics. Most of the daily homework assignments are reading related, and unlike math and science, do not usually have a written component which is turned in to the teacher. Because there frequently is no written component, and, therefore, no obvious accountability, it is tempting to skip or skim over the assignment, and, either, ad lib in class or remain quiet throughout discussions. Not reading the materials related to

the course is a problem, as it effects the overall understanding of the subject matter, and, eventually, produces inferior comprehension and poor scores on tests.

The purpose of this study is to determine if the addition of daily quizzes on assigned readings increases the chapter test scores for my economic students. As a by-product of the quizzing, I hope to experience that the extra familiarity of completing homework motivates students to participate in deeper, more meaningful, and comprehensive class discussion.

Review of Literature

In my review of related literature, I found several articles concerned with responsibility and the teenager. The continued growth in responsibility is important in the overall development of the teen in order for them to become the "responsible adult." In my classroom, I not only want my students to learn the content of the subject matter, but, I additionally, want them to further expand their areas of responsibility and dependability. "Helping students take responsibility for completing assigned work begins with the teacher developing a system that supports and enables them to become accountable." (Evertson & Poole, 2009, p. 2) Reading one's homework and contributing in class may seem insignificant in the grand scheme of things, but I believe it is another opportunity for students to grow as individuals, and is a building block, not only to a student's academic life, but, also, in becoming a vital member of society.

Research and study have found that the consequences for not taking responsibility can be detrimental, when one fails to accept responsibility over time:

> Once this habit of refusing to accept personal responsibility is maintained, your character can become slowly transformed. You may tend to become someone who is irresponsible, a quitter, reliant on others, disturbed, unhappy, hopeless, angry, irrational, and defiant.

> These qualities are not success enhancers. They can eat away at your ability to achieve your best. (Klingeman, 2009, ¶ 9)

A study, conducted at Wake Forest University, by Wood, Larson, and Brown (2009), showed that teens were most successful in increasing their responsibility when the teens were held accountable for their work, where there was a strong sense of structure, and when there was a lot expected from the students. Wood (Wood et al., 2009), an assistant professor in psychology at Wake Forest, suggests that, in adolescent years, higher levels of personal responsibility results from the demands youth face in completing homework. According to Wood et al. (2009), "We become responsible by successfully and repeatedly carrying out our responsibilities" (Understanding the Development of Responsibility section, ¶ 2).

In order to foster student accountability for academic homework, "teachers need to develop and implement strategies that support students' efforts at various stages of doing their work" (Evertson & Poole, 2009, p. 2). The strategies listed in this case study include providing content instruction, creating supportive settings, modeling desired outcomes, assigning appropriate tasks, and offering timely feedback. "Once these five areas have been addressed, the teacher's next step is to focus on ways of teaching students to be responsible for following the established procedures for completing and submitting assignments at a high level of performance" (Evertson & Poole, 2009, p. 2). I will use these strategies in my study, having the homework and quizzes become the "appropriate tasks."

The most relevant study I found was the review of one published in the *European Journal of Cognitive Psychology* (McDaniel, Anderson, Derbish, & Morisette, 2007). The highlights of this study were summarized by Klionsky (2008, ¶ 2):

a. Taking a test after studying promotes learning and retention.
b. Quizzing, but not additional reading of the same material, improves subsequent test scores.
c. Short-answer quizzes produce better results than multiple-choice quizzes.

This study made the statement that, "taking a quiz after the reading immediately points out what material was or was not learned appropriately. Quizzing with feedback provides a more positive learning outcome than multiple readings without quizzes" (Klionsky, 2008, ¶ 3).

I found no studies that were specific to my approach of using *daily* quizzes on homework readings to improve test scores. I am interested to see if my study of accountability will produce positive dividends in responsibility for the students, in terms of grades, and, in addition, for the class, as a whole, in terms of depth of discussion and number of participants.

Data Collection and Results

Data Collection

Subjects. In order to complete this study, I randomly selected two of my eight sections of economic students to participate. The students are predominately high school sophomores but there are a few junior and seniors students sprinkled throughout each section. The students range in age from 15-17 years, and the groups are approximately half male and half female. Class section 4A has 18 students and 5A has 15 students. All students in these sections are participating in the research study. Economics is a mandatory class at this public school, and students are required to have a passing grade in order to graduate from high school.

Methodology. This research study was conducted in my classroom with my economic students. The first aspect to the data collection was the quizzing of the students at the beginning

of the class period. I met with my students twice per week for 2 weeks, giving quizzes at each meeting. I did this for both sections involved in the research project. The quizzes were either over the reading assignments or the previous class meeting's main concepts. The quizzes were brief and could be completed in 5 minutes or less (see Appendix A). After the 2 weeks of using the quizzing method, as I worked through the subject matter, I tested each section with a chapter test. These test scores were recorded in the electronic grade book.

For the next area of study (with these same two sections of students), I abandoned the quizzing, altogether, while still carrying on with similar homework and reading assignments. The only difference in these 2 weeks was the absence of the quizzes at the beginning of the class period. At the conclusion of the second 2 weeks, I again tested each section with a chapter test. I recorded all data in the computer grade book and found the class average for each class section, 4A and 5A, on chapter test 1 and on chapter test 2.

Results

Figure 1 presents the averages for both chapter tests. The first chapter test includes the quizzing and the second chapter test is without the quizzing. For class section 4A, the class average of the first chapter test score was 84.9, which included the daily quizzes. The score for 4A on the second chapter test--without daily quizzing--fell to an average class grade of 74.3. This was a 10.6 point drop in average score, when moving from quizzing to not quizzing.

For class section 5A, there was an inverse relationship from 4A's results. The average score on the first test for 5A was 78, which included the quizzing. Section 5A increased their average score to 87.8 on chapter test 2, without the daily quizzing. This was a 9.8 point increase in the average scores of the section, when moving from quizzing to not quizzing.

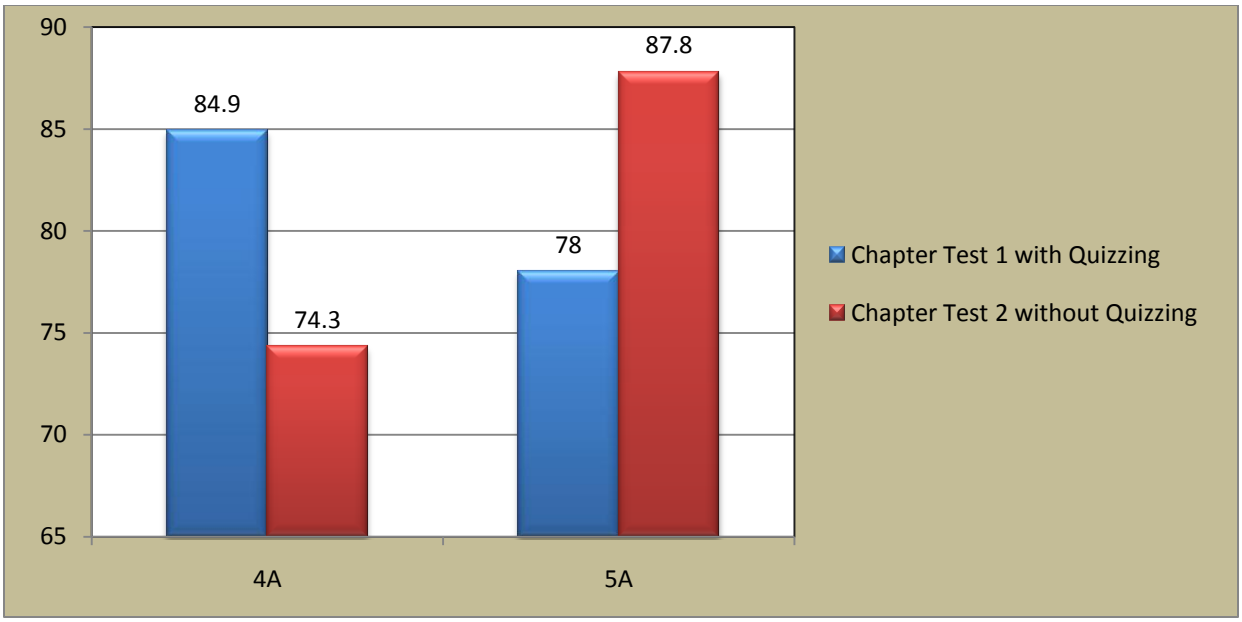

Figure 1. Results for sections 4A and 5A on chapter tests 1 and 2.

In analyzing the data from another perspective, I found that the median scores from each section's test show a different picture. The median is described as the numeric value separating the higher half of a sample from the lower half. When examining the data from this angle, the data shows that, for class section 4A, there was an overall increase in the class median of 4.5 points from chapter test 1 to chapter test 2, from an 80 to an 84.5.

Similar results occurred for class section 5A. The median score increased from 81.5 to 90 from chapter test 1 to chapter test 2. Figure 2 shows the relationship between the two class sections and the two tests, concerning median scores. (See Appendix B.)

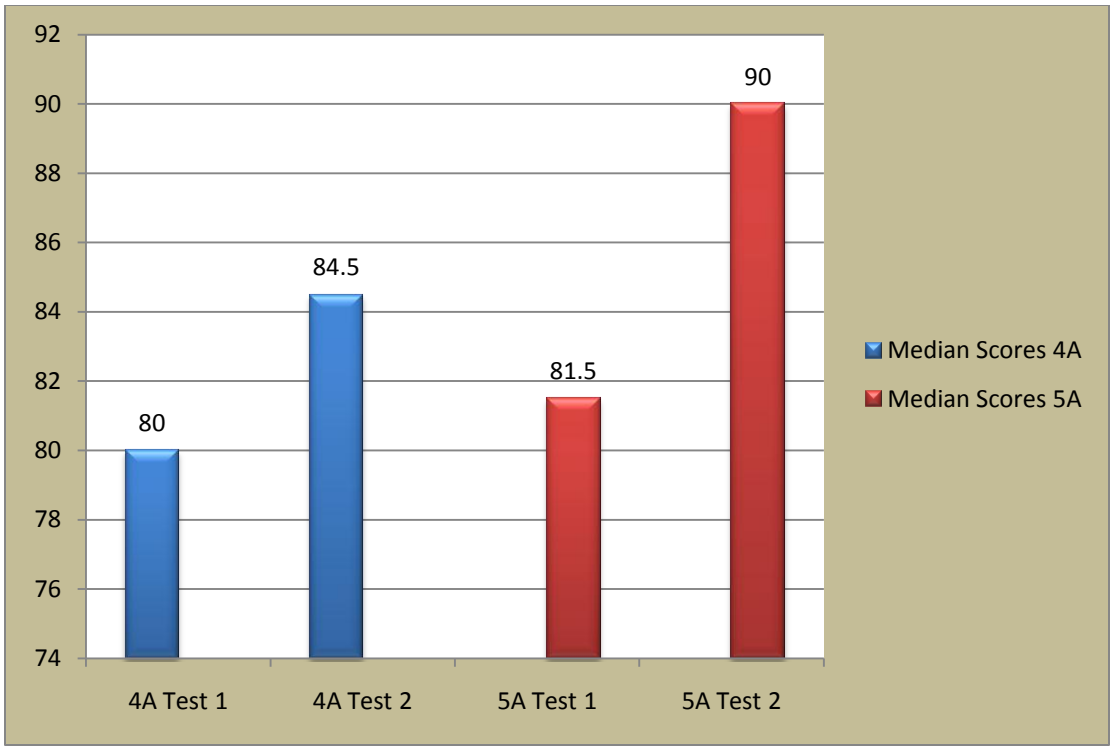

Figure 2. Median scores for 4A and 5A for chapter tests 1 and 2.

Conclusions and Recommendations

Conclusions

Based on the results of the case study, and considering the data on class sections 4A and 5A, with each section having the opposite average score outcomes, yet similar results in terms of the median score, it is necessary to conclude that the research done was insufficient to determine whether or not quizzing on a daily basis is effective in increasing test scores. With one class, section 4A, apparently benefitting from the quizzing by scoring higher on the chapter test by an average of over 10 points, one could conclude that the quizzing helped reinforce the concepts or important ideas in the chapter's material. However, the second section of students, 5A, did not appear to benefit from the initial quizzing, as their average scores increased after the quizzing was abandoned. It is possible that section 5A had learned some valuable study habits in their

preparations for the quizzes that carried over, but this is simply a hypothesis, and much more study is needed to explore whether quizzing does, indeed, affect student testing.

When looking at the median scores of the two class sections, it appears that quizzing was insignificant in terms of directly affecting the test scores. With both class sections, the median scores increased from the first test to the second test indicating that the scores were higher during the period of time that did not include the quizzing. As stated, concerning the average test scores, it is possible that the brief, initial quizzing aided in the students' study habits, and paid off on the second test. Another possibility is that, as the semester went along, the students became more comfortable with the teacher/teaching, and the type of chapter testing that was expected. As a result, adjustments were made by the students, which caused the increase in the median scores.

In general, based on the results of this study, there was not enough time allotted for research, nor was it comprehensive enough to determine whether or not the addition of quizzing is an effective strategy to increase chapter test scores.

Recommendations

The first recommendation I have to achieve more definitive results would be to gather data over a more significant time period. The time allotted for this project was limited to a few weeks. Developing habits, especially good ones, takes time, and there was insufficient time with the quizzing segment of the research to insure a true adjustment to the class procedures, especially with meeting with classes just twice per week. A second recommendation would be to begin the research without the use of quizzes. If I were to repeat this study, I would begin the first quarter of the school year without the daily quizzing. Beginning with the second quarter, I would introduce the quizzing. At the end of the semester, this approach might better show the

benefit (or lack thereof) of the study habits developed as a result of the quizzing on homework and readings.

A third recommendation is that of professional development. Increasing student scores through quizzing could possibly be achieved through increased professional development for the teacher. Focusing on techniques in preparations for testing/quizzing and related areas could benefit the students and extract more from the experience. Finally, a school schedule of meeting at least 4-5 times per week might prove to be a better environment for such a study, as routine is a significant factor in establishing good study habits, and developing responsibility, which is the goal of the quizzing strategy.

Because of the recent and growing consensus of educational professionals, as noted in my review of literature, on fostering accountability and responsibility for the teenager and student, there is merit to the idea of continued research. Several studies in the review were funded by grants. President Obama's "Race to the Top" policy, with an emphasis on using data to measure student growth, might provide a forum for obtaining federal grant money to explore the strategy of quizzing to increase comprehensive-style tests. Various types of technology and uses of technology could assist in future research as computers would be used not only to record data, but also to track effective techniques amongst teachers and school systems.

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Appendix A

Quiz Questions

Questions for Quiz #1

1. Name 2 of the 3 basic economic questions that every society must ask itself.

a.

b.

2. What are the four economic systems?

a.

b.

c.

d.

3. Pick one of the economic systems and tell me who answers its economic questions.

Questions for Quiz #2

1. List 3 of the 6 characteristics of the American economy.

a.

b.

c.

2. Pick one of the characteristics you wrote above and define / explain it.

Questions for Quiz #3

1. There are 6 goals of the American economic system. List four of the goals.

a.

b.

c.

d.

2. Explain economic efficiency. Can it ever be completely achieved?

Questions for Quiz #4

1. Define / explain Capitalism. What are some advantages to this economic system? Disadvantages?

2. Define / explain Socialism. What are some advantages to this economic system? Disadvantages?

Appendix B

Summary of Data

Class Section 4A

Scores on Chapter Test 1	Scores on Chapter Test 2
Average Score: 84.9	Average Score: 74.3
Median Score: 80	Median Score: 84.5

Class Section 5A

Scores on Chapter Test 1	Scores on Chapter Test 2
Average Score: 78	Average Score: 87.9
Median Score: 81.5	Median Score: 90

Math-ercise…Could It Fatten Up Scores?

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Introduction to the Study

Background and Problem Statement

Many of us have at least one, if not many, distinct memories of sitting in math class daydreaming, with the teacher's voice vaguely heard in the background. But, at the same time, parents, educators, and Americans know that math is a critical core subject that our children must grasp. As a country, our students' academic math scores have not been in the lead and they still lag behind today (National Assessment for Educational Progress [NAEP], 2009). Could it be that a vital subject is still taught the same way as it was 50 years ago? Could boredom be a factor? Another researched area is that of physical activity and its positive effects on our brains (i.e., boosting energy, attention span, and alertness) not to mention the positive effects on our bodies.

To state the problem plainly, a majority of kids think that math is boring and dull. Another problem is that math scores of American children are not where they should be, as compared to other countries. The purpose of this study is to determine if incorporating physical activities into math lessons will have an impact on students' scores and attitudes toward learning math. The intervention will be comparing two similar math classes in size and ability by incorporating math energizers into alternating lessons. Math energizers are activities developed by East Carolina University in which students will participate in some form of physical activity during the lesson. These activities vary from marching in place or jumping hopscotch style to students touching their toes or picking up cards from the floor. The teacher will align these activities with the math curriculum (Mahar, Scales, Miller, Kenny, & Shields, 2006). The researcher hypothesizes that, not only will scores increase, but students will be more engaged, learn more actively, and feel more confident about learning mathematical concepts. Parents should also notice a difference in their child's attitude toward learning, and display positive

feedback about how they learned and what they learned in these classes. This study was conducted at the level of sixth grade in a rural middle school. This particular school was chosen because the researcher is a math teacher at this school. This made the use of energizers easily incorporated into some math classes.

Research Questions

- What will be the impact on sixth grade students' math scores of including physical activity in math instruction?
- What is the impact on student attitudes toward math before and after physical activities are made a part of a mathematics lesson?
- Do parents report on surveys an improvement of their child's attitude toward math in general and toward daily math homework activities after physical activity is incorporated in math lessons?

Literature Review

Overview of Literature

While researching how physical activity affects the learning process, and, ultimately, the scores in our schools, the researcher began with finding research that found effects of the inclusion and exclusion of physical activity in the form of Physical Education class, in-school recess, and after-school sports activities. Some schools have implemented programs mainly geared to stem the rise of obesity and health-related problems from a sedentary lifestyle that many young people today are accustomed to living. The results of these programs yielded positive results or no negative results, on the whole. Since we know that physical activity has positive results on health, the question remained whether integrating movement into the classroom lessons would produce better scores improved, student attention span, or improved

attitudes about school. Ultimately, would students retain more of what is presented in the classroom when movement is involved? Although only a few studies were found on including activity/movement into lessons, the results are promising.

Impact of Lack of Exercise

It is common knowledge that, as a country, our schools' scores have not been what we have hoped them to be, when compared to scores of other countries (NAEP, 2009). Because of this great concern, more emphasis has been paid to academics alone, leaving physical activity in the dust. Physical education classes have been replaced with academic classes, in an effort to increase academic achievement, despite the fact that research has found increased activity in schools increases arousal and self-esteem, and reduces boredom, which could be expected to improve student behavior and academic success (Coe, Pivarnik, Womack, Reeves, & Malina, 2006).

Other than the possible adverse effects on academics by taking out physical activities in schools, child obesity has continued to rise. Ahamed, McDonald, Reed, Naylor, Liv-Ambrose, & McKay, (2007) found that in Canada, 82% of children aged 9-12 were not active enough to meet guidelines for normal growth and development.

Findings on Fitness Programs

Ahamed, et al. (2007) also found that it has previously been suggested that schools have a unique captive and diverse audience of students, and may be able to provide the best avenue to encourage physical activity. According to Kwak, Kremers, Bergman, Ruiz, Rizzo & Sjostrom, (2009), academic achievement has also been linked to cardiovascular fitness, which, in turn, is linked to cognitive performance. To support this, an international study was done to review the relationships between academic performance and physical activity in school. In this study, 55

minutes of physical education were included in one group, while the other group was given 55 minutes of art or computer sciences. The experimental group taking 55 minutes of P.E. showed greater reading and math scores than did the control group (Trudeau & Shephard, 2008).

Going beyond the academic and physical aspects of physical activity, children gain social benefits from group physical activities by learning to cooperate, sharing, and abiding by rules (Taras, 2005). According to Taras, during physical activity, circulation improves increasing blood flow to the brain. This raises the levels of endorphins and norepinephrine, which reduce stress, improves mood, and causes a calming effect, leading to a better learning environment for all students. This study looked at fourteen different articles dedicated to the link between academics and physical activity in school-aged children. The articles studied at by Taras did show that, though there may not be an academic improvement in every class because of a physical activity program, there is an improved rate of learning per unit of class time.

A program named Physical Activity Across the Curriculum (PAAC) was implemented in 26 elementary schools in northeast Kansas, out of concern for previous findings on childhood obesity. In this study of incorporating physical activity into some subjects (primarily language arts and mathematics), it was found that academic achievement was significantly improved. Teachers were trained to deliver physically active lessons for 90 minutes/week, in addition to 60 minutes/week of physical education. It also found that the children who participated in PAAC had favorable shifts in body-mass index (BMI), and tended to be more physically active over 24-hour periods and on the weekends (Donnelly, Greene, Gibson, Smith, Washburn, Sullivan, et al., 2009). Mainly in response to obesity trends, North Carolina State Board of Education required all children (K-8) to receive at least 30 minutes of physical activity per day. Their findings also showed improvements of increased focus, alertness, enjoyment in class, and awareness of health

(Evenson, Ballard, Lee & Ammerman, 2009). More in-depth study is needed, with this particular program, to determine if scores were favorably affected.

Physical Education Integration Strategies

There are various ways in which to integrate different levels of physical activities into classroom instruction. One early study used brain-based activities, and incorporated them into curricula. These activities can be individual, partner, or group. The focus of these activities is to stimulate both sides of the brain. For example, when student performs a "switch," they are to "point the right forefinger out away from the body, point the left thumb up to the sky, then quickly switch" (Worrell, Kowar, & Oldfather, 2003). Another program, called Getting Energized and Recharged (GEAR), was used in Hawaii. These are activities such as brisk walking, short aerobic exercises, jumping, etc., that help students regain their 'focus' (Maeda & Murata, 2004). Other integration suggestions come from a study, *Integrating Movement and Learning in Elementary and Middle School*. Instead of a program, the authors give suggestions for student placement in the room to perform activities like tag, relays, etc. Suggestions are given to use with the classroom instruction, such as, 'Add 6+2 and show the answer by jumping' (Clancy & Hruska, 2008).

Although this is advantageous to students to have movement in the classroom, reducing the monotony, Ammerman (2008) was in search of more movement within the curricula, instead of only adding physical activity, at some point during the day, in the classroom. The North Carolina Math Middle School Energizers, designed because of the action of the North Carolina Board of Education, is more specifically concentrated to subject areas (language arts and math). These energizers have had a positive impact on students' BMIs, and produced favorable reports from teachers and students.

Summary of Findings from Literature

In summary, although studies have shown that physical activity is an important component to student health, welfare, and academic comprehension and growth, the focus on scores, and scores only, has led the systematic departure of physical activity in school curriculum. The effect of taking physical activity out of the school day has been shown to hinder, instead of increase, scores and student performance, therefore, gradually, it has been brought back. Administrators, teachers, and researchers have been paying particular attention to the impact on scores, student achievement, student attitude, and the student health movement that physical activity has as it is brought back into the classroom.

Methodology

Setting

The school that participated in this action research study is a middle school of approximately 700 students. The area is a small rural community, with the majority of residents being Caucasian, and a very small minority of Spanish-speaking individuals. This school was selected, in part, because the researcher is a sixth-grade math teacher at this school. In addition, this school was chosen due to the fact that, over the last 3 years, the sixth grade has scored below zero for Value Added. The researcher felt these circumstances would be helpful in proving or disproving the hypothesis given.

Participants

Participants are two of the researcher's sixth-grade math classes, both of whom will be of similar ability, in terms of the previous year's scores. The control group participants are in two similar classes in grade, size, and abilities. Approximately 20 students are in the inclusion

classes, and 27-29 students are in the average- to high-ability level classes. Parents or guardians of students will also be participants.

Procedures

The study was conducted by using two control groups (Group A and Group AA), which included an inclusion class (Group A) and higher-level class (Group AA) of one teacher, and an experimental group (Group B), which included the researcher's inclusion class and higher-level class of the researcher, (Group BB). The exercise activities that Group B and Group BB participated in were not graded; only the outcome of math test scores were graded and compared to the graded test scores of Group A and Group AA, respectively. A pre-test was given to both groups to confirm that each group had approximately the same base knowledge before the unit began. Students were also given a pre-unit survey, with a Likert scale, to rate student attitude about math (see Figure 1). Group A and Group AA were taught a unit in math with direct instruction, group work, and graphic organizers, as was done the previous year. Simultaneously, Group B and Group BB were taught the same unit, but, mainly, with daily Math Energizers (Mahar et al., 2006). Math Engerizers included, a variety of activities that were included in the unit lessons. These included but were not limited to, hopscotch, jumping, skipping, marching, stretching, imaginary jump rope, math baseball, etc. After the unit was complete, all groups were given a post-test. Scores were compared, A to B and AA to BB. Students who were in the experimental groups (B and BB) were given a post-survey, (see figure 2) designed to rate student attitudes about math after this unit. Parents were asked to fill out a five-question Likert scale survey to rate their child's attitude toward math, after the unit was taught. Two comment questions are included in the parent survey. (See Appendix B.)

Data Collection and Analysis

Instrumentation. A pre- and post-test was created to assess the benefits of using physical activity as part of a math class by way of test scores. This was a 7-day lesson that involved adding and subtracting integers, multiplying and dividing integers, and coordinate plane. Pre- and post-test scores of the control groups (A and AA) and the experimental groups (B and BB) were tabulated. Pre- and post-attitude surveys were five-question surveys using a Likert scale and two open-ended questions (see Figures 1-4). Questions pertained to the feelings of the students about math, math class, math homework, understanding, and confidence in this subject area. The scale was rated from "strongly agree" to "strongly disagree." The researcher used the values 1-5 to score the scale. Attitude surveys given to parents/guardians about their child were a seven-question survey, with five Likert scale and two open-ended questions. Questions were asked to gain knowledge from the parent about attitude changes in math, math class, math homework, understanding, and confidence, as seen in their child, over the course of this research. The scale was rated from "strongly agree" to "strongly disagree," The researcher used the values 1-5 to score the scale (see Figure 5).

Data collection. The surveys were sent home with the students in Groups B and BB, along with regular correspondence from school. The parents were given 1 week to return their surveys to the school. The parents sent their surveys back to their child's homeroom teacher. The teachers placed the completed surveys in the researcher's mailbox in the office and the research collected them from there. Students from the researcher's classroom returned the surveys to other teachers on the same grade level so the researcher did not know the identity of the responder. Pre-tests were given after all consent forms and assent were signed. Data from the pre- and post tests given to students was summarized.

Data analysis. The researcher analyzed the surveys in several ways. First, the data were tabulated by adding the totals of agree and strongly agree together and then adding the totals of disagree and strongly disagree together. The researcher determined the percentage of the answers in comparison to the total number of responses. The percentages of the individual question's responses of all participants will be averaged to get an overall view of answers. The student and parental open-ended comments were collected and compiled and the researcher acknowledged and described common themes that were found through these qualitative data. Data from the pre- and post-test scores are compared (Group A to Group B and Group AA to Group BB).

Results

Pre- and post-tests. Each student was given a pre- and post-test. The results for these tests for the control groups are as follows. Group A scored a mean of 41.89 for the pre-test and Group AA scored a mean of 63.48 for the pre-test. The average results of the post-test given to the control are 69.14 for Group A and 89.90 for Group AA. This shows a score increase of 27.25% in Group A and 26.42% for Group AA. These students were taught in a traditional manner, using notes, graphic organizer, drill and practice. Results for the experimental groups, B and BB, are as follows. The mean for the pre-test of Group B was 35.17 and the mean for the pre-test of Group BB was 77.78. The average results of the post-test given to the experimental group are 69.90 for Group B and 94.27 for Group BB. This shows a score increase of 34.73% in Group B and 16.49% in Group BB. These students were taught not only by traditional methods, but by kinesthetic means.

Student surveys. Student surveys were given to Groups B and BB at the beginning of the unit to check for differences in student attitude in math. The choices were tallied and put in charts. The same process was administered after the unit was completed. There was an increase

in both groups in positive student attitude toward math, math class, and ability to comprehend and succeed in math class.

The results of the pre-unit attitude survey of Groups B and BB (see Figures 1 and 2, respectively) showed that 10% of students in Group B (with a total of 21 in the class) and 44% of Group BB (with a total of 27 in the class) either strongly agreed or agreed with question one, 57% of students in Group B and 85% of students in Group BB either strongly agreed or agreed with question two, 57% of students in Group B and 85% of students in Group BB either strongly agreed or agreed with question three, 38% of students in Group B and 59% of students in Group BB either strongly agreed or agreed with question four, 67% of students in Group B and 67% of students in Group BB either strongly agreed or agreed with question five. Concerning questions 6 and 7 of the survey, many students expressed that they would like less notes and less homework. It was also noted that more than half of the students mentioned that math class is boring, especially since, this year, math class is a block of 1 hour and 40 minutes.

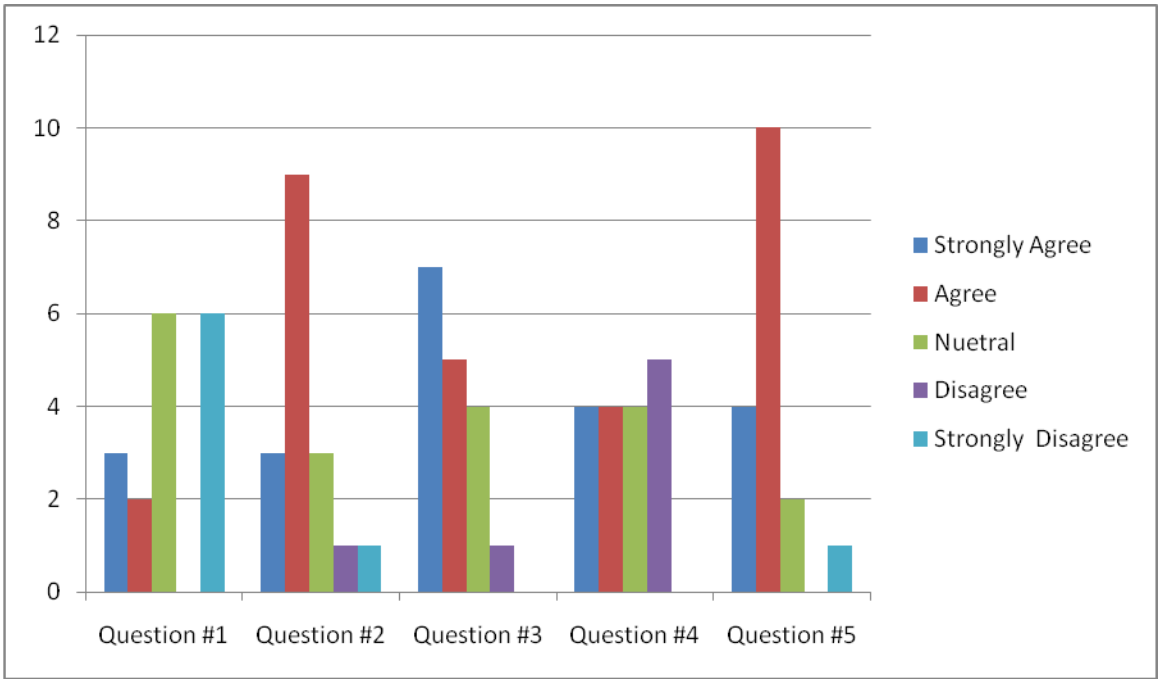

Figure 1. Pre-test survey results for Group B.

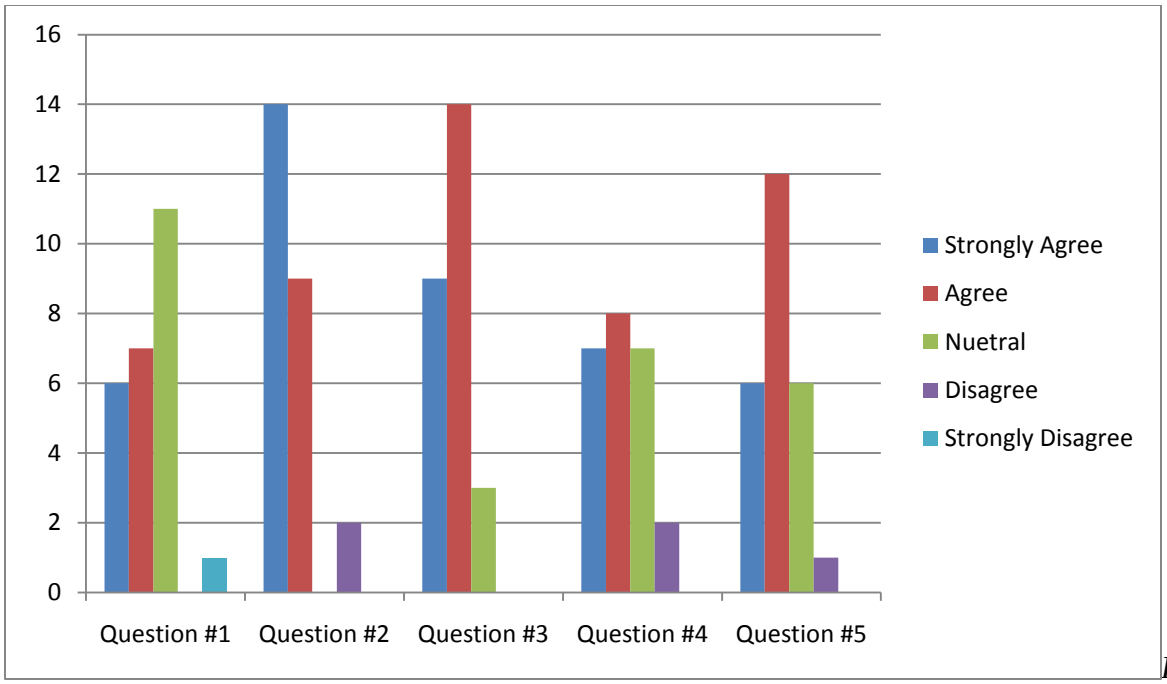

Figure 2. Pre-test survey results for Group BB.

The post-survey results (see Figures 3 and 4) showed that 57% of students in Group B and 67% in Group BB either strongly agreed or agreed with question one. This is a favorable increase of 47% in Group B and 23% in Group BB. Ninety-five percent of students in Group B and 85% of students in Group BB either strongly agreed or agreed with question two; a favorable increase of 38% in Group B and a 0% increase of students in Group BB. Seventy-six percent of students in Group B and 89% of students in Group BB either strongly agreed or agreed with question three. This is a favorable increase of 19% of students in Group B and 4% of students in Group BB. Fifty-seven percent of students in Group B and 56% of students in Group BB either strongly agreed or agreed with question four. This is a favorable increase of 19% for students in Group B and a 1% decrease for students in Group BB. Seventy-six percent of students in Group B and 63% students in Group BB either strongly agreed or agreed with question five. This is a favorable increase of 9% of students in Group B and a 4% increase of students in Group BB. Concerning questions 6 and 7 of the survey, students expressed

excitement about the movement and activities they had been doing in math class. Most that answered felt that they learned better by this teaching strategy. The overall theme was math was much more interesting and fun during this unit, than in any other this year.

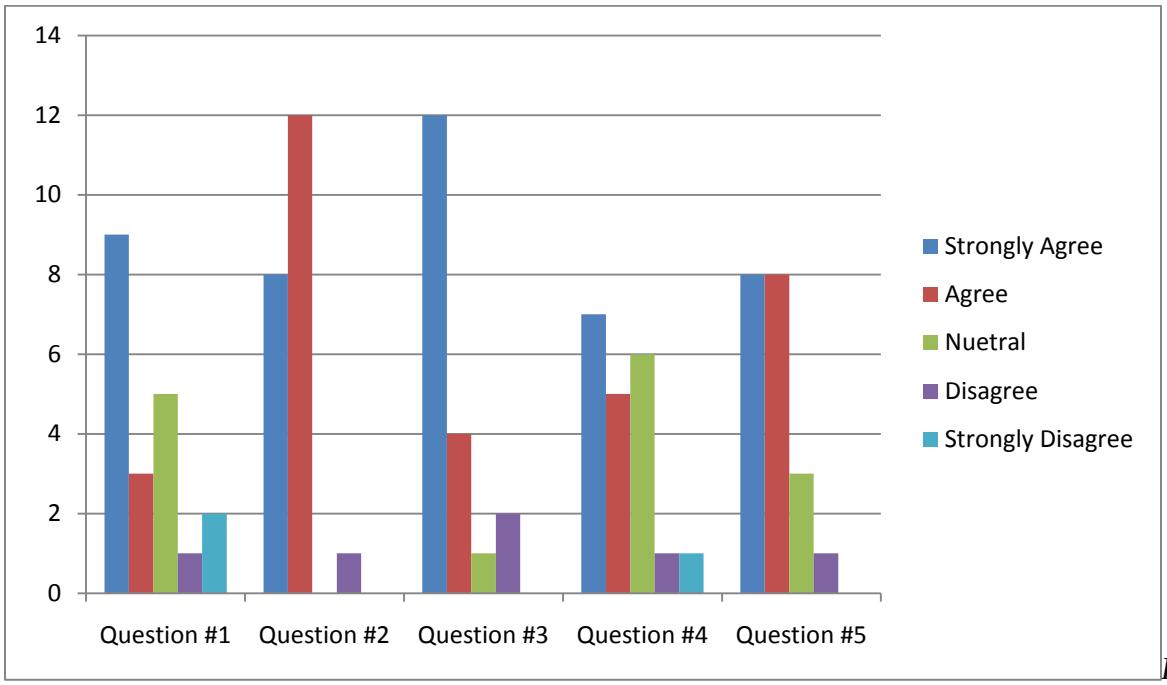

Figure 3. Post-test survey results for Group B.

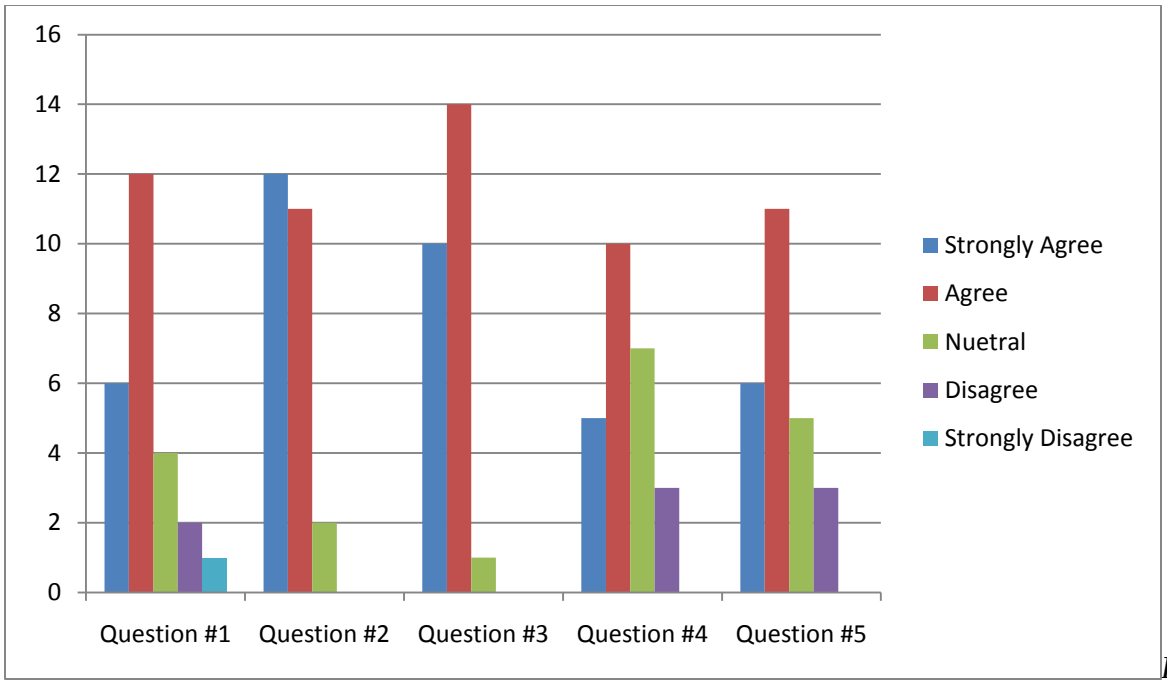

Figure 4. Post-test survey results for Group BB.

Parent surveys. Only one parent in Group B participated in the parent survey (see Appendix B). Eighteen parents with children in Group BB participated in this survey (see Figure 5). Eighty-three percent of parents either strongly agreed or agreed with question one, and 5% either disagreed or strongly disagreed. Ninety-five percent of parents either strongly agreed or agreed with question two, and 5% of parents either disagreed or strongly disagreed. Sixty-one percent of parents either strongly agreed or agreed with question three, and 17% of parents either disagreed or strongly disagreed. Eighty-nine percent of parents either strongly agreed or agreed with question four, and 5% of parents either disagreed or strongly disagreed. Fifty percent of parents either strongly agreed or agreed with question five, and 5% of parents either disagreed or strongly disagreed. The overall theme of parent comments for questions 6 and 7 was that the school should incorporate more movement across the curriculum. Most of the open-ended questions were left blank by the parents.

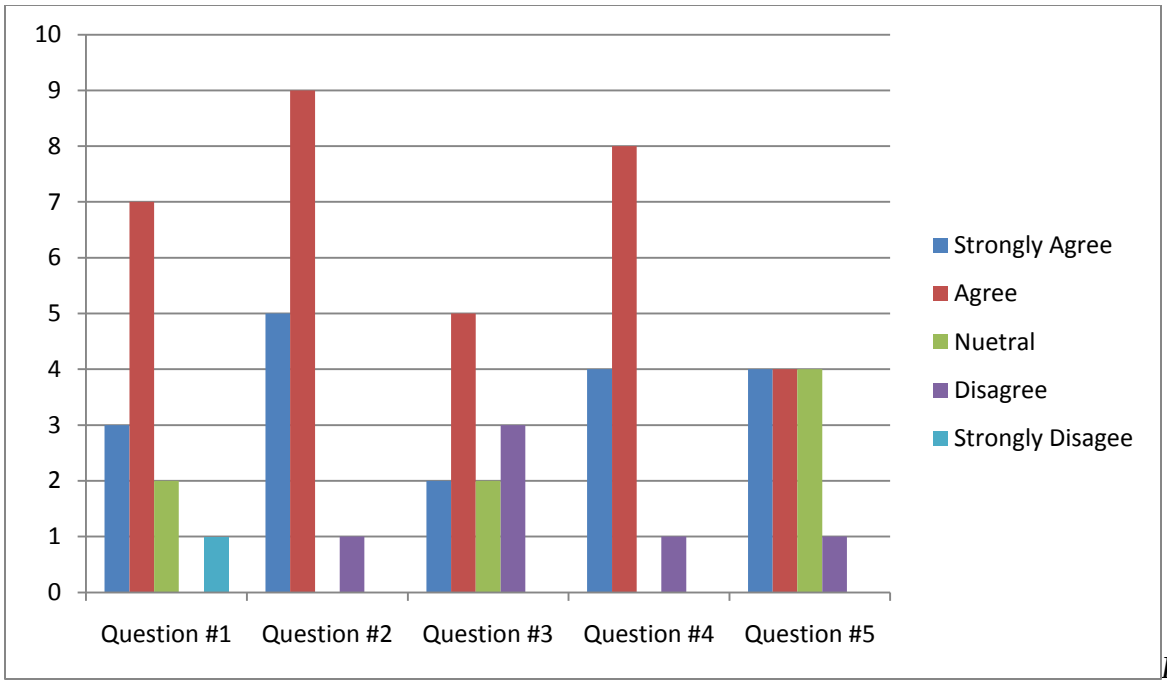

Figure 5. Survey responses of parents.

Conclusions and Recommendations

Even though Groups A and AA were comparable to Groups B and BB, there was a slight difference in ability, as documented by standardized test scores. This fact may have played a role in the pre- and post-test results and should be taken into consideration when evaluating the student scores and results, of this research. Secondly, although the control groups and the experimental groups were taught in different ways, each teacher has his/her own style and manner in which they interact with their students. Such anomalies have to be considered when comparing the differences in test scores.

Throughout the course of this lesson, several behaviors were noticed. As the researcher and the teacher of the experimental group, it was noticed that, by using the fun physical activities, when the time came for manual practice, students were much more open to this kind of activity, with much less complaining. Disruptive behaviors were greatly decreased during these

classes. It was noticed that students in the experimental Group B, an inclusion class, displayed more enthusiasm toward the physical movement activities than did Group BB, who were an advanced math class, and much more serious about academics, in general. Both experimental groups did enjoy all or most of the physical activities incorporated into the lessons, and have continued to ask for more of the same. These results are promising for student success in math, as shown by test scores and student attitude toward math. Further in-depth study in this area could prove very useful for professional development.

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Appendix A

Student Survey

Read the following questions and choose the answer that best corresponds to your opinion.

1. I look forward to coming to math class.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

2. The teacher makes an effort to make sure that I understand the material.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

3. The teacher gives me an opportunity to ask questions in class.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

4. I feel confident that I will be able to understand all the concepts in math this year.

- Strongly agree
- Agree
- Neutral

- Disagree
- Strongly disagree

5. I feel that I have mastered all of the topics presented in class so far.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

Please answer the following questions using the boxes provided.

6. What are some things the teacher can do to help you learn math better?

7. What are some things you feel the teacher should not change about the class?

Appendix B

Parent Survey

Read the following questions and choose the answer that best corresponds to your opinion.

1. My child looks forward to coming to math class.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

2. My child feels confident about his/her math homework.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

3. My child talks about math class in a favorable way.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

4. My child has been able to understand all the concepts in math presented so far this year.

- Strongly agree
- Agree

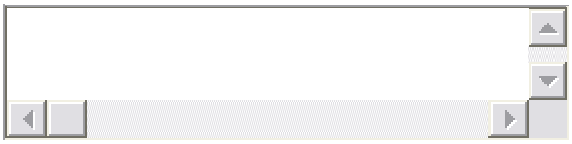
- Neutral
- Disagree
- Strongly disagree

5. My child feels math class is enjoyable.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

Please answer the following questions using the boxes provided.

6. What are some ways you feel your child could learn math better?



7. What are some things you feel the teacher should not change about the class?