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TEACHING WITH A LOGICAL-MATHEMATICAL STYLE ENSURES HIGHER
SCIENCE TEST SCORES IN PHYSICAL SCIENCE STUDENTS

by

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B.S., Winona State University, 2003

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Teaching with a Logical-Mathematical Style Ensures Higher Science Test Scores in
Physical Science Students

Capstone directed by Dr. Thomas Sherman

Abstract

The No Child Left Behind (NCLB) Act of 2002 now requires states to develop a system to measure the progress of all students based on the Minnesota standards. The science standards require that students develop logical thinking and inquiry skills. How are science educators to be sure that their students are meeting the new inquiry-based science standards? One possibility is to gear assessments towards the logical-mathematical intelligence, created by Howard Gardner.

In this study, a group of ninth grade physical science students were given assignments and activities designed to stimulate their logical-mathematical intelligence. An exam was administered at the completion of each unit that included questions regarding the logical-mathematical activities and assignments. The students were given a multiple intelligences inventory to determine their dominant intelligence. The unit test scores were grouped based on the dominant intelligence and were then averaged.

A t-test was done comparing the average unit test scores of the logical-mathematical students with the students whose dominant intelligence was not logical-mathematical. Statistically the results were found to be significant; however the average test scores of the students whose dominant intelligence was not logical-mathematical were rather low. Teaching towards the logical-mathematical intelligence does result in higher unit test scores in physical science students who have a dominant

intelligence of logical-mathematical, but unfortunately it did not result in high test scores for all physical science students.

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CHAPTER 1: INTRODUCTION

Need for the Study

Howard Gardner, a Harvard psychologist, has published studies and information regarding the seven multiple intelligences. His theory, developed in the early 1980s, states that there are eight intelligences that are possessed by everyone. The degree of development of each intelligence varies from person to person. He went against the tradition of IQ testing, stating that intelligence is a “plurality of capacities” (Gardner, 1983). Each intelligence focuses on the ability to solve problems, the ability to generate new problems to solve and the ability to produce or offer something of value from one’s culture. As a teacher of high school science classes, I gear my activities and assessments towards my logical-mathematical students. Logical-mathematical intelligence deals with analyzing problems logically, the solving of mathematical operations, and the investigation of scientific issues—all necessary for success in the sciences (Gardner, 1999). By teaching towards the logical-mathematical intelligence, students should develop that intelligence and score higher on science tests. Teachers and schools are also being held accountable for the success and progress of their students. Teachers would be able to demonstrate the success of their students by utilizing test scores.

Statement of the Problem

The No Child Left Behind (NCLB) Act of 2002 now requires states to develop a system to measure the progress of all students based on the Minnesota standards. The science standards require that students develop logical thinking and inquiry skills. How are science educators to be sure that their students are meeting the new inquiry-based

science standards? One possibility is to gear assessments towards the logical-mathematical intelligence.

Purpose of the Study

With the federal government focusing on highly qualified teachers and student achievement, it is important for teachers to ensure the success of their students in their particular subject matter. It is also important for high school teachers to prepare their students for the challenges they could encounter in college. The purpose of this study is to determine whether students can develop their logical-mathematical intelligence in physical science classes if they are instructed in a way that stimulates that particular intelligence.

Statement of the Hypothesis

Teaching with a logical-mathematical style does not affect the test scores of ninth grade physical science students.

Variables

The dominant intelligence of the students is the independent variable of the study. The dependant variable of the study is the student's test scores. The control variables of the study were the students whose test scores were used, the classroom that the tests were administered, the time of day, and having the same instructor. Prior knowledge and socio-economic background are moderator variables that could have potentially had an impact on the results of the study. The students were exposed to the same teaching style and methods as well as the same material. In addition, students who already have a heightened logical-mathematical intelligence may have had an impact on the results.

Limitations and Delimitations of the Study

All of the students were taught the same material by the same instructor. There was a difference of ability levels within the class as well as attendance issues that I was unable to control. The test questions were all created by the instructor rather than using questions from a textbook or a question bank.

Definition of Terms

No Child Left Behind (NCLB) Act—Education reform law enacted in 2002 by President George W. Bush that focuses on accountability for results, more choices for parents, greater local control and flexibility, and an emphasis on doing what works based on scientific research

Intelligence—the ability to learn or understand; or to deal with new situations

Multiple Intelligence—theory developed by psychologist Howard Gardner that suggests there are at least seven different ways people acquire information

Logical-mathematical—the capacity for inductive and deductive reasoning and reasoning as well as well as the use of numbers and the recognition of abstract patterns

Inductive reasoning—inference of a generalized conclusion

Deductive reasoning—the deriving of a conclusion by reasoning

CHAPTER II: REVIEW OF LITERATURE

History of Multiple Intelligences

Prior to psychologist Howard Gardner's publication of MI theory, intelligence quotient (IQ) was the sole measurement of a person's intelligence. IQ tests produce a number that is used to measure the academic success in schools. Certain numbers on the scale are flagged as numbers of importance. For example, IQ tests are usually used when students are tested for special education services. Type of mental impairment is based on the person's IQ score. The divisions of educable, trainable and severely and profoundly mental impaired depend on IQ score. According to Gardner, the ability to answer questions verbally or written shouldn't be the only measure of intelligence (1983).

Gardner felt that there was more to intelligence than just the IQ test. He cites examples from history and other cultures, including sailors and religious leaders. Youth who utilize the sky and stars for sailing and Iranian children who master the Koran and their language--are they not intelligent? By reframing the idea of intelligence, Gardner believed people would "devise more appropriate ways of assessing it [intelligence] and more effective ways of educating it [intelligence]" (Gardner, 1983).

From this, the theory of multiple intelligences (MI) evolved. Gardner studied evidence from many groups of people—prodigies, the gifted, brain-damaged patients, adults and children considered to be normal by society, idiot savants—those with a IQ less than 25, but with exceptional intelligence, along with experts in different fields and individuals from diverse cultures. Based on the information gathered, he was able to

develop a list of seven intelligences. Eventually, an eighth intelligence, naturalist, was added.

All of the intelligences must fulfill a set of prerequisites. The first of which involves problem solving. An intelligence must allow an individual to solve problems or difficulties that are encountered. Secondly, it must also allow for that individual to find or create problems—the means to acquire new knowledge (the definition of science). Finally, Gardner's list of prerequisites validated the intelligence and ensured that it was useful and important.

The criteria used to determine the intelligences were rather lengthy. First, an intelligence must have a unique symbol system that allows for the intelligence to be expressed, such as sign language or musical notes. Secondly, the intelligence must include individual histories in terms of emergence and development within an individual. There also needed to be a biological basis that is subject to change through injury to the brain. Finally, there must be expression of the intelligence in products that are culturally meaningful.

The History of the Logical-Mathematical Intelligence

The basis of the logical-mathematical intelligence is different from the other intelligences. Instead of developing within the person, the logical-mathematical intelligence is traced to the surrounding world and the comprising objects. A child counts objects, rearranges them and counts the same number of objects. During this process a child gains the most fundamental knowledge about the logical-mathematical realm. He or she can then develop the skills necessary to explain statements and the

relationships among those statements, eventually reaching a level of abstract thought (Gardner, 1983).

Jean Piaget, a leading contributor to childhood development, focused primarily on cognitive development and the logical-mathematical understanding. Piaget's original studies were in biology. After a period where he questioned his religious upbringing, he turned to biology to explain the world around him. Eventually he went back to school to study biology and philosophy. Piaget studied the development of the child and adolescent brains and constructed three principal stages of intellectual development—sensorimotor stage, representational stage and the final stage of formal operations. In each stage, the reasoning ability of the person is developed (Gardner, 1972).

He stated that the first interactions between people and objects occur at a fairly young age. Once babies reach eighteen months, they attain a sense of object permanence—even though an object is out of sight, it continues to exist. This realization allows the development of grouping—certain objects possess similar properties-- and eventually the idea of small quantities. Counting follows and then the ability to associate a number with an object: for example, the first object is number one; the second object is number two and so forth. Around six or seven years of age, the child can compare totals and determine which group has the lesser amount. Finally, quantity can be assessed and the concept of quantity has been learned. Once the child can compare objects, he or she can add, subtract and eventually learn more complex operations such as multiplication and division. Piaget's view of intelligence places

great importance in the mastering of these skills, but they only focus on the handling of objects.

These actions learned by children can become internalized, where the comparisons or calculations can be done mentally, and the child still arrives at the same correct answer. Piaget's final stage of mental development involves the inclusion of symbols and words. The child can solve for variables that stand for objects and actions upon objects. He can also state a hypothesis and infer the results.

Piaget meticulously describes the development of logical-mathematical thought, but he also believed that it pertains to other areas, such as musical intelligence.

Gardner disagreed with Piaget's step-by-step development of the logical-mathematical intelligence. It has been well studied and documented by psychologists that some children are able to perform mathematical operations earlier than others, but cannot comprehend formal operational thought involving symbols and variables. Another negative aspect of Piaget's work is that it doesn't apply beyond Western culture, while Gardner looked at education in many different countries (Gardner, 1983).

The Logical-Mathematical Intelligence

Math and science have always been closely related. Many scientific theories depend on math as an explanation. For example, Albert Einstein's theory of relativity has been simplified to an equation: $E = mc^2$. The scientist uses math to obtain some order out of chaos. The difference is that science uses math as a tool to explain the physical world and mathematicians use math to explain abstract systems. Piaget noted that scientific development parallels with the development of logical-mathematical

thought in children. Both involve simple experimentation with objects and determining patterns of their interactions and behaviors (Gardner, 1983).

The logical-mathematical intelligence is the basis for the more difficult sciences and math. People who utilize this intelligence emphasize the rational which allows them to be good at finding patterns, cause and effect relationships, and sequencing. Logical-mathematical people think in terms of concepts and questions and love to put ideas to the test. They are also good at controlled experimentation where students are given and follow a procedure for a scientific test (Silver, Strong, Perini, 2000).

The logical-mathematical intelligence also involves inductive and deductive reasoning. People who utilize their logical-mathematical intelligence enjoy logic puzzles and mental math. Famous people such as Albert Einstein, George Washington Carver and Marie Curie demonstrated highly developed logical-mathematical intelligences (Schmidt, 2001).

Gardner even comments in *Creating Minds* (1993) that Einstein embodied the logical-mathematical intelligence.

...Einstein's linguistic skills were modest and his interest in the personal sphere strictly limited. Rather, as befits a physical scientist, his thought was rich with visual-spatial images and possible experiments. He could readily relate these experiments to mathematical formalisms and to concepts that existed within a tight logical-mathematical structure (Gardner, 1993).

Education and Intelligence

Everyone possesses all eight intelligences and they are all used in different situations. Through life each intelligence is developed but people demonstrate a high ability in one or two intelligences, which are considered to be the dominant

intelligences. At an early age, children develop inclinations towards certain intelligences. By the time they enter school, their learning style may favor one or two particular intelligences (Armstrong, 2000). As young children, the linguistic intelligence is developed while students learn the alphabet, sentence structure and grammar. Memorization is standard practice with math facts and historical dates. According to Gardner in *The Unschooled Mind*, “the school experience is marked by an extreme dissociation from important events or palpable products in the life of the community” (1991). Interpersonal skills emerge as students learn to work with each other, but are not as developed as intrapersonal skills, where students look into themselves and plan for the future. Spatial and kinesthetic skills are used in elective classes, such as art or industrial technology. Gardner suggests using a “matching system” (Gardner, 1983) to pair students with their preferred method of learning. For many teachers, this sounds like an impossible task due to the large number of students and subjects taught, but allowing students to choose the type of assessment helps increase the understanding of the students in that particular subject matter (Silver, Strong, Perini, 2000). Some school districts are looking at differentiated instruction, which allows teachers to gear assignments to students of different learning abilities.

While students are responsible for learning mathematical facts, there is little emphasis on logic and inquiry. Studies have shown that many students learn through hands-on activities and experiences where they are actively involved. They also learn by trying to solve real-life problems. Inquiry-based activities stimulate the logical-mathematical intelligence by allowing students to solve problems in a logical manner (Schmidt, 2001).

Assessment and Intelligence

A test can be administered in order to determine a student's dominant intelligence. However it may not give the best representation of the student's learning style. Psychologist Thomas Armstrong suggests that teachers can determine a student's dominant intelligence by observing the student's misbehavior in class. For example, a student who talks out of turn may favor the linguistic intelligence while a student whose dominant intelligence is bodily-kinesthetic may fidget while sitting in his or her desk. He also recommends multiple types of assignments that would appeal to students based on their dominant intelligence such as skits or drawings (Armstrong, 2000).

Different intelligences can be integrated into the curriculum for instructors. Teachers can take a particular topic and develop assignments geared to each of the intelligences. The curriculum can then be modified depending on the success of the assessments. Students are exposed to different types of learning and can use and develop different intelligences (Silver, Strong, Perini, 2000).

In today's school systems tests have taken on a profound importance. Many states have introduced numerous standardized tests in all disciplines. The tests include multiple choice or short answer questions, which only assess the students' memorization of facts, not the application of their knowledge (Gardner, 1991).

Gardner also comments on the different learning styles of students.

...Children have different intellectual strengths and learn in different ways; that teachers must serve as role models of the most important skills and attitudes and must in a sense embody the practices that are sought; and that meaningful projects taking place over time and involving various forms of individual and group activity are the most promising vehicles for learning...Such assessment

should take place, in the context of normal daily activities of learning (Gardner, 1991).

He then states that teachers need to take into account the different ways students acquire and demonstrate their knowledge. Instead of teaching students to regurgitate facts, teachers should instruct students how to understand by setting a goal for the students to achieve at the beginning of a unit. Limiting the number of goals will focus the attention of the students to the desired standard or benchmark. Students should also be informed beforehand the content and expectations of test material. Many opportunities should be available for the students to practice the information and to receive feedback. Ongoing assessment will also help students to focus during the course of the unit, rather than worry about a culminating exam. Ongoing assessment helps students to use their intrapersonal intelligence and self evaluate their performances (Gardner, 1999).

CHAPTER III: METHODS AND PROCEDURES

Overview

The effects of teaching towards the logical-mathematical students were analyzed in this study by determining the dominant intelligence of each student and comparing average test scores throughout the fall semester of 2005.

Research Design

This study was conducted fall semester 2005 at a rural high school in southeastern Minnesota. Students were given multiple intelligence inventories to determine their dominant intelligence. The students were given a multiple intelligence inventory at the end of the semester to determine each of their dominant intelligences. The inventory was done at the end of the semester so there would be no bias towards particular students during the design or grading of assessments. At the completion of every unit the students were given tests to assess their comprehension of the particular topic. For each student, the test scores were averaged for the entire semester. The average scores were then compared with students who had the same dominant intelligence, as well as students with different dominant intelligences. The average scores for the logical-mathematical students were compared to the other students.

Subjects

The participants of this study included twenty-two high school physical science students enrolled in Science 9, at a small, rural school in southeastern Minnesota during fall semester of the 2005-2006 school year.

The student population was 100% Caucasian, with one student who transferred from Mississippi as a result of Hurricane Katrina. Six students were serviced by special

education for a range of disabilities. Two students were diagnosed as having developmental cognitive disabilities (DCD). Two students were diagnosed as having emotional and behavioral disorders (EBD) and two students were diagnosed as having learning disabilities (LD). Eleven students were female and eleven students were male. The ages of the students ranged from 15 to 16.

Instruments

The instruments used in this assessment were a Multiple Intelligences Inventory (Appendix A) as well as unit tests (Appendix B).

Validity and Reliability Measures

Many of the variables, with the exception of the students' dominant intelligence were kept constant. Within the course, students attended the same school, studied the same curriculum with the same teacher, and took the same tests. However, there were occasions when the other intelligences were presented in activities. For example, molecular models were made that would be more beneficial to the students with a dominance in spatial intelligence. For the students serviced by special education, some of their test questions were modified as required by their Individual Education Plans (IEPs).

The validity of the study was supported by the results of the t-test. A t-test was done comparing the average test scores of the logical-mathematical students with the average test scores of the other students. The results of the t-test supported the hypothesis of this study. The probability of the null hypothesis being correct was 0.0029. Some uncontrollable factors such as prior knowledge, parental assistance and

student aptitude may have affected the students' test scores and the validity of the results.

The reliability of the experiment is not as strong as the validity because of the affect the instructor had on the students. Another instructor might not utilize similar teaching methods or create similar test questions which could change the students' test scores. Another school with a different curriculum would also find different results. The relationship and repair that the instructor had with the students could have also affected the students' willingness to work and study hard in the Science 9 class.

Procedures

At the completion of each unit, students were given a unit exam consisting of 15-20 multiple choice questions followed by short answer and application questions. The questions were selected based on the content covered during the course of the unit. Test scores were calculated by taking the total number of points earned by the student divided by the total number of points possible. The test scores were not weighted or curved. Tests were always given at the beginning of class, after the students were given an opportunity to ask questions and review their notes. On the last day of the semester the students were given a multiple intelligences inventory to determine their dominant intelligence. The average test score for the semester was calculated for each student.

Conclusion

The purpose of this study was to see if teaching with logical-mathematical activities caused higher test scores in physical science students. Students were given a multiple intelligences inventory to determine their dominant intelligence. Tests were administered at the conclusion of each unit. Average test scores were calculated for

each student and were compared to students with the same dominant intelligence, as well as the other students in the class. The average scores for the logical-mathematical students were then compared with the average test scores of the other students.

CHAPTER IV: RESULTS AND DISCUSSION

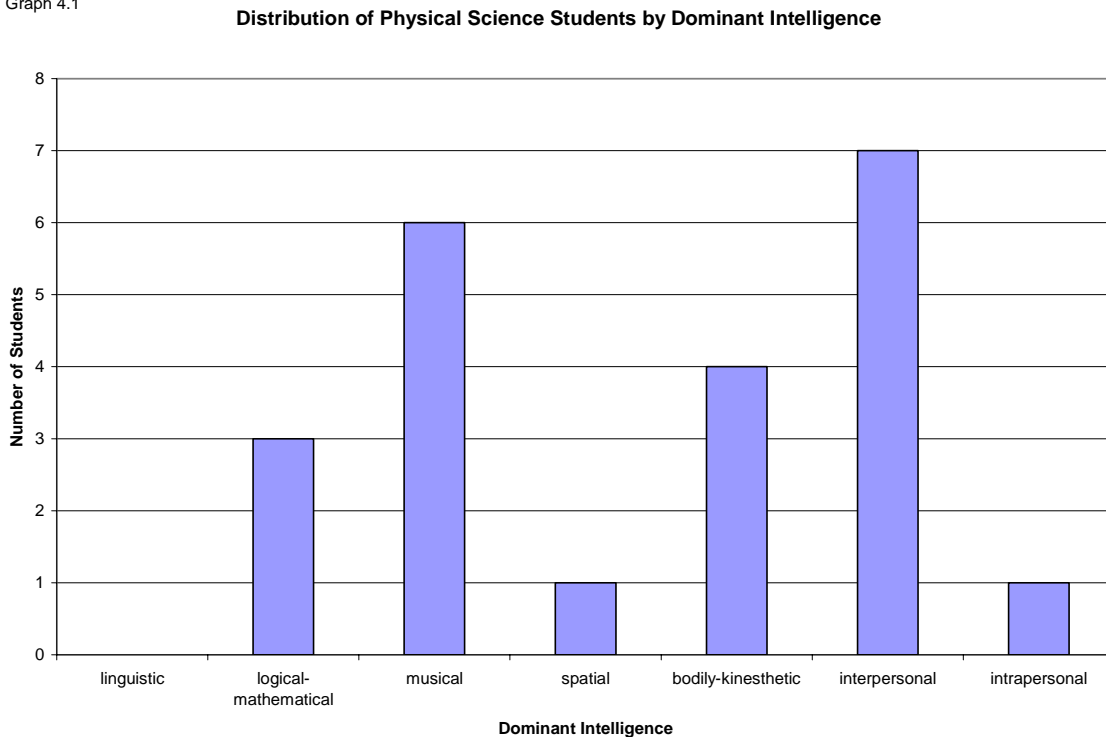
The purpose of this study was to determine if teaching towards the logical-mathematical intelligence caused physical science students to obtain higher unit test scores. Each unit consisted of a particular physical science topic. Assignments for the students included worksheets, laboratory experiments and activities. The students were then given a test at the completion of the unit. Test questions covered the lecture topics as well as the laboratory experiments and activities. Each test began with 10-15 multiple choice questions followed by short answer and application questions. The total point value for each test varied by unit. The students' score was calculated by taking the total number of points earned divided by the total number of points possible. The test scores were not curved or weighted.

The final day of the semester each student took a multiple intelligences inventory (Appendix A) to determine his or her dominant intelligence. The survey required the students to determine whether they agreed or disagreed with particular statements. Each statement was indicative of a particular type of intelligence. For example, the linguistic questions focused on literature and grammar. When the students completed their surveys, the number of responses to each intelligence was tabulated and their dominant intelligence was determined. Some students were found to have two or three dominant intelligences because they had answered an identical number of questions for more than one intelligence. The students listed the top three intelligences and then chose their dominant intelligence if they found themselves in that situation. If the students did not choose a dominant intelligence, it was then chosen for them when the average test scores were calculated.

Results

The test scores for each student were entered into a Microsoft Excel spreadsheet. Average test scores were calculated for each student. The students' dominant intelligence was also entered into the spreadsheet in order to create graphs and charts. Graph 4.1 shows the percent distribution of the different intelligences of the ninth graders.

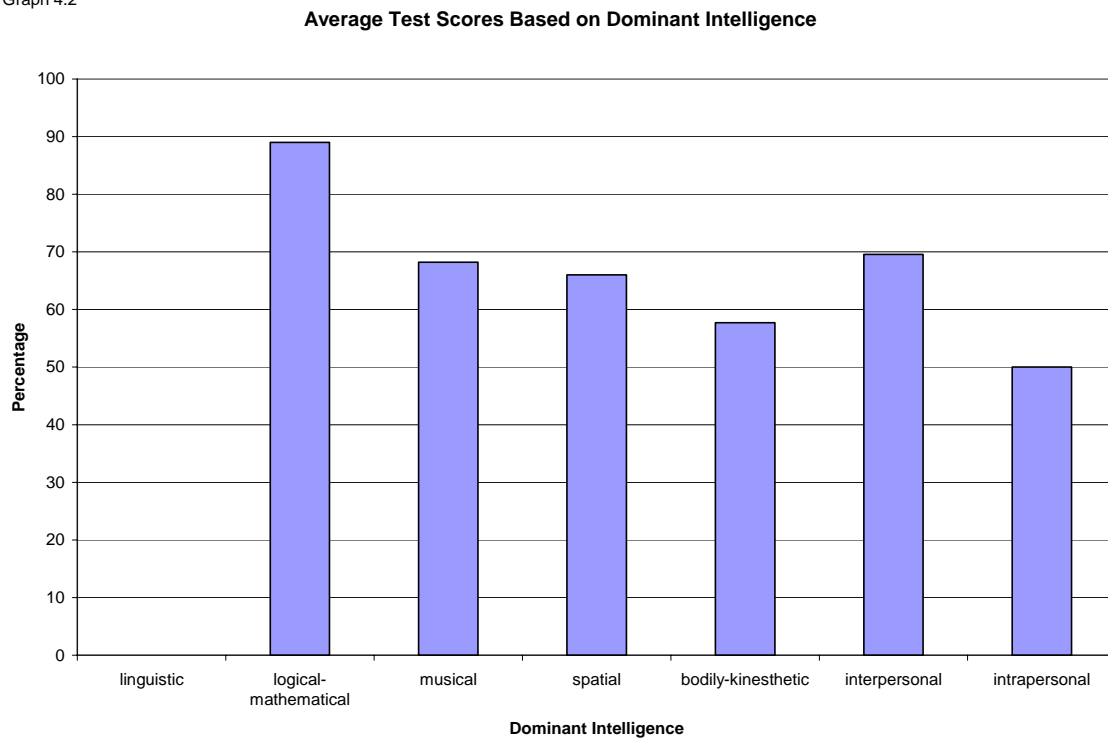
Graph 4.1



In the Science 9 class, no students possessed linguistic as their dominant intelligence. Almost one-third of the ninth graders determined interpersonal to be their dominant intelligence. Musical was the next dominant intelligence for the ninth graders, with 27.3% reporting it as their dominant intelligence. The third largest group reported bodily-kinesthetic as their dominant intelligence. Three of the students reported logical-mathematical as their dominant intelligence.

Graph 4.2 shows the average test score of the students based on intelligence. The scale used by the instructor is the standard 90-80-70-60 scale where 90% of the total points is an A, 80% is a B, 70% is a C and 60% is a D. Any percentage earned below a 60% is considered to be a failing grade.

Graph 4.2



The average test scores of the logical-mathematical students were compared to the average test scores of the other students. The probability of the null hypothesis being correct was 0.0029 which indicates that the results of this study were significant. In conclusion, it is shown that the logical-mathematical students earned higher test scores as a result of logical-mathematical activities.

CHAPTER V: SUMMARY AND CONCLUSIONS

Although the percentage of logical-mathematical students in the class was small, their test scores indicated that they were successful in demonstrating their knowledge in activities and assignments geared towards the logical-mathematical intelligence. However there may have been other factors contributing to the students' success, such as their prior knowledge. There were other intelligences however that demonstrated success in the logical-mathematical realm. For example, some of the musical students earned high individual test scores, but there were other musical students with low individual test scores. Since there were more students with lower test scores, the averaged value was lower.

Unfortunately, the other six intelligences did not demonstrate the high test scores desired by the instructor. Even though the results of the t-test support the hypothesis, the logical-mathematical activities did not increase the test scores of the non-logical-mathematical students. This may have been due to the students who received special education services. Their average test scores were quite low compared to the other students.

There were also students in the class who were unmotivated when it came to exams. One student in particular did not pass one test the entire semester because of his lack of motivation, regardless of the additional support offered to him by the instructor. There were other students who claimed to have "test anxiety", where they would freeze during a test and forget learned information.

Surprisingly, the bodily-kinesthetic had the second lowest test averages overall. Since there are so many opportunities for hands-on learning activities in science

courses, the bodily-kinesthetic learners should have learned more from performing laboratory experiments. Also, some of the students had more than one dominant intelligence based on the results of their multiple intelligence inventories. In order to simplify the results, only one intelligence was used for the calculations. The students may have had some difficulty interpreting the inventory questions but the questions were read to the entire group as an accommodation for the students in the special education program. The students were then given an opportunity to ask questions if they did not understand the vocabulary on the multiple intelligences inventory.

Recommendations

Although the statistical analysis of this study showed valid results, not all of the students had higher test scores. The students whose dominant intelligence was logical-mathematical did have higher test scores, which is to be expected since the activities were meant to stimulate the logical-mathematical intelligence. Unfortunately, the students whose dominant intelligence was not logical-mathematical had rather low test scores. In fact one of the groups obtained test scores that were below a passing level. A better comparison may have been made if a pretest and posttest were used as measurement tools.

It would also be interesting to compare the dominant intelligence and test scores with the rest of the ninth grade students. A larger sample size may provide more accurate results because there were students who were apathetic towards their test scores as well as a large number of special education students in the test sample.

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APPENDICES

Appendix A: Multiple Intelligences Inventory

Name _____ Class _____

Multiple Intelligences Inventory

Instructions: Read the statements and check the statements that apply to you.

Group 1

- I easily remember memorable quotes or “sayings” and use them well in my conversations with others.
- I am fascinated by scientific philosophical questions like “When did time begin?”
- I enjoy music and have favorite performers
- I can remember in detail the layout and landmarks of places I’ve visited on vacations
- I regularly engage in at least one sport or physical activity
- When I meet new people, I often make connections between their characteristics and those of other acquaintances
- I regularly spend time alone to meditate, reflect, or think about important life questions.

Group 2

- My library of books is among my most precious possessions
- I can easily double or triple a measurement, formula or recipe without having to put it down on paper
- People say that I have a pleasant singing voice
- I often see clear visual images when I close my eyes
- I can master new sports easily
- People often come to see me for help and advise
- I think about what I want from life and what I want to accomplish when I am grown up

Group 3

- I can hear words in my head before I read, speak or write them down
- Math and science are among my favorite subjects in school
- I can tell when a musical note is off key
- I am usually sensitive to color
- I find it difficult to sit still for long periods of time
- I can sense quickly how other people are feeling about things and themselves
- I have some important goals for myself that I think about on a regular basis

Group 4

- I get more out of listening to news on the radio and hearing books on tape than I do from watching TV
- I frequently beat my friends in chess, checkers or other strategy games
- My collection of music is among my most treasured possessions
- I have a camera or camcorder that I use to record what I see around me
- I like working with my hands at an activity such as sewing, carving, carpentry or model-building
- I prefer group sports like basketball, volleyball or softball to solo sports such as swimming or jogging
- I have intuitions about things that turn out to be true

Group 5

- I am a master when it comes to word games like Scrabble or Boggle
- I like to set up “what if” experiments
- I play a musical instrument
- I can easily solve jigsaw puzzles, mazes and other visual puzzles
- My best ideas often come to me when I’m out for a long walk or jog
- When I have a problem, I’m more likely to seek out another person for help rather than attempt to work it out on my own
- People tend to see me as a loner

Group 6

- I enjoy entertaining others with tongue twisters, nonsense, rhymes or puns
- People sometimes tell me I have a very computer-like mind
- I catch myself sometimes walking down the street with a television jingle or other tune running through my mind
- I sometimes have vivid dreams at night
- I like to spend my free time outdoors
- I have at least 3 close friends
- I have a special hobby or interest that I keep pretty much to myself

Group 7

- Other people sometimes have to stop and ask me to explain the meaning of words I use in my writing and speaking
- I organize things in my bedroom and desk according to categories and in patterns
- I can easily keep time to a piece of music
- I can easily find my way around unfamiliar territory
- I frequently use hand gestures or other forms of body language when conversing with someone
- I prefer social pastimes like Monopoly or sports to individual recreations such as video games or solitaire
- I prefer to spend a weekend alone rather than be around lots of people

Group 8

- English, social studies and history are easier for me than math and science
- I believe that almost everything has a rational explanation
- I know the tunes to many different songs or musical pieces
- People praise me for the drawings or doodles I create
- I need to touch things in order to learn more about them
- I enjoy the challenge of teaching another person what I know how to do
- I have participated in groups or counseling sessions to learn more about myself

Group 9

- When I am traveling down a highway, I pay more attention to the words written on the billboards than the scenery
- I wonder a lot about how certain things work
- If I hear a musical selection once or twice, I am usually able to sing it back fairly accurately
- Geometry is easier for me than algebra in school
- I enjoy scary movies, dare devil amusement rides or similarly thrilling experience
- I feel comfortable in the middle of a crowd
- I usually know how I feel about something or about my feelings

Group 10

- I have written something recently that I was particularly proud of or that earned me special recognition by others
- I like finding logical flaws in the things that people say and do
- I often make tapping sounds or sing while working, studying or learning something new
- I can comfortably imagine how something might appear if it were looked down upon from directly above in a birds eye view
- I need to practice a new skill by doing it rather than simply reading about it or seeing a video that describes it
- I like to get involved in social activities connected with my school, church or community
- I keep a personal diary or journal to record the events of my inner life

Group 11

- I note other people's errors in using words or grammar, even if I don't correct them
- I feel more comfortable when something has been measured, categorized, analyzed or quantified
- I sometimes enjoy different sounds in my environment
- I prefer looking at reading material that is heavily illustrated
- I often can figure out how something works or how to fix something that's broken, without asking for help
- I would rather spend my evenings at a lively party than at home alone
- Someday I would like to start my own business

Number of A's _____	Linguistic
Number of B's _____	Logical-mathematical
Number of C's _____	Musical
Number of D's _____	Spatial
Number of E's _____	Bodily kinesthetic
Number of F's _____	Interpersonal
Number of G's _____	Intrapersonal

My dominant intelligence is _____

My second intelligence is _____

My third intelligence is _____

Appendix B: Sample Unit Test

Name _____

Physical Science Quiz
 Scientific Method, Metric System and Scientific Notation

1. _____ Which of these is NOT an SI unit?
 a. Kelvin
 b. mole
 c. volume
 d. meter
2. _____ The SI unit for temperature is
 a. degrees Celsius
 b. degrees Fahrenheit
 c. Kelvin
 d. candela
3. _____ Which of the following measurements is the largest?
 a. 1 cm
 b. 1 μm
 c. 1 mm
 d. 1 dm
4. _____ How would 0.00865 be written in scientific notation?
 a. 8.65×10^3
 b. 865×10^3
 c. 8.65×10^{-3}
 d. none of these
5. _____ The SI prefix for 100 (10^2) is
 a. giga
 b. centi
 c. micro
 d. hector
6. _____ Which of the following is an example of quantitative data?
 a. The diaper smells putrid
 b. The leaves are green
 c. Dawson's mass is 8 kg
 d. The sulfur is dull
7. _____ Which number is written in correct scientific notation?
 a. 840×10^2
 b. 84.0×10^3
 c. 84000
 d. 8.4×10^4
8. _____ Which of these is equal to 1 millionth ($1/1,000,000$)?
 a. giga
 b. micro
 c. mega
 d. pico
9. _____ When writing a number in scientific notation, M must be
 a. greater than 1
 b. less than 1
 c. a positive number
 d. between 1 and 10
10. _____ When multiplying two numbers in scientific notation, the exponents must be
 a. the same
 b. added together
 c. subtracted
 d. multiplied

Write the following in standard notation. **Show your work!**

11. 5.2×10^3

12. 3.6×10^1

13. 9.65×10^{-4}

14. 6.452×10^2

15. 8.5×10^{-2}

16. 8.77×10^{-1}

17. 2.71×10^4

18. 6.4×10^{-3}

19. 9.34927×10^5

20. 3.2845×10^{-7}

Write the following in scientific notation. **Show your work!**

21. 78,000

22. 16

23. 0.00053

24. 0.0043

25. 250

26. 0.875

27. 2,687

28. 0.012654

29. 0.00003847

30. 4893600

31-35. Read the following paragraph. Circle any quantitative measurements and underline any qualitative measurements you may find. (5 points)

Skylar prepares for an experiment that calls for calcium chloride. She writes in her lab notebook that the mass of calcium chloride she is using is 12.8 g. She also writes that it is a white, round solid. She then uses a graduated cylinder to obtain 25.0 mL of water. When the calcium chloride is added to a sodium carbonate solution, a white solid forms. The water is evaporated off and the mass of the solid is 26.4 g.

For 36-40, use the following scenario.

Justin and Alex are sitting on a deck, enjoying the warm summer day. They pour soda pop into two glasses and decide to play tennis for a while. When they return, hot and thirsty, they each take a drink of their respective glasses and notice that the soda pop tastes flat.

36. Think of a question for this observation.

37. Think of a testable hypothesis for this observation.

38. What qualitative data could you collect?

39. What quantitative data could you collect?

40. After you have collected all of the data and finished the experiment, what is the next step?

Make the following conversions. Be sure to **show your work** for full credit.

41. 99 dag to dg

42. 653 μs to ns

43. 0.0645 Gm to km

44. 0.0000549 kL to mL

THE EFFECTS OF DIFFERENTIATED INSTRUCTION READING
COMPREHENSION HOMEWORK ON NORTHWEST EVALUATION
ASSOCIATION READING ASSESSMENT PERFORMANCE
OF SECOND GRADE STUDENTS

by

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B.A. University of Minnesota, Morris, 2001

A capstone submitted to the
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Northwest Evaluation Association Reading Assessment Performance
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The final copy of this capstone has been examined by the signatories, and we find that both the content and form meet acceptable presentation standards of scholarly work in the above mentioned discipline.

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The Effects of Differentiated Instruction Reading Comprehension Homework on Northwest Evaluation Association Reading Assessment Performance of Second Grade Students

Capstone directed by Dr. Thomas Sherman

Abstract

Young readers do not comprehend what they are reading resulting in the inability to retain information read by the time they are assessed. This study examined the effects of differentiated instruction reading comprehension homework on the Northwest Evaluation Association reading assessment performance of second grade students.

A class of second grade students took the NWEA assessment in the fall. They were then given differentiated instruction reading comprehension worksheets to be completed five days a week with an adult at home. They were divided into two differentiated instruction groups based on each student's previous RIT score on the fall NWEA reading assessment. A spring NWEA assessment was given to measure the class's mean RIT growth on the reading assessment from fall to spring. The mean RIT growth was compared to that of the previous year's second grade students.

Both years mean RIT scores improved from fall to spring. However, those students who had the opportunity to complete the differentiated instruction reading comprehension homework sheets mean RIT growth improved slightly more on the NWEA reading assessments in comparison.

While differentiated instruction reading comprehension homework sheets increased students' mean RIT scores on the NWEA assessment, the practice was very time-consuming for the teacher and required much adult interaction with the students at home. If readers still struggle with comprehension after second quarter of second grade, this practice might be best reserved for them to prepare for the spring NWEA assessment.

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CHAPTER I: INTRODUCTION

Need for the Study

We read everyday. We read books, poems, assignments, lists, signs, puzzles, directions, recipes, letters, advertisements, and much, much more. To face the world of print, students need to comprehend what they are reading. When students comprehend what they are reading, they make connections with the ideas in that text. They read the texts and make meaning of the ideas they represent based on: (1) information they already know that's related to the new situation and (2) their own perceptions and feelings about the information (Glazer, 2000). If they don't know anything about the text, then pouring words into their mind is like pouring water into your hand. You don't retain much (Martin, 1991).

Statement of the Problem

Students' reading ability is measured, in part, by their comprehension of what is read. Northwest Evaluation Association has created an assessment that measures reading ability as one of their three core areas. Data of past second grade students in this school district has shown a deficiency in reading comprehension on the NWEA assessment. Practices that are the most effective for building the reading comprehension of second grade students need to be examined. While reading comprehension is a common practice in most primary classrooms, perhaps differentiated instruction reading comprehension homework sheets would be more beneficial to students taking the Northwest Evaluation Association reading assessment to improve their reading comprehension.

Statement of the Hypothesis

The growth of the mean Rasch Unit (RIT) scores on the Northwest Evaluation Association reading assessment will improve more for second grade students who engage in differentiated instruction reading comprehension homework sheets than for the previous year's second grade students who did not.

Definition of Terms

Measures of Academic Progress (MAP): Un-timed achievement tests in mathematics, reading, and language usage that are taken on a computer. The MAP system displays one test question at a time on the screen. The difficulty of the test will adjust to how you perform on the questions that you answer. As you answer the questions correctly, the questions become a higher RIT level question. As you answer the questions incorrectly, the question will result in a lower RIT level question. It will build the test just for the student.

Northwest Evaluation Association (NWEA): Assessment instrument uniquely designed to provide accurate measurement of student achievement and student growth across time. It is not an assessment for determining mastery of skills. It provides a road map for students toward achieving mastery. It enables students to take an assessment that is just right for them – not too hard or too easy. Because the test is matched to the student, the scores are more accurate. The assessment results may be used for focusing instruction for students and for evaluating the overall effectiveness of instructional programs.

RIT (Rasch Unit): All assessments developed by NWEA use the RIT scale which stands for Rasch Unit for the mathematician who developed the theory for the RIT scale. The RIT scale is an achievement or curriculum scale that starts at 150 and goes to 300. RIT is the unit of measure that uses individual item difficulty values to estimate student achievement. All items in the test bank have an identified RIT level of difficulty. A RIT score is a student's instructional level on the RIT scale where they can answer questions with approximately 50% accuracy. RIT scores create an equal interval scale. Equal interval means that the difference between scores is the same regardless to whether a student is at the top, bottom, or middle of the RIT scale and it has the same meaning regardless of grade level. The RIT score reflects the level at which the student is performing and is unrelated to the age or grade of the student.

Mean RIT Score: The class average (mean) is the average score received by the class.

Differentiated Instruction (DI): Differentiated instruction is a teaching philosophy based on the premise that teachers should adapt instruction to student differences. Teachers should modify their instruction to meet their students' varying readiness levels, learning preferences, and interests.

Homework: Out-of-class tasks assigned to students as an extension or elaboration of classroom work.

Remedia Publications' Wonder Stories: High interest low readability reproducible reading comprehension homework sheets.

Variables

The independent variable of this study was the differentiated instruction reading comprehension homework sheet. The dependent variable was the mean RIT growth on the reading section of the NWEA assessment taken during the fall of 2004 and the spring of 2005. Control variables of this study included the students being in the same classroom with the same teacher and the students receiving all the same reading instruction. The students will also be using the same computer lab while sitting in the same seating arrangement for the NWEA assessment. Moderator variables that might have affected the outcome of the study included students' individual differences and the amount of parental involvement in each student's differentiated instruction reading comprehension homework sheet.

Limitations and Delimitations of the Study

This study compared second grade students taught by the same teacher in the same school district from two different school years. Individual differences in students from those two years may have accounted for some of the differences in the results. Other limitations that were impossible to control were the students' background, academic needs, and parental involvement and dynamics, all of which may have had an impact upon the results of this project. The time and the day the NWEA assessments were taken may have also impacted the study. The relatively small number of students (21 in 2003-2004 and 22 in 2004-2005) included in this study was also a limiting factor.

Delimitations were imposed on the study. First, the study narrowed the scope to compare the growth of mean RIT scores on the NWEA assessment of only one section of second graders. Second, the study was conducted over two consecutive school years. Finally, the study focused on only the reading portion of the NWEA assessments.

CHAPTER II: REVIEW OF RELATED LITERATURE

Parental Involvement

Learning how to read is a crucial part of every child's education. Parental involvement plays a vital role in their reading success. Parental involvement has been defined as "any interaction between a parent and child that may contribute to the child's development or direct parent participation with a child's school in the interest of the child." The most basic reason to involve parents in education is student success (Anderson, 2000). Evidence suggests that a focused collaboration between home and school boosts reading achievement and that children need that boost. Teachers and parents need to work together to make the transition from learning to read to reading to learn (Boston, 2000).

A Nation At Risk: The Imperative For Educational Reform stated that parents are the child's first and most influential teacher. Moreover, they bear a responsibility to participate actively in their child's education. They must monitor the child's studies; encourage good study habits; and nurture their child's curiosity, creativity, and confidence (The National Commission on Excellence in Education, 1983).

Student achievement improves when parents are enabled to play four key roles in their child's education: (1) as teachers creating a home environment that promotes learning, (2) as supporters to their child and school district, (3) as advocates working to make the system more responsive to all families, and (4) as decision-makers on curriculum committees and management teams (Learning Resources and Educational Technology, 1997).

The Commission on Reading found parents, not the schools, laid the foundation for a child's learning to read. This report also stated the parents have an obligation to support their child's continued growth as readers. Parents reading to their children is the most recommended parental practice that is related to positive attitudes and reading achievement. Reading to a child increases the child's listening vocabulary, letter and symbol recognition abilities, length of spoken sentence and many more reading comprehension abilities (Anderson, 2000).

Parents often ask, "How can I help my child grow as a reader?" Carol Boston, an Assistant Director of the ERIC Clearing House on Assessment and Evaluation at the University of Maryland, lists a few recommendations. She recommends to give your child books as gifts, help your child use the local library, learn about how reading is taught in your child's school, keep in touch with your child's teacher, applaud the practice of literacy, let your child see you and other important adults reading and writing for practical and for pleasure, spend thirty minutes reading to or listening to your child read, and to monitor your child's homework to find out what they are learning about (Boston, 2000).

Homework

Homework is defined as out-of-class tasks assigned to students as an extension or elaboration of classroom work (ACCESS ERIC, 2005). Assigning homework can serve a variety of educational needs. It establishes good study habits, helps with time constraints on the amount of curricular material that can be covered in the classroom, adds responsibility for students by taking work home and returning it to school on time. It also brings home and school closer together. Research has begun in the last decade focusing on the relationship between homework and student achievement. There have been mixed feeling about whether homework has increased student achievement, but teachers and parents agree that homework helps develop students' initiative and responsibility. It also fulfills society's expectations of students, parents, and schools.

There are two ways for students to have more opportunities to learn: (1) increase the amount of time students have to learn in school by making the school day longer, and (2) to expand the amount of content they receive. When teachers assign homework it allows for both of these opportunities to happen at the same time. Guidelines have been recommended for the amount of homework that is assigned. From kindergarten to third grade it is recommended no more than twenty minutes per day of homework (ACCESS ERIC, 2005). It is also recommended that parents spend and additional thirty minutes a day reading to their child or listening to him or her read (DeBruin-Parecki, Perkinson, Ferderer, Lehr, & Osborn, 2005).

Reading Comprehension: Making Connections

Developing students' comprehension of literature is a complex process. There are three components for reading comprehension: a text, a reader of the text, and an interpretation of the text of the reader (Norton, 1997). When readers encounter printed text, they comprehend through retrieving prior experiences and concepts rooted into their culture and language. Good readers connect past experiences with the text, interpreting, evaluating, and considering alternative responses and interpretations (Applegate, Quinn, & Applegate, 2002). Readers in our school systems in America today, have a significant diversity of backgrounds, cultures, languages, and experiences. Each can interpret and comprehend the same text in a variety of ways. This is a profound example of how complex reading comprehension truly is.

Comprehension is the reason for reading. Good readers always have a purpose for when they read. They may read a recipe to find out how to cook a meal for their families, read directions to learn how to get to a friend's house, read a magazine for entertainment, or read a novel to meet requirements for a course. As they read, they are actively using their experiences and knowledge of the world, their understanding of vocabulary and language structure, and their familiarity of reading strategies. Good readers make sense of what they are reading and get the most out of it (Glazer, 2000).

Metacognition and Reading Comprehension

Developmental psychologists have been interested in metacognition since the early 1970s (Garner, 1987). Metacognition can be defined as “thinking about thinking.” It has also been given a great deal of attention in reading research for awareness, monitoring, and strategy use for text-processing. (Armbruster, Lehr, & Osborn, 2001). Good readers use metacognitive strategies to think about and have control over their reading. Comprehension monitoring is a critical part of metacognition. Teachers have long used questions to guide and monitor students comprehension. Teacher questioning strongly supports and advances students’ learning from reading. Questions are highly effective for improving learning from reading because they give purpose, focus student’s attention, make a reader actively think, monitor comprehension, review content and relate it to what the reader already knows. Before reading the text, readers can clarify the purpose for reading and preview the text. During reading, they can check for understanding through self-check questions. After reading the text, they can answer follow up comprehension questions (Garner, 1987).

Northwest Evaluation Association

The philosophy and purpose of Northwest Evaluation Association assessment is to “fit the test to the student, not the student to the test.” They use the assessment data to find the instructional level of each student. The assessment data is accurate and reliable as it uses a common and stable scale. It allows educators and parents the ability to monitor student academic growth and achievement.

NWEA uses the RIT scale to reflect the level at which the student is performing. RIT stands for “Rasch Unit” named after the Danish mathematician Georg Rasch who developed the theory for the RIT scale (Masters, 1993). The RIT scale is an achievement or curriculum scale that starts at 150 and goes to 300. All items in the test bank have an identified RIT level of difficulty. The RIT scale is an equal interval scale that allows educators to monitor growth accurately much like a ruler measures physical growth. The RIT score is a student’s instructional level on the RIT scale where they can answer questions with approximately 50% accuracy. The RIT scale is not grade level dependent. Any student at any grade level can attain any RIT score.

Measures of Academic Progress or MAP testing is “computer adaptive”, meaning that questions will adapt to the student’s achievement level. Questions on the assessment are generated based on student responses: a correct response results in a higher RIT level question, and an incorrect answer results in a lower RIT level question. The computer then adapts the questions until it finds the student’s RIT level within an acceptable standard error of measure. The MAP tests are un-timed and can be given up to 4 times a year.

The NWEA Learning Continuum is aligned with the 2003 Minnesota state standards. There are 5 Minnesota aligned reading standards: (1) Word Recognition, Meaning, and Vocabulary, (2) Literal Comprehension, (3) Interpretive and Inferential Comprehension, (4) Evaluative Comprehension and (5) Literature (Northwest Evaluation Association, 2004).

Word Recognition, Meaning, and Vocabulary examples include: identify and understand basic sounds, letters, words and word components, use of phonetic clues to decode, use of context to predict and infer, identify antonyms, synonyms, homonyms, and idioms, and identify multiple-meaning words.

Literal Comprehension examples include: identify topic, main idea, and supporting details, understand sequence of events, follow multiple-step instructions, locate information and structural features, and locate details of various texts.

Interpretive and Inferential Comprehension examples include: identify the author's purpose, make predictions and inferences, draw conclusions, summarize and paraphrase, and determine cause and effect.

Evaluative Comprehension examples include: Evaluate text for validity of author's point of view and evaluate author's evidence in a persuasive text, distinguish fact from opinion, and compare and contrast information from various sources, genres and authors.

Examples of literature on the NWEA test are: identify and analyze various genres, analyze and evaluate how figurative language and literary devices, such as similes, metaphors, symbolism, tone, irony, and satire, contribute to the meaning of a text, identify and understand elements of fiction (character, setting, plot, tone, point of view, theme, ect.), and recognize and evaluate author's purpose, technique, and point of view.

The examples provide a variety of graphics, illustrations, and diverse literary passages to aid in assessing for the different standards.

Differentiated Instruction

In most elementary classrooms, some students struggle with learning, others excel beyond grade level, while the rest fit somewhere in between. Within the different categories of students, individuals learn in a variety of different ways and have many different interests. To meet the needs of all of their students, teachers differentiate instruction. Differentiated instruction is a teaching philosophy based on the premise that teachers should adapt instruction to meet the needs of their students' differences (Willis and Mann, 2000).

Differentiated instruction is not a new teaching philosophy according to Carol Ann Tomlinson, an associate professor at the University of Virginia. In the old one-room schoolhouses that had students ranging from primary age to high school age learning together, differentiated instruction was used. Differentiated instruction “was how school was done” notes Tomlinson (cited in Willis and Mann, 2000). A traditional school is designed for left brain learners who love books. If you do not fit that norm, you would suffer. This type of learner, however, only represents a quarter of all learners. Differentiated instruction breaks the stereotypical school perception (Willis and Mann, 2000).

Differentiated instruction focuses on meaningful learning for all. The teacher monitors simultaneous activities that have rules to them. The activities are student centered with the teacher acting as a coach or mentor instead of the expert. Flexible groups are used that vary in size and can be changed. Assignments are given that fit the student based on conversations, student work, discussions, observations, and ongoing formal assessments, not one-size-fits-all (Tomlinson, 2001).

As the analogy goes, we cannot simply alter the same suit of clothes. One suit will not fit everybody. We can use the same fabric but how we style it, shape it, cut it and structure it will become the framework of a challenging and rigorous curriculum (Tilton, 2004).

Summary

With a limited amount of time to teach reading comprehension in the school day, it needs to be determined if students achieve more through the addition of differentiated instruction reading comprehension homework sheets. If the technique of differentiated instruction reading comprehension homework helps students make significant gains in RIT reading scores on their NWEA reading assessment, then it would seem to be an appropriate reading technique to employ in the classroom. If no greater reading comprehension gains are made by students engaged in the homework than by students without, then it wouldn't be the best practice. Attention and time could, perhaps, be better utilized elsewhere in the curriculum. This study investigated the different effects of this reading practice on the reading comprehension of second grade students.

CHAPTER III: METHODS AND PROCEDURES

Overview

This study examined the effects of differentiated instruction in the form of reading comprehension homework sheets on the outcome of the growth of the mean RIT score on the NWEA assessment between two different classes of second grade students: class of 2003-2004 and 2004-2005. Both classes took the NWEA assessments during the fall and spring of the year. The second grade class of 2003-2004 did not receive differentiated instruction reading comprehension homework sheets. The second grade class of 2004-2005 were split into two differentiated instructional groups based off their outcomes from their RIT scores on the fall of 2004 NWEA reading assessment. Then they received a differentiated instruction reading comprehension homework sheet every school day from January until April 2005. The homework sheets were sent home in cloth homework bags and were to be completed with parental supervision and returned the following school day.

Research Design

This study was a simple experiment that looked at the effects of the independent variable, the differentiated instruction reading comprehension homework sheets, on students' NWEA reading mean RIT scores. The mean RIT growth of the students from 2004-2005 were compared to the mean RIT growth of the students from 2003-2004.

Selection of Subjects

The participants of this study included 21 seven and eight year olds in a second grade class in 2003-2004 and 22 seven and eight year olds in a second grade class in 2004-2005. The small town community in which this school is located is predominantly Caucasian and middle class. The ethnic make-up of the class was predominantly Caucasian. None of the students in this study received any special education services. The students in the 2004-2005 class were grouped for differentiated instruction according to their previous NWEA RIT scores from the fall of 2004 and the classroom teacher's impressions of their reading comprehension abilities. The students from 2003-2004 were not grouped.

Instruments

Students from both years took the NWEA reading assessment in the fall of the year and again in the spring in the schools DELL computer lab. NWEA MAP Reports from both classes were downloaded and printed from <https://reports.nwea.org> which is a web site that tabulates and stores the student's scores. The reading comprehension homework sheets were reproduced from Remedia Publications' Wonder Stories Reading Level Grade 1 {Appendix A} and Grade 2 {Appendix B}.

Validity Measures

The internal validity of this study was strong because the major difference in reading instruction that the two classes received was the differentiated instruction reading comprehension homework sheet, which was completed by only one of the

classrooms. Individual student differences in reading ability and the amount of help that each student received at home were not able to be standardized, however. The students were from two different classrooms from two different years, but taught by the same teacher.

The external validity was difficult to measure because the results from these particular groups of students may not generalize to other students. Comparing the results of these groups of students to other students in other classes and other schools may not be applicable. The study needs to be replicated with other students and classes in order to ascertain external validity.

Reliability Measures

The equivalency reliability was determined by relating two sets of test scores to one another to highlight the degree of relationship. The mean RIT growth from the NWEA reading assessment (dependent variable) from the 2003-2004 class was compared with that of the 2004-2005 second grade class. Both years mean RIT scores improved from fall to spring, but the students from 2004-2005 who had the opportunity to complete the differentiated instruction reading comprehension homework sheets (independent variable) mean RIT scores growth improved slightly more on the NWEA reading assessments in comparison.

Procedures

All students in the study during the 2004-2005 school year were given a Remedia Publications' Wonder Stories reading comprehension homework sheet to be completed at home supervised by their parents. This homework sheet was to be returned the following school day in a cloth homework bag. This bright corduroy bag was used as a mode of transportation and to spark interest in returning homework. When the work was returned, the assignments were entered as returned on the computer grade book. After ten sheets were returned, the students went to the teacher's prize box. If the homework sheets were not returned, no penalty was assessed immediately. The students were asked to return the sheets the next school day. If the sheets were never returned, the parents were notified during conferences and the students were docked on their report cards as not being responsible.

The students from 2004-2005 were split up into two differentiated instructional groups based on their performance of their fall RIT reading score. The group that received a RIT score lower than the median, received the Grade 1 version of the Wonder Stories {Appendix A} (Remedia Publications, 2002). The second group, who scored above the median, received the Grade 2 version of the Wonder Stories {Appendix B} (Remedia Publications, 2000). Wonder Stories are high interest low readability reproducible sheets that motivate students to read further and discover surprising answers. Following each story, comprehension activities focus on the following basic skills: finding the main idea, finding a fact, locating an answer, inference, vocabulary, reading for details, and word analysis. The second grade students in 2003-2004 did not take part in this portion of the study.

NWEA MAP reading assessments were given to both classes during the fall of their second grade school year and again in the spring. They were tested on: (1) word recognition, fluency, and vocabulary, (2) literal comprehension, (3) interpretive and inferential comprehension, (4) evaluative comprehension, and (5) literary response and analysis.

Conclusion

This study measured the effects of differentiated instruction reading comprehension homework sheets on NWEA reading assessments of second graders. Classes from 2003-2004 and 2004-2005 took the NWEA assessments during the fall and spring of the year. The students from 2004-2005 were split up into two differentiated instructional groups based on their performance of their fall RIT reading score. Those two differentiated instructional groups in the class of 2004-2005 received the Remedia Publications' Wonder Stories reading comprehension homework sheets. The class of 2003-2004 did not have the independent variable.

CHAPTER IV: RESULTS AND DISCUSSION

The purpose of this study was to determine the effects of differentiated instruction reading comprehension homework on NWEA reading assessment performances of second grade students.

Two NWEA reading assessments were given to both second grade classes in the two year duration of this study, one in the fall and one in the spring. The mean RIT growth score for the 2003-2004 class was 18.14 with a standard deviation of 13.78. The median RIT growth of the scores was 20. The mean RIT growth score for the 2004-2005 class was 19.64 with a standard deviation of 10.29. The median RIT growth of the scores was 21.5.

Table 1.1 shows the mean RIT growth, standard deviations, and median RIT growth values of each year's class.

Table 1.1

	03-04	04-05
Mean RIT Growth	18.14	19.64
Standard Deviation	13.78	10.29
Median RIT Growth	20	21.5

Figure 1.1 compares the mean RIT growth from the 2003-2004 class to the mean RIT growth of 2004-2005 class.

Figure 1.1

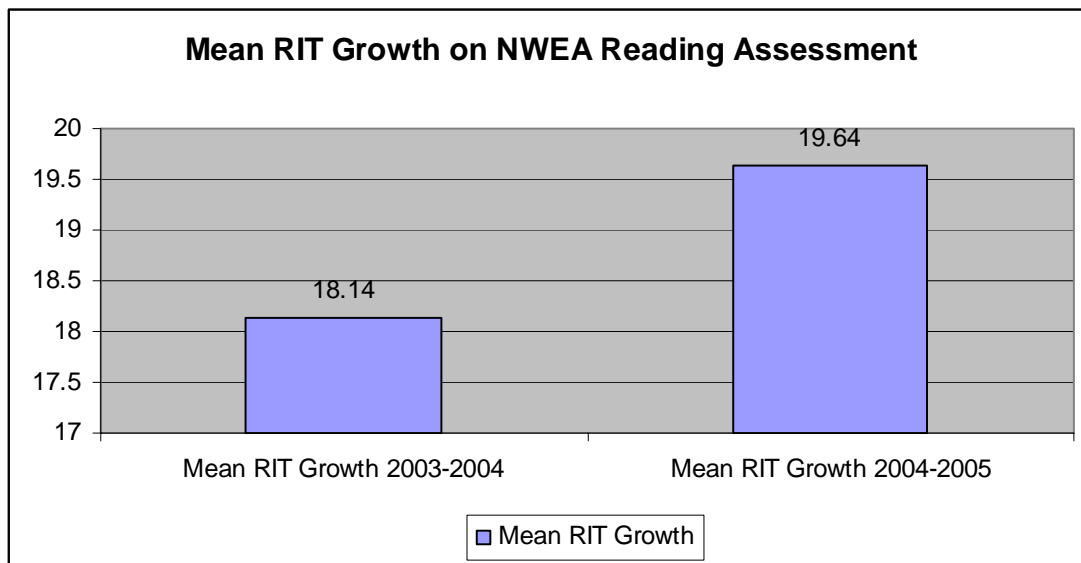


Table 1.2 shows the mean RIT values from 2003-2004 and 2004-2005 reading assessments on the NWEA test.

Table 1.2

School Year	Mean
Fall 2003	172.95
Spring 2004	191.09
Fall 2004	167.45
Spring 2005	187.09

A t-test analysis of the data showed that the t-value was 1.14 with 41 degrees of freedom. A t-value of 1.14 does not show a significant difference. The data does show that the students during the fall of 2004 had a mean RIT score starting lower than that of the fall of 2003. However, the span of mean RIT growth for the 2004-2005 class grew wider by 1.5 RIT points compared to that of the 2003-2004 class who ended with the higher of the two mean RIT scores.

CHAPTER V: SUMMARY AND CONCLUSIONS

Summary of Results

The purpose of this study was to determine the effects of differentiated instruction reading comprehension homework on NWEA reading assessment performance of second grade students. By examining the growth of the mean RIT score on the NWEA reading assessments of the students who received the differentiated instruction reading comprehension homework sheets to those who did not, the significance of the effects can be determined. The research suggests that the students who participated in the differentiated instruction reading comprehension homework sheets during the 2004-2005 school year grew more on the mean RIT of the NWEA reading assessment. Students who completed the differentiated instruction reading comprehension homework sheets made improvements on their NWEA reading assessment. However, the gains were not proven significantly different.

The students and parents enjoyed their time spent completing the Wonder Stories reading comprehension homework sheets together. Many parents commented on how they are learning along with their child. The students wanted to complete their reading homework and looked forward to returning and receiving credit for their completed work in their cloth homework bags. The reading comprehension homework was returned 92.4% of the time by the 22 students in the class. Only one student received an insufficient mark on their report card for showing a lack of responsibility. When students discussed how they felt about completing the reading comprehension homework sheets, most stated that they would rather read aloud to

someone else than read by themselves. The students liked having help to complete the reading homework and appreciated the individual attention. When asked why, they reported that it was more fun to read to someone and that they could get help with the words.

Conclusions

Differentiated instruction reading comprehension homework helps improve students' reading comprehension. Having students complete the homework with a competent reader who is available to give help and feedback helps build a student's confidence and improve comprehension. However, a t-value of 1.14 does not show a significant difference. The data does show that the students during the fall of 2004 had a mean RIT score starting lower than that of the fall of 2003. However, the span of mean RIT growth for the 2004-2005 class grew wider by 1.5 RIT points compared to that of the 2003-2004 class who ended with the higher of the two mean RIT scores.

Recommendations

While the practice of differentiated instruction reading comprehension homework sheets helped to increase the growth of students' NWEA reading assessment scores, there was not a significant statistical advantage to this method as a best practice in the classroom. A disadvantage of using the differentiated instruction reading comprehension homework sheets include the amount of time it takes the teacher to correct the homework and pass out the new homework sheet for the

following evening. Unfortunately, this takes time away from another core classroom subjects. Even though homework is proven to be positive connection between school and home, parents and children may not always have the appropriate time to successfully complete the homework sheets. With the time teachers put in daily in school and the parental involvement asked every night, differentiated instruction reading comprehension homework might be best used only for struggling readers or limited to sending the sheets home only 3 nights a week (Monday, Wednesday, and Friday). The implementation of differentiated instruction reading comprehension homework component was certainly a beneficial experience for the students even though it doesn't show a significant difference on their NWEA reading assessment.

One area that this study did not address and could not be measured was the amount of parental help that was given to students at home. Because each student reads at a different level of comprehension, it was found more beneficial to let parents use their best judgment on the amount of assistance that was to be given on the homework assignment each given night. If the second grade reader was a proficient reader and an independent worker, the parents would offer less assistance. In comparison, if the second grade reader is a less competent reader or a student who would need to fall back on the support of an adult to read the stories to them, the parents would need to spend more time directly with their child completing the assignment. This method by the parents would involve more listening comprehension for their child compared to their child's own reading comprehension. Both have their benefits.

The differentiated instruction reading comprehension homework sheets are perhaps most beneficial for use with those students who truly struggle with reading comprehension. The results of this study have shown that this strategy is effective; however, it is time consuming for the minimal gains. By focusing on the students who need reading comprehension improvement the most, the most effective use of teacher and adult attention can be achieved.

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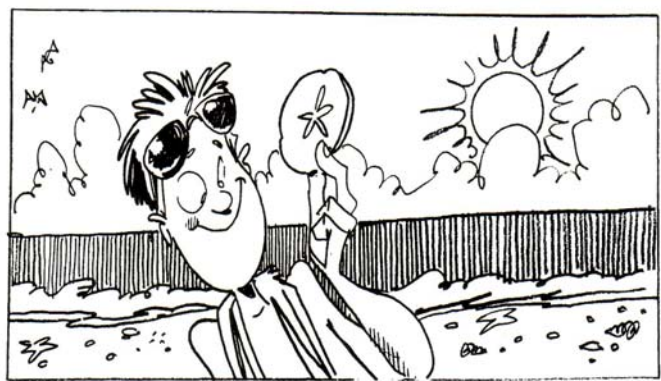
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Appendix A

Name _____

What is a sand dollar?



Do you like to walk on the beach? Then maybe you have seen a sand dollar shell. It is gray and round. It looks like a silver dollar. It also has spots on it. They are in the shape of a star.

How does this shell get on the beach? The tide brought it there. Once it was part of a sand dollar. A sand dollar is a small animal. It lives in the water by the shore. It has spines. It uses them to dig and crawl. When the sand dollar dies, it decays. It leaves its shell behind.

-
1. This story is about a small animal called a _____ .
 2. When the animal dies, it leaves its _____ behind.
 3. What brings the shell to the beach?

 4. What word in paragraph 2 means the same as *land along the ocean*?

 5. What does the sand dollar use to dig and crawl?

Appendix B

Name _____

What causes colds?



For years no one knew why we catch colds. Most colds attack in the winter. For that reason, we thought chilly air gave us colds. Now we know that colds come from a kind of germ. The germ is a virus.

The first sign of a cold is often a sore throat. The viruses make themselves at home there. Then they move down into your chest. Or they may move up into your nose and head. You start to sneeze and cough. Your eyes may water, and you may feel sleepy.

There is no cure for the cold. Pills won't help. But a cold will go away by itself in three to seven days. The best thing is to rest and drink fruit juices.

If you sneeze, be sure to cover your nose and mouth. Otherwise the germs will spread. All your friends might get the germ.

After you have a cold, you are protected from that virus. It won't hurt you again. But you can catch a second cold from a different virus.

1. This story is about why we catch _____.
2. What are the signs of a cold? _____

3. Write the sentence in paragraph one that tells what kind of germ turns into a cold.

4. Who might you go see if you have a cold? _____
5. What is a word in paragraph five that means "kept safe from"?

6. Write the homonyms in the story for these words:
 knows: _____ heir: _____
 soar: _____

The Effect of the Accelerated Math Program on the
Minnesota Basic Skills Test Scores of Ninth Graders

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Winona State University

An action research project submitted to the
Graduate School of Winona State University
in partial fulfillment of the requirement for the degree of
Master of Science

Department of Education

2006

This action research project entitled:
The Effect of the Accelerated Math Program on the
Minnesota Basic Skills Test Scores of Ninth Graders

Written by Margaret A. Hongerholt
Has been approved for the Department of Education

Ryan Haraldson

Kelly Marin

Andrew Wieme

Patricia Waters

Dr. Thomas Sherman
Faculty Advisor

The signatories have examined this project, and we find that both the content and the form meet acceptable presentation standards of scholarly work in the above-mentioned discipline.

Margaret Hongerholt (M.S. Education)

The Effect of the Accelerated Math Program on the Minnesota Basic Skills Test Scores of Ninth Graders

Capstone Director: Dr. Thomas Sherman

Abstract

Every student in Minnesota must pass the Minnesota Math Basic Skills Test (BST) to be eligible to graduate from high school. The test is administered in the 8th grade, with a current passing rate of almost 75%. The high schools must provide the remediation needed to help the failing students pass the Math BST.

This study tested the effectiveness of the Accelerated Math Program as implemented in the Standards Math 1 course at a large high school in a Mid-Western City. The improvements in students' scores from 8th grade to 9th grade were compiled for the year before Accelerated Math was implemented, and for its first year in use. Accelerated Math is a computer based administrative and record keeping tool. It allows the teacher to set up appropriate, individualized assignments for each student.

The results show that the Accelerated Math program had a significant effect on the student's Minnesota Math BST scores. The test scores improved more with Accelerated Math than with the traditional workbook based curriculum.

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CHAPTER I: INTRODUCTION

Every student in Minnesota must pass the Minnesota Math Basic Skills Test (BST) to be eligible to graduate from high school. In the past a large high school in a Mid-Western city focused remediation for students that need to pass the Math BST in a course titled Math Connections 2. During the 2003-2004 school year the course used a traditional workbook based curriculum. The next year a new curriculum system was implemented and the course was renamed Standards Math 1. The new computer generated curriculum, Accelerated Math, improved many aspects of the course.

The improvements to the course included individualized assignments, immediate feedback and extensive practice with multiple-choice problems. These changes greatly improved classroom climate. Does this new computer aided curriculum actually improve the Math BST scores for the students that had previously failed the test in 8th grade?

Need for the Study

One of the toughest challenges currently facing schools across the nation is to get every student to pass the high stakes standardized tests that are mandated by No Child Left Behind. Every student in Minnesota must pass the Minnesota BSTs to be eligible to graduate from high school. The three BSTs are in Math, Reading and Written Comprehension. Of the three BSTs, the Math BST remains the largest barrier to graduation statewide (<http://education.state.mn.us>).

The Math BST is first given to students in the 8th grade. The passing rate for 8th graders in 2005 was almost 75%. It is up to the high schools to provide

interventions and remediation for the more than 25% that fail the Math BST. The question is, what should the schools do with the students that do fail? About one-third of students pass each re-take of the Math BST. In March of 2005 there were over 3,000 high school seniors in the state that still had not passed the Math BST. Seniors are given one “last chance” to re-take the BST in the spring. If they still do not pass the test, they are not eligible to graduate with their class.

Once students are put into this cycle of remediation and retesting, their progress towards advanced math courses is thwarted. Remedial courses eat-up precious time in a students’ schedule. This lack of advanced math courses can limit a student’s post secondary options. The goal of each school is to find the most effective remediation to get the students back on track as quickly as possible.

Statement of the Problem

There is an urgent need to improve remediation strategies to help students pass the Minnesota Math BST to ensure that they are eligible to graduate from high school on time. In the school where the study was conducted the remediation for the Minnesota Math BST in the past has been focused in a course titled Math Connections 2. In the fall of 2004 the Accelerated Math program was implemented into this course and the course was renamed Standards Math 1. Did the scores and the passing rate of the students in 2004-05 improve from the 2003-04 students?

Will the BST math scores improve more with the implementation of the Accelerated Math Program?

Purpose of the Study

This study tested the effectiveness of the Accelerated Math program as implemented in the Standards Math 1 course.

Statement of the Hypothesis

The implementation of the Accelerated Math program will improve the test scores of the 9th grade students that failed the math BST as 8th graders more than the traditional workbook based curriculum.

Definition of Terms

Accelerated Math –

A computer-based assignment generator and record keeping tool, developed by Renaissance Learning, Inc., Wisconsin Rapids, WI.

Feedback –

An evaluation of progress that is given to students.

Individualized Assignments –

Assignments that are tailored to each student's unique needs.

Minnesota Math Basic Skills Test (BST) –

Given to 8th graders in Minnesota; the students must pass the test to be eligible for high school graduation.

Multiple-choice Problems –

The student must choose the correct answer from a list of options that contains 3 or 4 wrong answers.

Peer-tutoring –

Students teaching and tutoring each other.

Remediation –

The process of correcting or improving a deficiency in a skill.

Variables

Independent Variable

The independent variable was the curriculum format - traditional workbooks versus Accelerated Math Program. During the first semester of the 2003-04 school year the traditional workbook was used to prepare students for the Minnesota Math BST. During the first semester of the 2004-05 school year the Accelerated Math Program replaced the traditional workbook. The Accelerated Math Program changed the curriculum format to a multiple-choice curriculum that provides individualized assignments and immediate feedback.

Dependent Variable

The improvement of students' Math BST scores from 8th grade to 9th grade was measured for both the 2003-04 (control) and 2004-05 (test) groups.

Control Variables

Students in the course failed the Minnesota Math BST in 8th grade and retook the test in February of their 9th grade. Each group had the same teacher, the topics covered were similar, and both courses were primarily self-paced.

Moderator Variables

During the Math Standards 1 course, the teacher had one more year of teaching experience and was no longer a teacher new to the school district.

Limitations of the Study

The small number of students involved in the study will limit the validity of the study. Also, the two groups being compared are different students, and took the course at different times of the day. The control group was Math Connections 2 6th

period, 2003-04; this class contained a high percentage of English Language Learners. The experimental group was from two different class periods, 3rd and 8th. The 8th period class had a high percentage of EBD and ADHD students. The class sizes varied slightly. Additionally, the students' scores on these "high stakes" tests often depend on the students' attitude on the day of the test.

CHAPTER II: LITERATURE REVIEW

Summary of Accelerated Math Program

The new Standards Math 1 course at the large high school in a Mid-Western city uses the Accelerated Math program from Renaissance Learning, Inc., Madison, Wisconsin. Accelerated Math is a computer based administrative and record keeping tool. When using Accelerated Math the teacher assigns and arranges the order of the specific objectives that each student should complete, and then prints out a practice for each student. Every practice is unique; while the students may each be working on the same objectives, the problems will be different for each student. The students have little opportunity to cheat. (Renaissance Learning 2002)

Once a student finishes a practice they fill out a multiple choice scan sheet and scan their results. A report immediately prints and the program automatically creates the student's next practice based on the results. If a student does well on an objective, the computer marks that objective as "ready to test" and scrolls on to the next objective. If the student struggled with the objective, the computer will include that objective on the next practice. If the student continues to struggle with an objective the program will alert the teacher that the student needs additional assistance.

Each report the student receives contains valuable detailed information. The problems the student answered incorrectly, the objective that each incorrect problem relates to, and the correct answers are listed at the top of the report. This allows the student to check over their work and attempt to find their mistakes. Next, a list of the objectives in the assignment and the results for each, current and overall, are included.

A summary of the student's progress for the marking period and year to date is included. This summary contains the number of testable objectives and objectives mastered, and the average percent correct for practices, tests and review problems.

The Accelerated Math computer aided curriculum system improves three aspects of the previous workbook based curriculum. First, the curriculum is primarily multiple-choice. This provides the students that often struggle with multiple-choice tests an opportunity to become comfortable with the BST test format. Second, the program produces unique assignments that are tailored to each student's individual needs. This level of differentiation was unavailable in the workbook based curriculum. Third, the students are able to have their work assessed immediately. Timely feedback was difficult with the previous curriculum.

Accelerated Math has been implemented in many math classrooms throughout the country. Renaissance Learning, the company that sells the Accelerated Math program, has published many research articles extolling the virtues and effectiveness of Accelerated Math. The research reports such dramatic findings as "students in Accelerated Math classes gained 12 percentile points and a full grade equivalent on the SAT 9, while students in the control classes gained only 3.8 percentile points and 0.3 grade equivalent" (Gaeddert 2001).

Dr. Jim Ysseldyke also found significant gains in student math achievement. These gains were reported in each ability level. He stated that Accelerated Math allowed the teachers more time to work with each student individually. His report concluded that "Accelerated Math is a powerful intervention for improving math outcomes for students" (Ysseldyke 2003).

While Accelerated Math has been shown to be a great tool in the classroom, there are some criticisms of the program. It provides no instruction, examples or explanations to the students, just problems to be solved. Some see it as simply a worksheet generator. Therefore, the students must rely entirely on the classroom instruction. Also, when the curriculum is completely multiple-choice the students may develop excellent multiple-choice test skills instead of excellent math skills (Johnson 1999).

Individualized Instruction

The individualization of assignments has a positive effect on student learning (Hattie 2003). Individually tailored assignments provide the student with the opportunity to experience success on a regular basis. Having small “do-able” tasks that build upon each other is critical to student motivation; when students feel successful they become more motivated to learn and work harder. Student motivation increases when tasks are at the appropriate skill level. Students are more motivated to learn when they are challenged and feel competent to meet the challenges in class (Curwin 1992).

Accelerated Math enhances the teacher’s ability to provide individualized instruction and practice to students (Ysseldke 2003). Each student works through a series of appropriate objectives at their own pace, this gives them an opportunity for challenge and success.

Peer Tutoring

A benefit of the individualized assignments is that the students are not able to copy each others’ work. Students helping each other changes from copying each

others' answers, to students tutoring and teaching each other. A climate of peer tutoring in the classroom has a positive effect on student achievement (Hattie 2003). When students are able to tutor each other they feel useful, this improves their attitude about themselves and builds their confidence (Curwin 1992).

Feedback

To provide the needed sense of success, students must be given timely feedback on their progress. "To enjoy a mental activity...there must be skill in a symbolic domain; there have to be rules, a goal, and a way of obtaining feedback" (Csikszentmihalyi 1990). The Accelerated Math program gives each student immediate feedback at the completion of each practice, exercise or test. The student fills in their answers to the problems on a scan sheet, scans their responses and then receives a report on their individual assignment and their overall progress in the class. When students are able to quickly observe the results of their efforts, they develop a greater sense of responsibility for their work. Feedback is the greatest of all of the influences on student achievement (Hattie 2003).

CHAPTER III: METHODS AND PROCEDURES

Overview

All of the students in this study failed the Minnesota Math BST as 8th graders and were required to take a remedial math course to better prepare for the test. For the 1st semester of the 2003-2004 school year the control group students used a traditional workbook, *Passing the Minnesota Basic Standards Test in Mathematics* (Pintozzi 1999). During the 1st semester of the 2004-2005 school year the test group students used the Accelerated Math program instead of the workbook. The goal of this study is to measure the effectiveness of the Accelerated Math program. This will be done by comparing the increase in scores from 8th grade to 9th grade on the Minnesota Math BST.

Research Design

The first year of the study the students were enrolled in a course titled Math Connections², they used a traditional remedial math workbook to help prepare for the Minnesota Math BST. Classroom instruction was given at the beginning of each class on the topics to be completed that day. Students were allowed to work ahead in the workbook. Their work was regularly collected, scored and returned to the student the next day of class.

The second year of the study the students were enrolled in a new course Standards Math 1. The course had the same goal, preparing students to pass the Minnesota Math BST, but the new course used Accelerated Math to provide the students their work. Due to technical difficulties at the high school, the Accelerated Math program was not available for use until the 4th week of school. So until then the

students were using the traditional workbook. Once the Accelerated Math program was available, the students received classroom instruction at the beginning of class only 2 or 3 days per week. The bulk of the instruction was delivered individually as the teacher moved around the classroom. The students scanned their own answer sheets, and then the Accelerated Math program printed them a detailed report of their progress and a new assignment based on their results.

The 8th and 9th grade Minnesota Math BST scores were compiled for each group of students.

Selection of Test Subjects

All of the participants of this study failed the Minnesota Math Basic Skills Test in 8th grade and were required to take a remedial math course to better prepare them for the test. Students that did not take the Minnesota Math BST in 8th grade or did not participate in the full 1st semester of either course were not included in the study.

Measuring Devices

The Minnesota Math BST is administered statewide. Students must pass this test in order to be eligible to graduate from high school in Minnesota. It is a multiple-choice test and is machine scored. Work has been done by the state to ensure that the test is non-discriminatory.

Validity Measures

The Minnesota Math BST is considered fairly valid; it is a state mandated test of minimum competency. The characteristics of the control and test groups were similar, but some differences need to be noted. The control group contained 50%

ESOL students while the test group contained only 23% ESOL students. Also, the control group was comprised of only 12 students while the test group contained 31 students. The small number of control subjects limits the validity of this study.

Reliability Measures

The small number of subjects in the control group reduces the reliability of this study.

Field Procedures

The 8th and 9th grade Minnesota Math BST scores were compiled for the control and test groups. The improvement in each student's score was computed, and the results were analyzed.

Conclusion

Using the Minnesota Math BST scores is the best way to determine the impact of the Accelerated Math program. This study contains many variables that are impossible to control such as: class size, time of day, and individual student characteristics. A larger sample size is recommended to truly measure the effect of the Accelerated Math program.

CHAPTER IV: RESULTS AND DISCUSSION

Results

The control group made only limited progress towards passing the Minnesota Math BST. There were only 12 students in the control group, and one student's data was an obvious outlier (more than 3 standard deviations above the mean), so that data was eliminated. Three out of the remaining 11, (27%) scored lower when they took the test in 9th grade. While a few students came close, none of the students in this group scored the required 600 out of 800 points to pass the test. The mean gain for the control group was a 13.4 point increase out of a scaled score of a possible 800, a 1.7% increase. The state of Minnesota requires a score of 75% or 600 to pass the Math BST. The control group's mean test score rose from 555.2 to 568.6.

The test group had better results. All of the students showed some gain in test scores, the mean point increase was 29.4, 3.7%; more than twice the control group's increase. The test group's mean test score rose from 560.4 to 589.8. Ten out of the 31, (27%) students in the test group scored over 600 and passed the test. (See Figure 4.1)

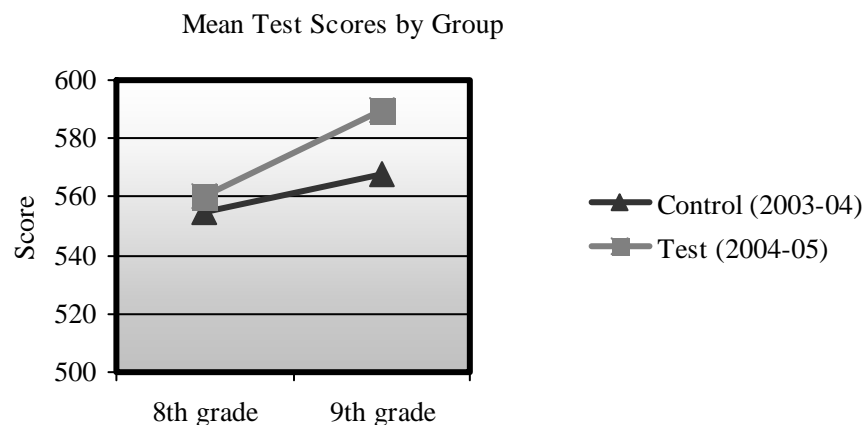


Figure 4.1

The increases in test scores in the control group range from a loss of 11 points to a gain of 39 points. The test group had a range of a gain of 5 points to a gain of 64 points. (See figure 4.2)

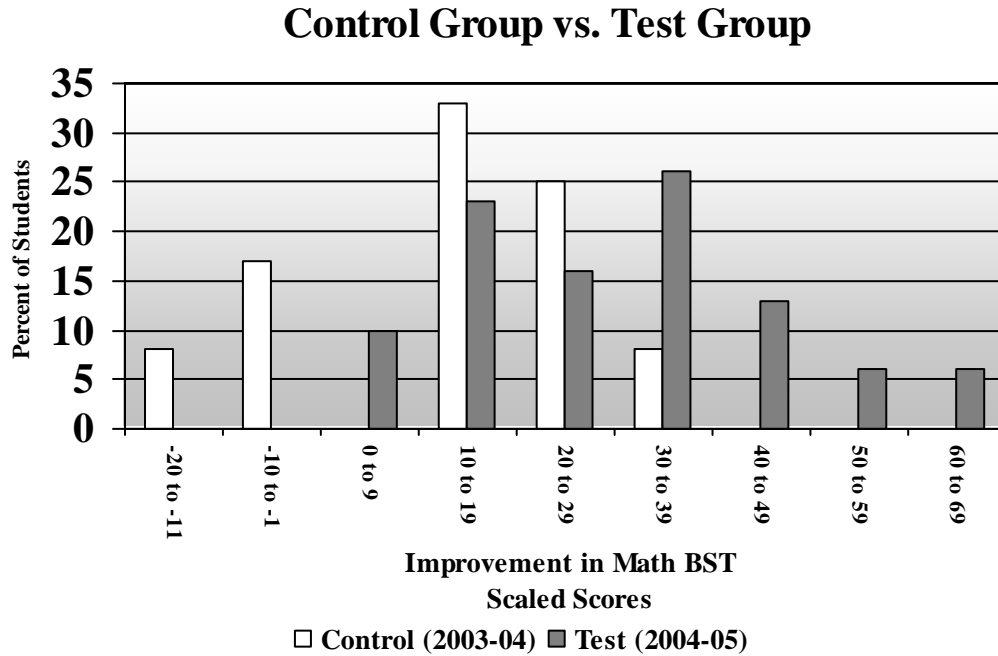


Figure 4.2

The data produces a T-value of 2.78; this indicates a 99% probability that the difference in the means is significant. The results show that the Accelerated Math program had a significant effect on the student's Minnesota Math BST scores. The implementation of the Accelerated Math program improved the test scores of the 9th grade students that failed the Minnesota Math BST as 8th graders more than the traditional workbook based curriculum.

Discussion

There were a few obstacles encountered while putting the Accelerated Math program into place. The program was planned to be ready to go on the first day of school in September of 2004, but due to a few technical difficulties the program wasn't running until mid October that year. I feel that the students would have made much larger gains had the program been in place from the very beginning of the school year. Accelerated Math is an impressive program, but teachers using the program must understand that it only replaces the assignments, it doesn't replace instruction.

The results show that with the Accelerated Math program the students test scores improved much more than with the old, traditional workbook. Teaching with the workbook was a chore. With the large range of abilities in remedial classes, it was difficult to provide classroom instruction to the large group. About one-third of the class was ready for the material being presented; one-third of the class already understood the material and wanted to move on, while the last one-third of the class didn't have the math skills needed to master the new material.

The Accelerated Math Program is almost entirely multiple-choice word problems, just like on the Minnesota Math BST. This was valuable multiple-choice test practice that students lacked in previous years. For the many of the students English was their second or third language, practicing word problems was an excellent opportunity to develop their mathematical vocabulary.

The most important benefit of the Accelerated Math program for the students is the immediate feedback. The students got excited when they get their first 100%

on a practice or test! The change in some of the students was almost instantaneous. All of the students in this class have experienced failure in mathematics numerous times. When they start this course many have already accepted the fact that they will never pass the Minnesota Math BST, and therefore probably never graduate from high school. Once these students get a taste of success, they are hooked! The program is set-up so that they can be challenged and experience success.

'Gina' was convinced that she was a failure. For the first two weeks of the program it was very difficult to get her to work on any assignment. Once she did finish an assignment, she scanned her own answers and then came to me very proud of herself. She had scored an 83% on the practice. Later that week, she was working in class with very little redirection. On that Friday she scored 100% on her test; as she left class she said, "I'm not a loser anymore!" She explained to me that she thought she was a loser because she had always failed math. Would this happen if we were working out of a workbook? I don't think so.

Now that we have found a tool to help us improve the test scores of students that need to pass the Minnesota Math BST, the state has eliminated this test as a requirement for graduation. The 8th graders from the 2004-05 school year (the current 9th graders) are the last to be required to pass the Minnesota Math BST in order to graduate. Instead a Minnesota Comprehensive Assessment will be given in 11th grade to determine if students are eligible to graduate.

CHAPTER V: SUMMARY AND CONCLUSIONS

Summary

This study shows that the Accelerated Math program had a significant effect on the student's Minnesota Math BST scores. The test scores improved more with Accelerated Math than with the traditional workbook based curriculum. Due to the limited number of students in the control group, further study of this program is recommended.

Recommendations

While there are many advantages of using the Accelerated Math program, it is recommended that more studies be done to help track its success. If this study were conducted again, it should include the students in all of the Standards Math 1 courses throughout the school district. A larger sample size would produce an even more valid conclusion. It would also be interesting to include a survey of the students' attitudes towards school, math and their self esteem before and after the course.

CHAPTER VI: REFERENCES AND BIBLIOGRAPHY

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CHILDRENS'S BEHAVIOR WILL BE AFFECTED IN A POSITIVE MANNER
BY GOING FROM A MIXED GENDER CLASSROOM TO A SAME GENDER
CLASSROOM

by

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B.S., South Dakota State University, 1997

An action research project submitted to the
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Master of Science
Department of Education

2006

This action research project entitled:
CHILDRENS'S BEHAVIOR WILL BE AFFECTED IN A POSITIVE MANNER
BY GOING FROM A MIXED GENDER CLASSROOM TO A SAME GENDER
CLASSROOM

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The signatories have examined this project, and we find that both the content and the
form meet acceptable presentation standards of scholarly work in the above-
mentioned discipline

Kesler, Michael (BS, K – 12 Physical Education)

Children's behavior will be affected in a positive manner by going from a mixed gender classroom to a same gender classroom.

Research project under the direction of Dr. Thomas Sherman

Abstract

Student behavior can change based on the environment that surrounds them. PE offers an environment that can either be a same gender classroom or a mixed gender classroom. Children's behavior will be affected in a positive manner by going from a mixed gender classroom to a same gender classroom.

Two fourth grade classes participated in a behavior study for a total of eight weeks. One of the classes had twenty-four students (twelve boys/twelve girls); the other class had twenty-two students (ten boys/twelve girls). For four weeks, the classes went to PE like they normally do as mixed gender; the other four weeks the classes were separated into same gender sections. All of the children's behavior was recorded over the eight week testing to see if the gender environment had an affect.

Results from the study showed a slight increase in positive behavior from mixed gender to same gender. Students in the same gender classroom had fewer behavior tickets issued to them than those in the mixed gender classroom. After conducting this experiment, behavior will improve by going to same gender classrooms.

ACKNOWLEDGMENTS

Writing a paper of this size requires a lot of input and feedback from many different people. I would like to thank the members of my Advisory Group, Brian Menk and Jane Erickson, for all of the feedback and support they have given not only on this project, but to all of the projects completed in this graduate program. I would also like to thank Mindy Scheel, Terry Huhn, and Scott Nickels for helping me prepare and proofread this paper.

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Lastly, I would like to personally thank Dr. Tom Sherman for sticking with me and giving me a chance to prove myself at the graduate level. Thanks, Tom!!

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CHAPTER I: INTRODUCTION

For nine and a half years, I have taught PE in Catholic Schools in southern Minnesota. The last seven years, I have taught elementary PE at a Catholic School which is a kindergarten through 8th-grade setting. The school has just fewer than four hundred students enrolled for the 2005-2006 school year.

Working at two different schools, I have had the privilege of teaching PE to classes with same gender and classes that are mixed gender. I have always wondered why schools have different philosophies in regard to PE classes. Co-ed PE continues to be a topic of debate among educators (Derry, 2002).

Need for the Study

Need for this study is to understand the reasoning of elementary schools' policy on co-ed PE. For years physical educators have been trying to find a way to make PE more enjoyable for kids (Hutchinson, 1995).

Statement of the Problem

Will a child's behavior improve by going from a same gender classroom to a co-ed classroom? The rigorous support of co-ed in PE in the 1970's and 1980's for children ages ten through sixteen, when girls were taught soccer and the boys dance in co-ed classes, has been subject to critical evaluation of whether girls (and boys) really benefit from co-ed classes (Wilson, 2005). Elementary PE will be more productive by moving toward a same gender classroom.

Purpose of the Study

There appears to be a better way to teach elementary PE than the traditional way. If negative behavior can be reduced in the classroom environment, then learning can be increased.

Statement of the Hypothesis

Childrens's Behavior will be affected in a positive manner by going from a mixed gender classroom to a same gender classroom.

Definition of Terms

Stop and Think Ticket:	Device used to chart students' poor behavior if needed.
Same gender classroom:	Male and Female students separated over a four week period.
Mixed gender classroom:	Male and Female students together over a four week period.
Non-Co-ed Classroom:	Same sex classroom over a four week period.
Co-ed Classroom:	Two sexes of students in class for a four week period.
PE:	Physical Education

Variables

Independent Variable

First four weeks, the class will be all the same gender; the second four weeks, the class will be a mixed gender.

Dependent Variable

Stop and Think Tickets are issued to students who are having behavior problems. Bad behavior happens in many different ways. Students can get a ticket for being disrespectful to staff or classmates, damaging school property, cheating or lying during a class, out of dress code or swearing. These are some of the different ways that students can receive a Stop and Think Ticket.

Control Variables

The students are all 4th-grade students who will be monitored for a total of four weeks each. The test will always be in the same room at the same time while participating in the same unit.

Moderator Variables

The students were taught by the same teacher throughout the unit.

Limitations of the Study

This study is limited to small Catholic elementary schools students with the same socio-economic status. The study covers a small group of students with no ethnic diversity. Sickness, equipment available, and children's daily health will also limit this study. Lastly, the Stop and Think Ticket was just introduced to the faculty last year, making it sometimes difficult on when to give or not to give a behavior ticket.

CHAPTER II: LITERATURE REVIEW

No person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving federal financial assistance (Wilson, 2005). In a traditional elementary PE class, students come to class as a mixed gender classroom. Majority of the classes that come to PE are an even mix of boys and girls. Provisions in Title IX provide teachers with latitude to legally instruct students in co-ed groupings (McKenzie, 1999). Co-ed PE continues to be a topic of debate among educators (Derry, 2002).

An important factor when considering ways to make PE more meaningful is the issue of integrated classes as mandated by Title IV (Osbourne, 2002). When Title IV was implemented, did the educators writing this law understand how this was going to affect students' behaviors? Studies have shown that the environment students are surrounded by have a major impact on their behaviors. How would changing the gender environment affect both boys and girls behaviors? An area of concern for girls during co-ed classes was that of boys controlling the activity environment and decreasing girls' levels of participation (Derry, 2002). Boys also had their concerns as well about co-ed PE classes, "How come we have to try and compete down to their level?" (Griffin, 1984)? How would this affect the girls' behavior if the boys were always the ones in control?

Educators and others assumed that with the gender integration of PE classes, the issue of inequity for boys and girls would be diminished as they would receive the same instruction and curricular content (Griffin, 1984). This, however, has not

proven true. Equitable treatment for girls has not occurred within the co-ed PE environment (Hutchinson, 1995).

All students deserve the opportunity to have success, so how does their gender environment affect their ability to reach that success? Evidence has shown that properly designed and delivered PE programs can enhance young people's enjoyment of and participation in PE, and possibly increase leisure time participation in physical activity. However, qualitative research often uncovers strongly held negative views about PE, and shows how badly delivered PE can put someone off physical activity for life (Logstrup, 2001). Given the nature and difficulty of adolescence, many educators continue to debate and question the scheduling of boys and girls in co-ed PE (Adler, 1992).

Proponents claim that dividing boys and girls creates a more comfortable, engaged learning environment that can contribute to academic success (Belden, 2006). Opponents say by segregating girls and boys, it perpetuates segregating men and women as they become adults and professionals (Belden, 2006). The number of U.S. public schools offering single-sex educational opportunities is on the rise, up from 4 eight years ago to at least 211 today (Belden, 2006).

Younger students were more likely to find being in a single-sex class a positive experience; as students got older, they expressed more desire to be in mixed classes, even when that choice entailed potential problems (Spielhagen, 2006). Children who experience or perceive negativity during interaction with peers in physical activity environments may develop greater anxiety or negative feelings associated with involvement causing them to become non-participants (Derry, 2002).

Children need a positive experience in PE so they can carry those feelings with them as they move on into living a healthy lifestyle.

CHAPTER III: METHODS AND PROCEDURES

Overview

The school designed a new behavior ticket program at the beginning of the school year. This study is looking at how many tickets were given out to students and the impact gender had on the results.

Design

The lesson was over an eight week time frame. The unit chosen for this study was pickle ball. The reason this unit was chosen for this project was that it offered a team concept along with an individual concept. This would give the study a broader base on the behaviors observed.

Selection of Test Subjects

The first four weeks, the lesson being taught was to a traditional 4th-grade co-ed PE class. The second four weeks, the lesson was expanded and taught to the same 4th-graders, while having a same gender classroom. During the eight week study, the total number of days in the classroom was 20; ten were co-ed days, and ten were non co-ed days.

Measuring Devices

The measuring device used for this study is called a Stop and Think Ticket. What the ticket does is keep track of children's behaviors through immediate documentation of bad behavior. A child can get a ticket for various displays of bad behavior. The student knows immediately if he/she receives a ticket should the

behavior warrant one. Some examples of bad behavior could range from inappropriate language or noise, pushing, name calling, disrespect of property, and uniform policy.

Validity Measures

The instrument used in this experiment is valid because it tests children's behaviors consistently and provides a clear number to be measured from class to class.

Reliability Measures

Utilizing the same Stop and Think program for both classes (co-ed vs. non co-ed) should produce consistent results.

Field Procedures

It was determined that 4th grade students would be used in this study because of their age and maturity. The two sections came to class for four weeks as their normal co-ed classes. Behavior was documented throughout the four weeks using the Stop and Think Tickets. After the four weeks were up, the sections split into same gender classes. The next four weeks, the students came to class as a same gender classroom and their behavior was documented using the same program. After a total of eight weeks went by, the classes went back to their normal sections of co-ed classes.

The time frame for this project was set after the Stop and Think Program was established and utilized throughout the school for a six week time period, which in turn would help provide consistent results.

Conclusion

In conclusion, the same gender classroom had less behavior tickets given to them than the co-ed classroom. Thus providing evidence that suggests children's behavior will improve by going from a co-ed classroom to a same gender classroom.

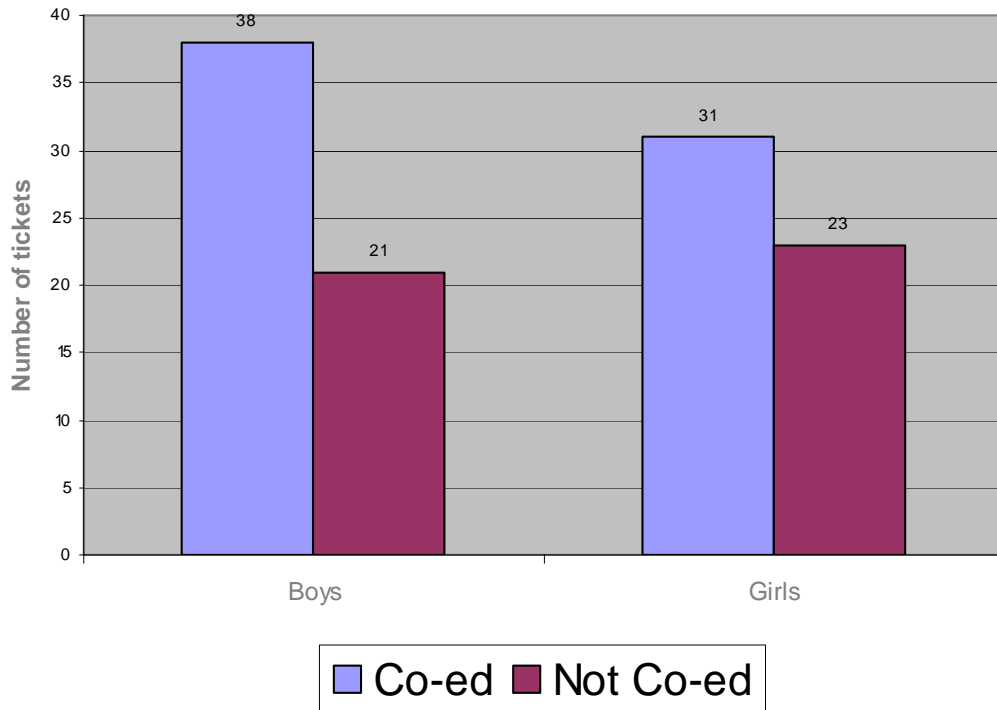
CHAPTER IV: RESULTS AND DISCUSSION

Two different measurements were taken during this study to help form the results. One, the number of tickets issued to two co-ed classrooms, and two, the number of tickets issued to two same gender classrooms.

Results

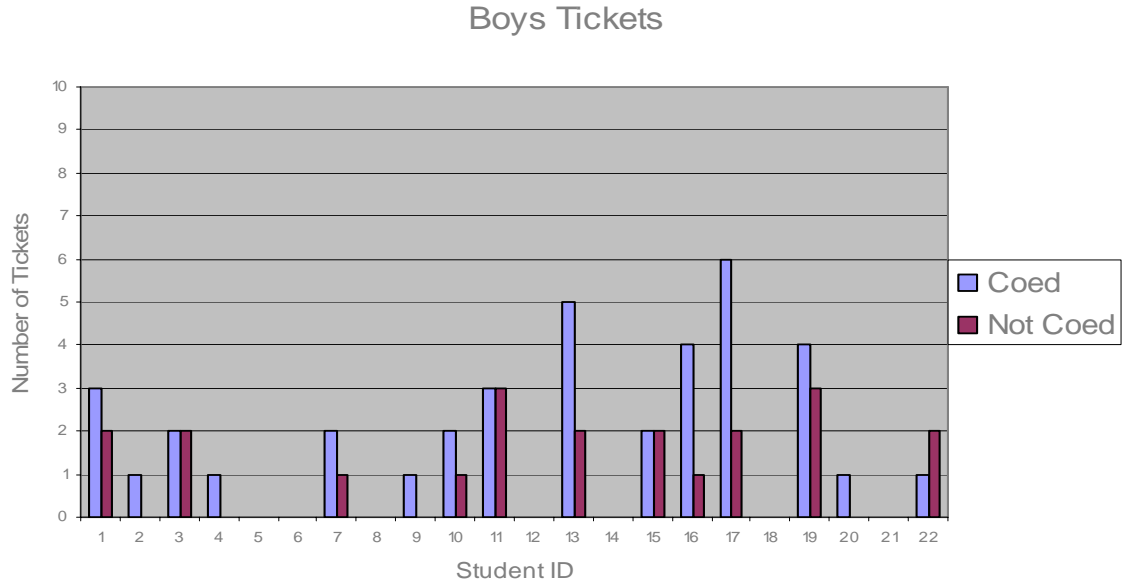
The total number of tickets issued during the eight week study for both boys and girls was recorded. The chart below reflects that fewer behavior tickets were given to students in a same gender classroom. See Figure 4.1

Figure 4.1



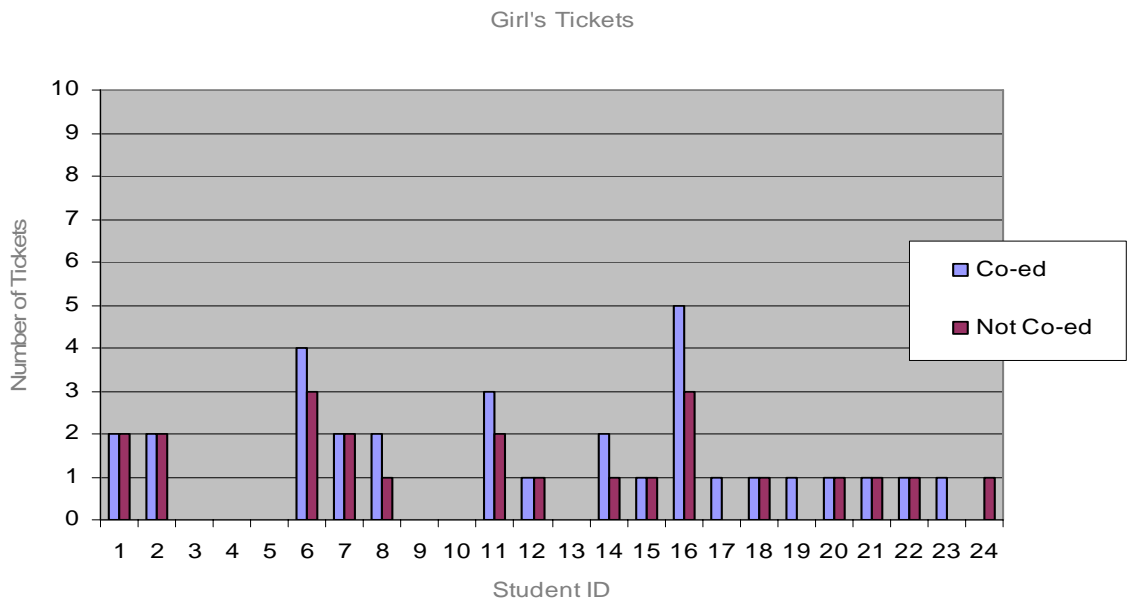
Of the 22 boys in class, all but one had the same number of tickets or less in the same gender classroom compared to the co-ed classroom. See Figure 4.2.

Figure 4.2:



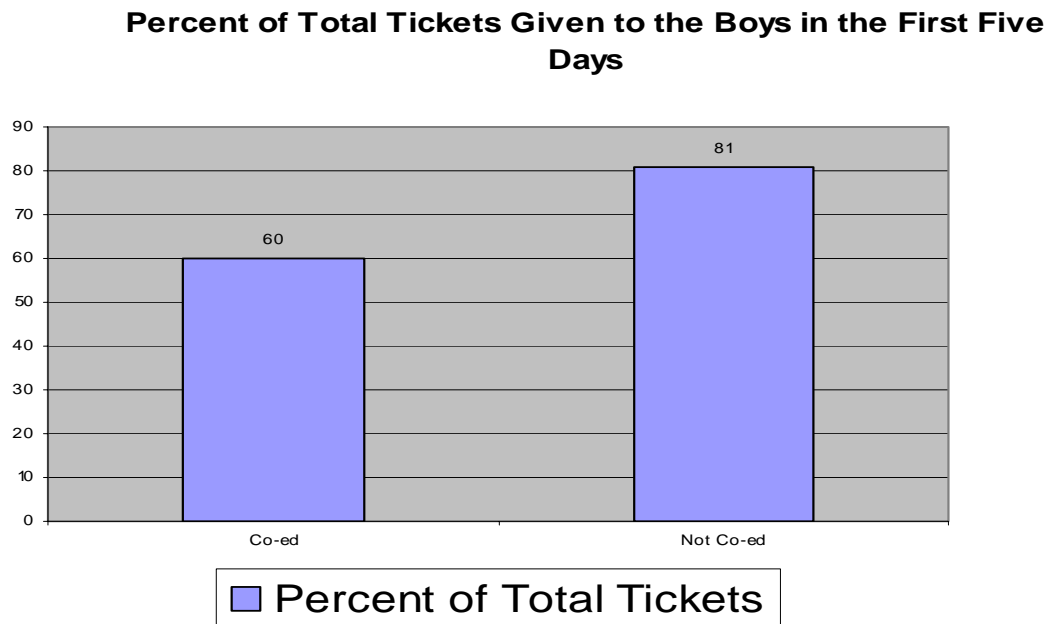
Of the 24 girls in the study, all but one had the same number of tickets or less in the same gender classroom compared to the co-ed classroom. See Figure 4.3

Figure 4.3



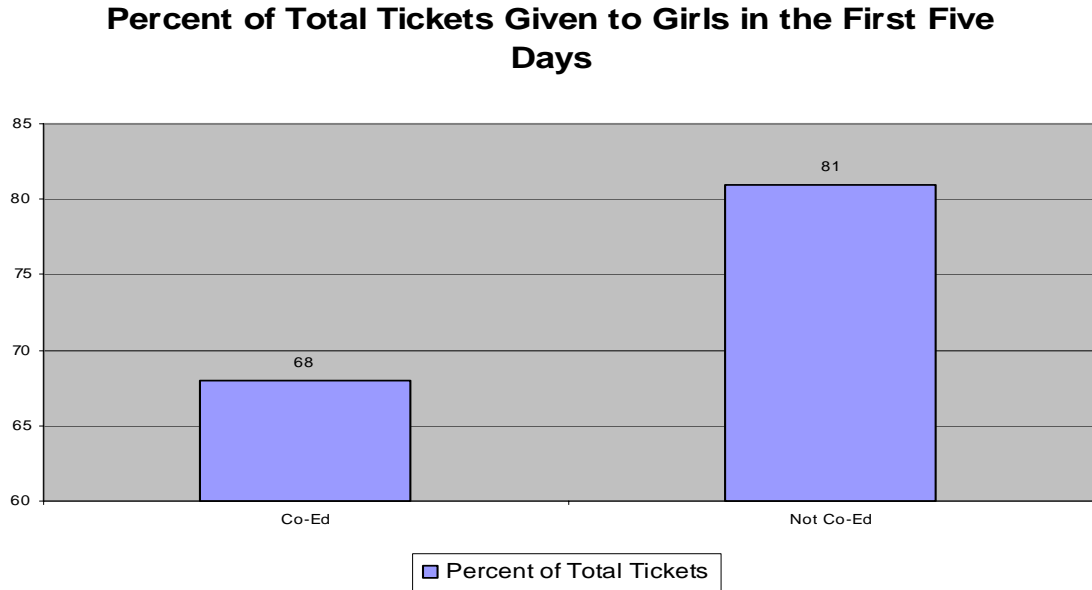
For the 22 boys in this study, the environment change had a short term affect on their behavior. 81% of the boys received their tickets in the first five days in a same gender classroom compared to 60% in a co-ed classroom. See Figure 4.4

Figure 4.4



For the 24 girls in the study, the environment change also had a short term affect on their behavior as well. 68% of their tickets were given to them during coed class in the first five days. When the girls went to the same gender classroom, 81% of their tickets came in the first five days. See Figure 4.5

Figure 4.5



The results of the study were expected for the time frame of the study. If the study would have been done over a shorter period, the results would have been different according to the first five days charted. It was clear that the students in the same gender classroom have fewer behavior problems than those in a co-ed classroom over a longer period of time.

Many factors go into children’s behavior patterns and that could have impacted the study. Also, the Stop and Think Ticket used in this study was somewhat new to the faculty and students which could cause some inconsistencies with the results. Overall, the results seemed in line with the expectations for this study.

CHAPTER V: SUMMARY AND CONCLUSIONS

Summary

The study was performed over an eight week time frame and was the key to this successful experiment. Same gender classrooms do affect student behavior in a positive manner. If the work would have been done in a four week study, the hypothesis would be inaccurate.

Conclusions

Students should have the opportunity to spend quality class time in a same gender classroom. This study concludes that there are fewer behavior problems in the same gender classroom over an extended period of time, which would improve student learning.

Recommendations

To better support or disprove the hypothesis of this paper would require more in depth study. Testing the same gender classroom first could have provided different results. Also, changing up the unit during the study could have shown different results rather than the pickle ball unit. Lastly, the Stop and Think Ticket was used for this experiment, and that in itself was its own experiment. A more traditional way of charting students' behaviors could have been used. Overall, this study had a very positive impact throughout the school, and the children who missed out on this opportunity should have a chance to experience this study themselves.

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DOES THE USE OF A WORD OF THE DAY TO TEACH HIGH-FREQUENCY
WORDS HELP STUDENTS READ AND WRITE THE WORD MORE
SUCCESSFULLY?

by

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University

in partial fulfillment of the requirement for the degree of

Master of Science

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This capstone entitled:

Does the Use of a Word of the Day to Teach High-Frequency Words Help Students
Read and Write the Word More Successfully?

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The final copy has been examined by the signatories, and we find that both the content and the form meet acceptable presentation standards of scholarly work in the above mentioned discipline.

Lovelace, Sandra Ann (M.S. Education)

Does the Use of a Word of the Day to Teach High-Frequency Words Help Students

Read and Write the Word More Successfully?

Capstone directed by Dr. Thomas Sherman, Ph.D.

Abstract

Learning to read and write high frequency words is crucial to a student's reading comprehension and overall reading success. High frequency words appear often in printed text and should be recognized quickly by students. Children must be able to read and spell these words to allow them to focus their attention on decoding and comprehending less frequent words. Stopping to think about a word takes time away from the meaning of the text.

Two sets of similar words were used to complete this study. The first set of 20 words was taught to students through direct-instruction; which consisted mainly of word wall activities. The second set of 20 words was taught using the same word wall activities. An additional teaching element, word of the day, was added for the second set of words.

The procedure for word of the day included brainstorming words that rhymed with the word of the day, using the word in sentences, and discussing the meaning of the word. The word was then hung by the classroom door for the remainder of the day. Each time a student passed through the doorway, he/she needed to look, point, and say the word of the day.

The study was conducted for eight weeks. At the end of the study students were tested on their ability to read and spell each of the words. The first test required the students to accurately read each of the high frequency words. The second test required that students correctly spell the words.

The results of the study indicate an improvement in the ability of the students to read and spell the words. However, to confirm that this improvement was not merely by chance, the study should be conducted again with some modifications.

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CHAPTER I

Introduction

Teaching a child to read is a rewarding, but complex process. Educators today face a wide spectrum of ideas and approaches to teaching reading; phonics, whole-language, and others. It can be very difficult to know which is the best approach. The focus of this study is the investigation of one method of teaching those high-frequency vocabulary words that are often difficult for young children to learn.

Need for the Study

First graders need to learn high-frequency words by sight. A continued finding in reading research shows that student vocabulary knowledge relates strongly to their reading comprehension and overall academic success (Lehr, 2004).

The purpose of this study is to investigate whether the use of a word of the day, compared to the use of word wall activities alone, helps students to better learn the words that are being studied. In this classroom, the words that are chosen are from the school district's reading basal series and from a list of high-frequency words. This study addresses this question: Does using a word of the day method help first grade students successfully read and write high frequency words?

Statement of the Problem

Learning how to read these high-frequency words is crucial to successful reading development. Studies suggest that the most common words in our language, known as "high-frequency words" would be the best place to start. Of all the words

we read and write it is estimated that approximately 50 percent is accounted for by 100 highly frequent words (Fry, Fountoukidis, and Polk, 2000).

As soon as possible, children should learn to read and write these words. If students learn to read and write the high-frequency words at an early age, they are able to focus their attention on decoding and spelling less-frequent words. In addition (and more importantly), they are able to process the meaning of the text more efficiently (Cunningham, 1995).

Learning these high-frequency words can be difficult, as most of the words have no phonemic patterns. Therefore, these words need to be committed to memory.

Hypothesis

Students who are exposed to a high-frequency word multiple times through the use of word of the day will be able to read and write the word more successfully when compared to the use of word wall activities alone.

Definition of Terms

Word Wall: In this study, the term word wall refers to a collection of high frequency words. These words are printed in large black ink and are placed in alphabetical order on a bulletin board.

High Frequency Words: The words that appear most often in printed text and should be recognized quickly by students.

Word of the Day: A word that is placed by the classroom door and is acknowledged each time students enter or leave the classroom.

Reading Vocabulary: The words we need to know to understand what we read.

Writing Vocabulary: The words we use in writing.

Reading Comprehension: The ability to create meaning and usefulness from text.

Reading Fluency: The ability to read a text accurately and quickly.

Decoding: The method or strategy a person uses to “figure out” a word.

Variables

Independent Variable: In this study the independent variable is the use of a word of the day. The first grade classroom uses a word wall on which high-frequency words are placed. Each week five new words were introduced. A variety of activities followed this introduction; chanting and cheering the words, rainbow writing, and word wall games. These high-frequency words were also used as a word of the day. In the morning, the word was introduced to the students and the structure and meaning of the word was discussed. The word was then placed by the door and the students needed to look at, point to, and say the word each time they entered or left the room.

Dependent Variable: The ability of the students to read and write the words at the conclusion of the study were the results being tested.

Control Variable: The researcher conducted the study in a first grade classroom consisting of six and seven year olds, with all students being tested in the same manner.

Moderator Variable: Because the students in the study are the same age and are in the same class, there are no true moderator variables.

Limitations and Delimitations

This study is limited by the number of students (24), the length of the study (eight weeks), and the inability to select words that are precisely the same difficulty. In addition, because of the variety of reading levels in the classroom, some students may have been able to read the high-frequency words with little or no assistance at the onset of the study.

CHAPTER II

Review of Literature

Vocabulary

There is extensive research indicating that a rich vocabulary is a crucial part of reading ability. Laflamme (as cited in Brynildssen, 2000) states that recent research on reading has found vocabulary knowledge to be the most important factor in reading comprehension.

In many classrooms, vocabulary knowledge is ignored. Children need to understand at least 95% of the words they read. If they do not, they may lose the meaning of the text (Biemiller, 2001).

Vocabulary development is a critical part of classroom learning. Laflamme provides several principles that should guide a vocabulary program. First, teachers must offer direct instruction of techniques for developing a wide vocabulary. Next, students should be able to use the vocabulary words in everyday life. In addition, practice and repetition are important in helping students become familiar with new words and in helping them understand how to use the words correctly. Lastly, teachers should model enthusiasm about new words (Brynildssen, 2000).

In this study involving beginning readers, the term “vocabulary” refers to high-frequency words, or those words that occur most frequently in the English language. *Put Reading First* identifies four types of vocabulary; listening, speaking, reading, and writing (Armbruster, Lehr, & Osborn, 2001). This research project refers to two types of vocabulary; reading and writing.

There is abundant research that points to the importance of repeated exposure when learning a new word. The National Reading Panel (as cited in Reading First Publication, 2000), states that multiple exposures to vocabulary items are critical. The frequency with which a word is encountered increases new learning for kindergarteners and first graders and repeated readings can help young children's vocabulary growth (Reading First, 2000). Graves and Watts-Taffe suggest using a word of the day strategy in the classroom to promote vocabulary development (2002).

Students learn new words better when they encounter them often. The more often they see and hear words, the better they seem to learn them. Four to fifteen exposures to a word are needed for the word to become automatic to the reader. However, learning disabled children may need to read a word 50-100 times before it becomes automatic (Honig, 1996).

Why is automatic recall of high-frequency words important? There are many reasons for helping students increase their vocabulary; however, none is as important as the relationship of vocabulary knowledge to reading comprehension. Shu, Anderson, and Shang (as cited in Lehr, 2004) refer to many studies that show a strong relationship between vocabulary growth and reading comprehension. A continued finding in reading research shows that student vocabulary knowledge related strongly to their reading comprehension and overall academic success (Lehr, 2004).

High-Frequency Words

Of all the words we read and write, approximately 50 percent are accounted for by 100 highly frequent words. Even more impressive is that the 25 most common

words make up about one-third of our written material (Fry, Kress, & Fountoukidis, 2000). This includes the words: the, and, it, said, and you.

In the 1930s Dolch compiled a list of 220 “basic sight words” by selecting words that were common to three comprehensive lists developed in the 1920s. For many years these words have been a part of reading programs for children (May, 1982).

To become a skillful reader, a child has to attain a large bank of high-frequency words (May, 1982). Children should learn to read and spell these words to allow them to focus their attention on decoding less frequent words. Stopping to think about a word takes time away from the meaning of the text. In 2003, the National Reading Panel stated that the ability to recognize words automatically is essential to reading fluency, which is closely tied to reading comprehension (Reading First, 2000).

Pinnell and Fountas feel that young readers should “control” as many high-frequency words as possible. Controlling high-frequency words means that the reader recognizes the word quickly and easily, and is able to write these words correctly in his/her stories. Having many words that are easily recognized helps a reader become more fluent, as he/she does not need to problem solve with each word. Also, writers are able to write more meaningfully if they are able to spell high-frequency words easily (Pinnell & Fountas, 1997).

High-frequency words may be difficult to learn, as many times these words are not pronounced or spelled in predictable ways. Of the 150 most frequent words only 35 are easily sounded out (Cunningham, 1995).

Many high-frequency words are phonetically irregular, which means they cannot be sounded out. Fortunately, although the vowels are irregular, many of the spelling/sound correspondences are regular and help establish the spelling and phonetic pattern to facilitate memorization (Honig, 1996). For example, while the word *have* does not follow the final /e/ rule, the /h/, /v/, and /e/ all perform as they should, and the /a/ makes the sound that it frequently represents (Pikulski & Chard, 2005).

How are sight words attained? Essentially, by frequent exposure, although there are factors which influence the amount of exposure needed. These factors include meaningfulness and quality of visual memory (May, 1982). High-frequency words are best taught a few at a time and should be reinforced regularly. A mixture of learning modalities should be used to teach and reinforce these words: Say them, cheer them, shout them, sing them, print them on paper, and use plenty of actions (Rog, 2003).

May (1982) suggests several approaches to develop a sight vocabulary. The first is frequent exposure to common words. A second approach is developing visual memory, which is the ability to recognize, recall, and produce letters and letter sequences. This requires a child remember sequences of letters that represent actual words. Lastly, May recommends highly structured lessons on specific words (1982).

Word Walls

A word wall is a systematically organized collection of words displayed in large letters on a wall or other large display place in the classroom (Cunningham, 1995).

Word walls are an extremely effective tool for teaching high-frequency words. A word wall is an approach to teaching that involves finding featured words in reading and writing experiences. Words are taught using a variety of learning modalities-visual, auditory, and kinesthetic. These words should then be applied in reading and writing situations (Rog, 2003).

Rog states that words on the word wall must be meaningful to students. Placing a word on the word wall is a great way to pre-teach words that students are likely to come across in their reading (2003).

Most word walls share common characteristics: Words are developmentally appropriate for students in the classroom, words are selected with certain instructional ideas in mind, new words are continually introduced, word wall activities help students in the way they think about and use words, and word wall words support students in independent reading and writing (Brabham, 2001).

Both Cunningham (1999), and Pinnell and Fountas (1998) emphasize that word walls must be interactive. An effective word wall will include planned activities that help student develop an understanding of letters and sounds, and to use these words to figure out new, unfamiliar words. A variety of activities often follow the introduction of new words. Students may clap the words, write the words in the air, and use shaving cream to write the words.

An effective word wall provides a reference that allows students to become more independent problem solvers as they read and write. As students continue to work with them, word wall words become a part of long-term memory and are easily accessed (Brabham and Villaume, 2001, p. 2).

CHAPTER III

Methods and Procedures

Overview

The students in this study are taught five new high-frequency words each week, totaling 160 words during the school year. These high-frequency words are selected from both the reading series used by the school district and from the Dolch list of high-frequency words (May, 1982). The high-frequency words are taught through the use of a classroom word wall.

This research project was designed to determine whether focusing on one word each day through the use of a word of the day would help students more successfully learn these words. Research shows that multiple exposures to a word are necessary for the word to become automatic to the student (Honig, 1996).

Research Design

The experiment was conducted over an eight week period, with 40 high-frequency words selected for use in the study. Data collection for the study consisted of two methods: Students were tested on their ability to read each word aloud and a spelling test was administered to the entire group of students.

Selection of Students

Participants in this action research were first grade students in attendance during the 2004/2005 school year. The study was conducted at an elementary school in a major city in the Midwest. The study involved 24 first grade students. Of the 24

students, 13 were girls and 11 were boys. 19 of the students were Caucasian, and five were minority students. Prior to the study, two children qualified with learning disabilities, and one child received English as a Second Language services.

The researcher included all members of the class in the study because of the need for all students to learn the high-frequency words.

Instruments

The instruments used in the study were a list of high frequency words (Appendix A), a checklist to record number of words read correctly (Appendix B), and a chart showing the words which were used as a word of the day (Appendix C).

Validity Measures

Students were tested individually on their ability to read each word in the study. The spelling test was administered as a whole group using the same procedure as the weekly spelling test. Based on the format of the assessments, little or no error should occur when testing a student.

Reliability

Reliability is achieved when a study is repeated and the outcome is consistent with that of the first study. It is likely that similar outcomes and patterns would occur in future studies. Factors that may affect the reliability of this study include class size and prior reading experience of the students.

Field Procedure

This study focused on two methods of teaching high-frequency words; a classroom word wall, and the use of a word of the day.

Word wall activities included introducing the five new words on Monday, clapping the words, chanting and cheering the words, and writing the words in the air and on paper.

The procedure for word of the day was as follows: Each day one of the new word wall words was shown to the students. The students brainstormed words that rhyme with the word of the day, used the word in sentences, and talked about the meaning of the word. The word was then hung by the classroom door for the remainder of the day. Each time a student passed through the doorway, he/she needed to look, point, and say the word. If a student forgot and a classmate noticed, he/she would need to look, point, and say the word three times.

At the end of each week, the five high-frequency words were placed in alphabetical order on the classroom word wall, where they remained for the duration of the study. The students were then able to refer to the words when reading and writing.

Two sets of words were chosen for the study. The first set was taught using both methods, and the second set was taught with only the use of the classroom word wall. At the conclusion of the study, students were tested individually on their ability to read the high-frequency words. In addition, a spelling test was administered to determine each child's ability to correctly spell each word.

Conclusion

This study was designed to measure the effect of repeated exposure to a word through the use of a word of the day. Students were assessed at the conclusion of the study on their ability to read and spell the high-frequency words.

CHAPTER IV

Results and Discussion

Introduction

The purpose of this study was to determine whether or not the use of a word of the day would help students more successfully read and write high-frequency words. Students were taught five new words each week over an eight week period of time. 20 of the words were taught using the word of the day method, while twenty were taught without word of the day.

Procedures

This study was comprised of 24 first grade students with a wide range of reading and writing abilities. Over an eight week period of time, students were given direct-instruction on 40 high-frequency words. 20 of the words were taught with a variety of word wall activities. Each Monday during the study, five new words were introduced. The students participated in a variety of word wall activities during the week. The remaining 20 words were taught using the word wall and additional exposure was given through a word of the day.

At the end of the eight week period, students were tested on their ability to read each word. Children read the words they recognized from a list (Appendix A). The tester used Appendix B to mark each word the child was able to read. To assess the ability of the students to correctly spell the words, a whole class spelling test was given using the words from Appendix A. The spelling test was given in the same manner as the weekly spelling test to ensure that the children were comfortable with the format.

*Summary of Results***Reading Scores**

Student #	Without Word of the Day	With Word of the Day
1	17	16
2	20	20
3	20	20
4	20	20
5	0	0
6	20	19
7	18	20
8	17	19
9	19	20
10	20	20
11	18	20
12	19	20
13	20	20
14	17	20
15	20	20
16	14	20
17	17	20
18	19	20
19	18	20
20	20	20
21	20	20
22	15	19
23	15	18
24	0	2

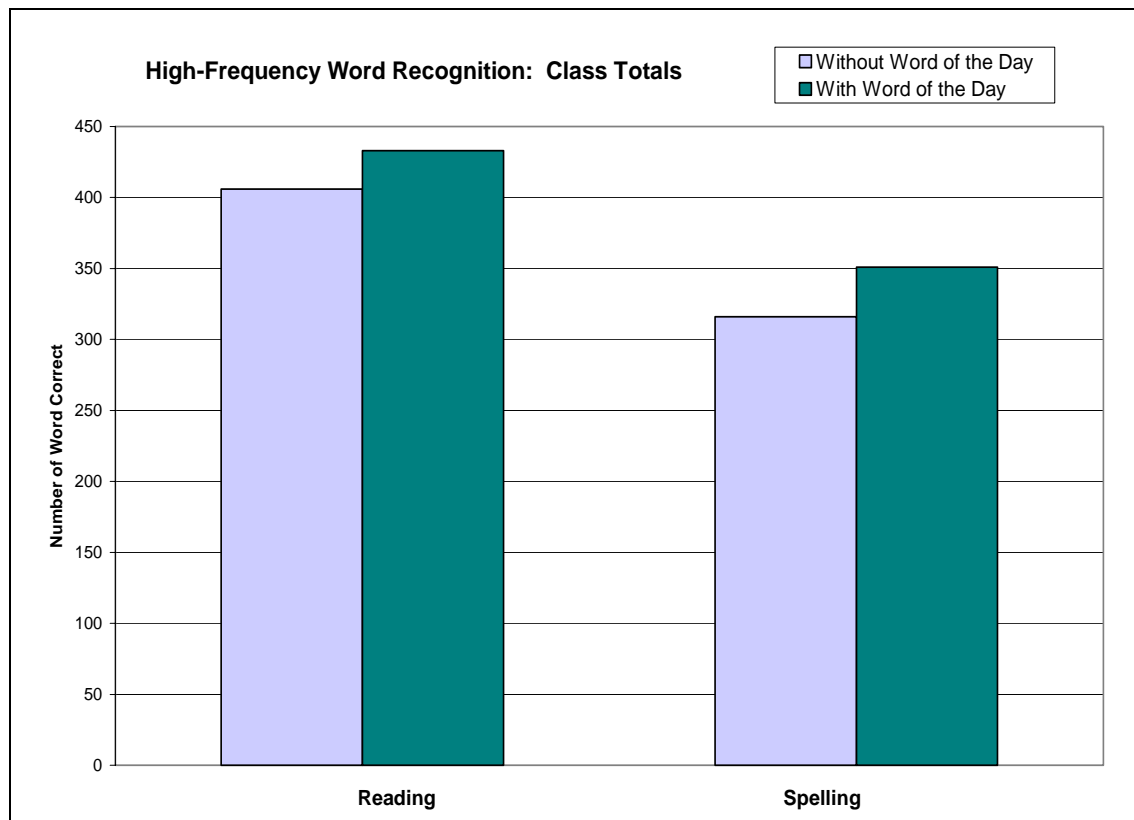
The above table shows the comparison between words read correctly by the students with the use of only the word wall and with the addition of word of the day.

Of the 24 students, 13 were able to read more words when taught with the word of the day method.

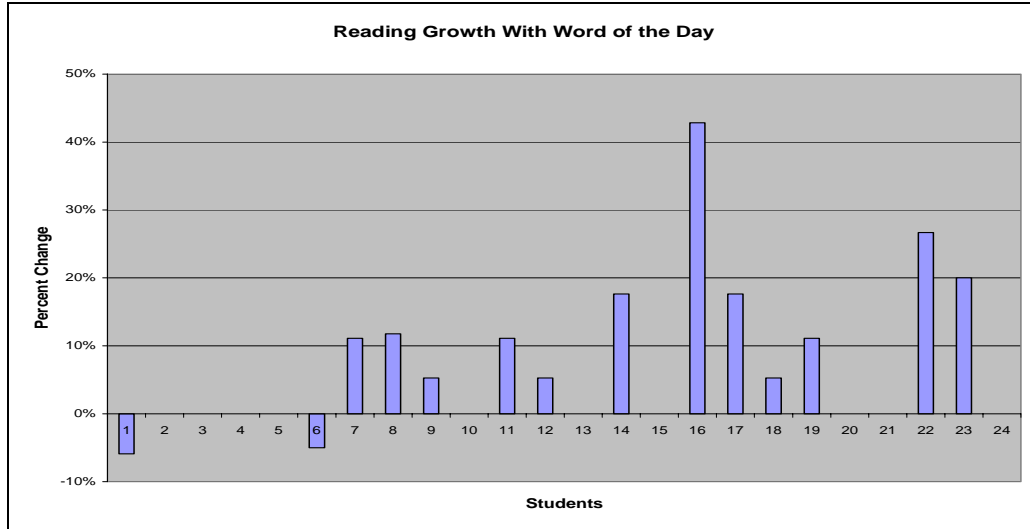
Spelling Scores

Student #	Without Word of the Day	With Word of the Day
1	9	14
2	15	16
3	19	20
4	17	18
5	0	0
6	20	20
7	18	19
8	12	13
9	13	16
10	17	19
11	15	17
12	14	15
13	19	18
14	10	12
15	13	16
16	8	11
17	13	14
18	20	20
19	10	12
20	16	19
21	19	19
22	12	14
23	7	9
24	0	0

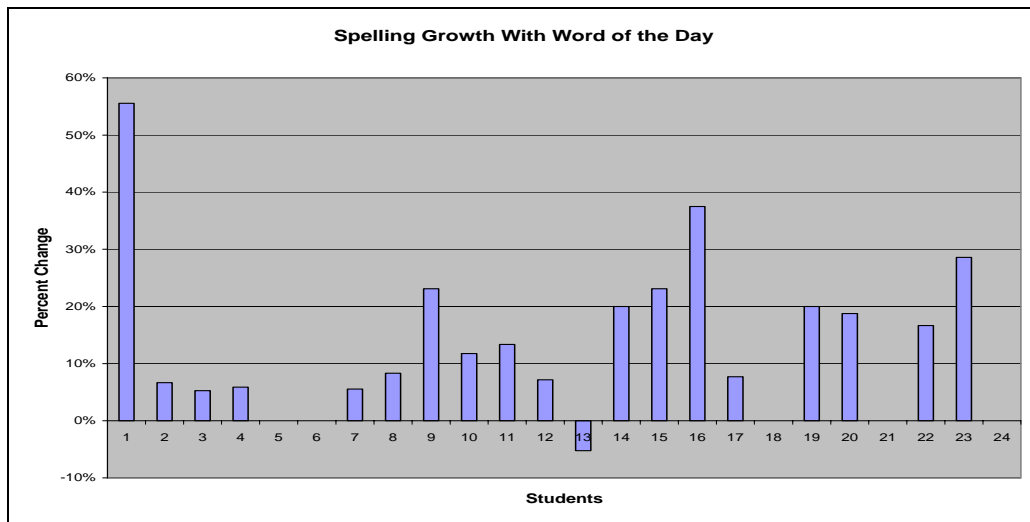
The previous table shows the comparison between words spelled correctly by the students with the use of the word wall alone and with the addition of word of the day. Of the 24 students, 18 were able to spell more words correctly when taught with the word of the day method.



The figure above shows that overall, students in the study showed an increase in the ability to both read and write the high-frequency words which were taught using a word of the day method. Out of a possible 480 words, students were able to read 406 words taught using only the word wall, compared to 433 words taught with the addition of the word of the day method. When tested on ability to spell the high-frequency words, students were able to accurately spell 316 words taught using only the word wall, compared to 351 words taught with the addition of the word of the day method.



As one can see, of the 24 students, 12 show an increase of at least five percent with the addition of word of the day. Nine of the students show a minimum of a 10% change. The average gain in ability to read the words correctly is 12.5% when taught with the word of the day method.



Of the 24 students, 18 show an increase of at least ten percent with the addition of word of the day. The average gain in ability to spell the words correctly is 16.4% when taught with the word of the day method.

Results of a statistical t-test show that the results of the study were not significant at the 95 percent level. This suggests that the difference could have been the result of chance. However, there does appear to be a trend that supports increased reading and writing ability with the use of a word of the day.

Variables

The results of the study may have been impacted by the fact that the study was conducted in the second half of the academic year. Although the students had not received direct instruction on the high-frequency words in the study, at this point in the year the students had already been exposed to many of the words through their reading and writing experiences.

In addition, the inability to select words for the two lists that were equally challenging may have had an impact on the results.

After the completion of the study two of the students were diagnosed with learning disabilities. This disability might have prevented both students from making progress in all areas of reading and writing. This may have negatively impacted the results of the study.

Hypothesis Testing

The hypothesis for the study was that students who were exposed to a high-frequency word multiple times through the use of word of the day would be able to read and write the word more successfully when compared to the use of word wall activities alone. The hypothesis was tested by comparing the students' reading and spelling test scores for the two word lists; the words taught using word of the day and

word wall, and the words taught through the use of the word wall alone. The results of these tests were recorded and compared to show how much, if any, improvement had been made with the use of a word of the day.

CHAPTER V

Summary and Conclusion

Introduction

In this study, students were tested on 40 high-frequency words. The first set of 20 words was taught using only the classroom word wall. The second set of 20 words was taught using a combination of the classroom word wall and the word of the day method. At the end of the study period, students were assessed on their ability to both read and spell the high-frequency words.

Conclusions

By looking at the data, one can see that for this test group the use of a word of the day does appear to improve the students' ability to read and write the high-frequency words. With an average reading growth of 12.5% and spelling growth of 16.4%, there does appear to be a benefit in using the word of the day approach.

Recommendations

While many students learn to read and write these high-frequency words quickly, research shows that repeated exposure to a word does help with this process. This study should be repeated with a largest test group to determine if using a word of the day to teach high-frequency words does help young children to learn these words.

It is recommended that the study should be conducted again with several changes. First, the study should take place earlier in the school year. This would eliminate prior exposure to many of the high-frequency words. Typically when a student enters first grade, his/her high-frequency word knowledge is very limited. In

addition, the study should continue over a longer period of time with a larger test group. A larger sample size might confirm the trend that is seen. Finally, the use of a larger group of words might also validate this trend.

A word of the day program is very simple to implement in any classroom, and there are no detrimental effects of using this method. Based on this knowledge and the results of this study, the researcher has decided to continue with the use of a word of the day in her classroom. Although the impact on students may be small, even an increase of five percent in the ability to read and/or write high-frequency words can be significant to a struggling reader.

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Appendix A**High-Frequency Word List**

1. before	15. read	29. must
2. soon	16. their	30. ask
3. black	17. call	31. because
4. that	18. us	32. good
5. run	19. do	33. will
6. some	20. first	34. no
7. into	21. them	35. fast
8. help	22. had	36. work
9. who	23. more	37. new
10. where	24. make	38. may
11. not	25. after	39. white
12. what	26. these	40. bring
13. has	27. found	
14. said	28. they	

APPENDIX B
Reading Assessment Checklist

Name _____

Date _____

before some not their

soon into what call

black help has us

that who said do

run where read first

them these because work

had found good new

more they will may

make must no white

after ask fast bring

Appendix C

High-Frequency Word List With Word of the Day

Week 1	Week 3	Week 5	Week 7
1. before	1. some	1. not	1. their
2. soon	2. into	2. what	2. call
3. black	3. help	3. has	3. us
4. that	4. who	4. said	4. do
5. run	5. where	5. read	5. first

High-Frequency Word List Without Word of the Day

Week 2	Week 4	Week 6	Week 8
1. them	1. these	1. because	1. work
2. had	2. found	2. good	2. new
3. more	3. they	3. will	3. may
4. make	4. must	4. no	4. white
5. after	5. ask	5. fast	5. bring