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WILL THE IMPLEMENTATION OF INDIVIDUALIZED SELF-PACED

INSTRUCTION VIA THE ACCELERATED MATH SOFTWARE PROGRAM

IMPROVE MATH COMPETENCY FOR TARGET MATH STUDENTS?

by

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B.A. Winona State University, 2003

A capstone submitted to the Faculty of the Graduate School of

Winona State University

In partial fulfillment of the requirement for the degree of

Master of Science

Department of Education

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This capstone entitled:

Will the Implementation of Self-Paced Individualized Instruction Via the Accelerated

Math Software Program Improve Math Competency for Target Math Students?

Written by William J. Theisen

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Will the Implementation of Self-Paced Individualized Instruction Via the Accelerated Math Software Program Improve Math Competency for Target Math Students?

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

Abstract

School districts generally begin to identify and remediate struggling math students during their middle school years. This remediation typically consists of providing the students with an additional math period over and above the grade level math course the student is fulfilling. Instruction is simplified and concentrated during these remedial courses, emphasizing basic math standards. The teacher to pupil ratio is usually much smaller than the regular math class, providing the teacher with the opportunity to teach to varying learning styles and at a slower pace. This study investigates the use of self-paced individualized computer software instruction as an alternative means of providing remediation to these identified students.

Two groups of students were utilized to complete this study. The groups received remedial instruction on alternate days of the school week. The traditional group, consisting of four classes with an average of ten students per class, received instruction via a traditional method of teacher led demonstration and one on one assistance completing math related tasks such as worksheets or text book assignments. The Accelerated Math group, consisting of five classes averaging nine students per class, received instruction via a self-paced software program, Accelerated Math, by Renaissance Learning, Inc. The teacher role within this program was limited to providing assistance with learning how to use the software

and answering student questions derived from using the software; no direct instruction was performed.

The basis for the Accelerated Math program is the concept of self-paced individualized instruction. This is a method of instruction whereby the student works at his or her own pace with one-on-one help from a teacher when requested. Students proceed to new objectives only upon the mastery of the current objective.

The study was conducted over a period of six weeks. The content area used for the basis of comparison was consistent between the groups. This area, Strand A of the Minnesota Basic Standards, which comprises problem solving of whole numbers and fractions, was evaluated to ensure the delivery of content consistently between each group. Results from the study were based upon the improvement in score from a test completed by each student prior to and at the conclusion of the study. This test utilized sample test questions available from the State of Minnesota Department of Education for use in preparing students for annual comprehensive exams.

The results of the study indicate an improvement in math competency for students in the self-paced individualized instructional group at a higher percentage than the traditional instruction group. While both groups showed improvement as a result of the remedial instruction, it is evident that the requirement with self-paced computerized instruction to master an objective prior to proceeding to another provides an overall higher level of understanding and learning.

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CHAPTER I

INTRODUCTION

The school district of this study started a Target Math program for middle

school students in the year 2000 as a method to increase the passing rate of students

taking the eighth grade Minnesota Basic Standards Test (BST) in mathematics. The

program began as a pilot at one of the middle schools in the district. An instructor

was hired to provide remedial mathematics instruction to eighth grade students

identified as having a high probability of failing the BST test based on a practice test

given in seventh grade. The remedial course received by the students was in addition

to their regular math course, provided on alternate days in place of the students' study

hall. The instructor provided comprehensive instruction of the strands of the BST and

emphasized test taking skills and practice.

The results were exceptional as the percentage of students passing the BST in

mathematics at the middle school far exceeded the projected percentage. As a result,

the school district expanded the Target Math program to the other three middle

schools. Those schools did not hire individual instructors for Target Math but instead

added the course to the mathematics teachers already employed at the school. The

success seen at this middle school was duplicated at the other middle schools,

although to a lesser percentage perhaps due to the lack of a single instructor.

Subsequently, Target Math instruction was extended to students in grades six and

seven.

In 2004, the middle school of this study hired a second Target Math teacher.

This teacher's emphasis would be to provide remedial support for students in grade

seven with the intent of improving Minnesota Comprehensive Assessment (MCA) scores in mathematics. The Target Math teacher was encouraged to provide alternative means of instruction for the students. The goal was to reach the students in a manner that was not available to the regular mathematics teacher in a large classroom setting. One particular alternative teaching method, computerized instruction, intrigued the principal at this school more than any other.

Need for the Study:

The principal received a budget for the 2004-2005 school year to hire an additional Target Math teacher. In addition, he obtained permission to pursue the possible purchase of software for use within the Target Math program. The principal therefore had two objectives in regards to the software. The first objective was to conduct a review of various software programs available to assist with remedial mathematics instruction. His second objective was to pursue an investigation of a specific software program to determine its effectiveness and worthiness of purchase.

One of the programs being considered for purchase was Accelerated Math, by Renaissance Learning, Inc. This software is currently in use at the high schools within the district. Accelerated Math is a program that provides practice on foundation skills with immediate feedback to both the student and the teacher, while handling all scoring and record-keeping tasks. It was this software program that was chosen as the tool to investigate and complete this study.

Statement of the Problem:

The Target Math program has been in existence for the past four years at the middle schools in the school district of this study. The emphasis of the program from its inception has been to extend regular classroom instruction in mathematics to qualified students targeted as needing extra existence. The class sizes are kept at a minimal level with no more than 15 students, allowing the teacher to provide one-on-one support whenever possible.

At the beginning of the 2004-2005 school year, the middle school of this study elected to employ a second Target Math teacher due to the high number of students eligible for the program. The existing Target Math teacher was assigned eighth grade students for the first semester and sixth grade students for the second semester while the additional teacher became responsible for seventh grade students.

Instruction for seventh grade Target Math students in the past had followed the curriculum of the grade level math textbook, utilizing supplemental worksheets, games, and projects related to the ongoing regular math instruction. This instruction method continued for sixth grade students. However, it was decided to utilize an alternate approach for seventh grade students. Incorporating the same worksheets and activities from the traditional approach, the instruction sequence was altered to be based upon the strands of the Basic Standards Test rather than the math curriculum. Formulized pre-tests and post-tests were used to measure growth within each strand area.

Unfortunately the data from these tests, while signifying improvement within the strands, did not quantify individual improvement on the various objectives of the strands. In addition, tracking and recording of data for internal use within the district and for reporting to the student and parents was inadequate and insufficient. Finally, it was believed that individualized self-paced instruction would achieve higher standardized test results. Therefore, the school district decided to pursue software to assist in these areas and recommended a pilot study of Accelerated Math as one of the alternatives.

Purpose of the Study:

The purpose of this study is to determine whether the implementation of individualized self-paced instruction via the Accelerated Math computer software program will improve math competency for Target Math students.

Statement of the Hypothesis:

Individualized self-paced instruction via the Accelerated Math software program will improve math competency for Target Math students when compared to the use of traditional group instruction.

Definition of Terms:

Accelerated Math. Technology that monitors practice of foundational skills while providing immediate feedback on performance to both the student and the teacher, ensuring that each student works at his or her own pace with a continuous supply of new and relevant problems and assignments. The program also handles all scoring and record-keeping tasks, minimizing teacher paperwork and time.

Basic Standards Test. An assessment program in Minnesota to measure student progress toward achieving academic excellence in the subjects of reading, writing, and mathematics. All Minnesota students must pass the Basic Standards Tests to be eligible to graduate from high school. The mathematics test is administered to students for the first time in the eighth grade. Students must retake this test annually until a passing performance has been attained.

Individualized self-paced instruction. A method of instruction whereby the student works at his or her own pace with one-on-one help from a teacher, proceeding to new objectives only upon the mastery of the current objective.

Minnesota Comprehensive Assessment. Assessment tests in Minnesota in the subjects of reading, writing, and mathematics that help schools and districts measure student progress toward the state's academic standards. Tests are administered for students in grades three through eight, ten and eleven.

Target Math. A math support class for middle school students in the school district who, based on prior standardized tests and math course grades, have been projected as being unable to pass the Basic Skills Test in the eighth grade. The class is an alternating day class in place of a Target (study hall) class. Grading for the class is pass/fail based upon behavior and effort, not on specific mathematical achievements or results.

Variables:

Independent variable. The independent variable in this study is the individualized practice work provided by the Accelerated Math software program.

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Dependent variable. The dependent variable in this study is the percentage of increase or decrease in test scores for students using the Accelerated Math software as compared to the percentage of increase or decrease in test scores for students in traditional Target Math instruction.

Control variables. The traditional group consists of four classes totaling 39 students and will continue instruction in a traditional format. The Accelerated Math group consists of five classes totaling 44 students and will be utilizing the Accelerated Math software program. All students are at the same grade level and age.

Moderator variables. Comparisons will be made between two different sets of students. The groups are fairly distributed by sex and race. As a prerequisite for entry in Target Math, each student has been projected as being unable to pass the Basic Standards Test and does not qualify for special education services. Therefore, the student population can be considered fairly consistent in terms of mathematical ability and achievement.

Limitations of the Study:

This study is limited by the length of the study and by the objectives of the strand being instructed.

CHAPTER II

REVIEW OF RELATED LITERATURE

Students in the early years of elementary school through grade five generally receive the same mathematics instruction, regardless of ability. It is during the middle school years of grades six through eight that many school districts begin to recognize and address those students who are unable to maintain the pace of the regular classroom. Typical intervention is to provide remedial mathematics instruction. This instruction is usually provided in addition to the regular classroom and supports or enhances the instruction provided by the regular mathematics teacher.

Multiple methods of remedial instruction are utilized in remedial mathematics classrooms. Technology enhancements during the past decade have inspired many school districts to provide this instruction in non-traditional manners, such as with the use of computer software. Typically, this software offers support and reinforcement for the instruction provided by the remedial teacher. In recent years, however, enhancements to the computer software have allowed the possibility of the roles of the computer software and the remedial instructor to be reversed, with the main instruction provided by the software and reinforcement as needed by the instructor. This reversal allows for the implementation of self-paced individualized instruction, whereby each student progresses at his or her own pace, proceeding to the next topic area only upon mastery of the current area. It is a dramatic change in remedial instruction practice with the possibility of having significant impact on the learning of students in remedial mathematics.

Remedial Mathematic Methods:

Instructional methods utilized by remedial mathematics teachers generally emphasize the individual student instead of the body of students in the classroom. Therefore, techniques used concentrate on individual learning styles, similar to mathematics instruction provided to learning disabled students. In *Techniques in Teaching Remedial Math,* author Diana Humphreys (1998) provides many techniques for use with struggling mathematics students. These techniques include visual cueing, auditory cueing, and the use of manipulatives. She also recommends variations in delivery including the assignment of fewer problems, elimination of copying from the textbooks, step by step instruction, and instruction in small steps with adequate practice and review at each step. Authors Nancy Bley and Carol Thornton, in *Teaching Mathematics to Students with Learning Disabilities*, document many of the same techniques in addition to recognizing the value of technology by writing,

> "If used properly, as a tool, by teachers who feel comfortable with it, the computer can provide simulated real-life experiences, practice at a pace that is slow and individualized enough for students to process material and over learn where necessary, and opportunities for learning in a cooperative manner" (Bley and Thornton, 2001, p. 33).

Use of Software to Teach Mathematics:

There is little argument that the use of technology will aid student development and achievement. There has been a great deal of research completed that compliments the relationship between technology and student achievement at the middle level (Quinn and Valentine, 2001). In addition, there is evidence the use of instructional technology across the curriculum will increase student performance. A

study by Interactive Educational Systems Design, Inc. (IESD, Inc.) argues this claim

most forcefully by summarizing in their research,

> "Educational technology has demonstrated a significant
> positive effect on achievement. Positive effects have
> been found for all major subject areas, in preschool
> through higher education and for both regular education
> and special needs students" (IESD, Inc., 1999, p. 3).

In the study, *Does It Compute? The Relationship Between Educational*

Technology and Student Achievement in Mathematics, Harold Wenglinsky (1998)

targets the use of technology in mathematics. His analysis of a national database of

student test scores found consistently higher scores in classrooms utilizing computers.

Two findings of importance were reported. First, fourth graders using computers

mainly for math learning games outperformed students who did not use computers at

all. Second, eighth graders who used the computers for simulations and applications

performed better than eighth graders who used them primarily for drill and practice.

Self-paced Individualized Instruction:

Wenglinsky's research justifies the use of technology and computer software

to provide mathematics instruction to students. For the remedial student, however, the

use of technology alone does not improve their learning. Remedial instruction

emphasizes a decreased pace, one that meets the learning capacity of each individual

student. Ideally, the student should manage this pace. The study, *Student-Paced*

Versus Teacher-Paced Accommodations, concludes,

> "Student-controlled pacing allows the student to control
> their environment. As a consequence, students who
> believe they are in control of their environment may
> persist more at difficult or uninteresting tasks. Students
> show more enjoyment of, better performance on, and

greater persistence at a variety of activities when they are allowed control of their environment" (Hollenbeck, Rozek-Tedesco, Tindal, Glascow, 1993, p. 4).

In a similar self-paced study, *Motivation and Performance in College Students Enrolled in Self-Paced Versus Lecture-Format Remedial Mathematics Courses*, the authors report improved attitudes and confidence by students in the self-paced group. They summarize,

"Students in the self-paced or personalized instruction group expressed more positive attitudes and more confidence in their ability to perform college work" (Ironsmith, Marva, Harju, Eppler, 2003, p. 3).

Impact of Mathematics Software in Remedial Instruction:

Allowing students to proceed at their own pace with mathematics software requires the teacher to undergo a change in instructional philosophy. Accelerated Math, the software program for mathematics instruction chosen for this study, forces this philosophy change upon the instructor. In *"Using Accelerated Math to Enhance Instruction in a Mandated Summer School Program"*, the authors report that this software,

"…uses technology that monitors practice of foundational skills while providing immediate feedback on performance to both the student and the teacher, ensuring that each student works at his or her own pace with a continuous supply of new and relevant problems and assignments. Accelerated Math also handles all scoring and record-keeping tasks, minimizing teacher paperwork and time" (Spicuzza and Ysseldyke, 1999, p. i).

The provision of new and relevant problems and assignments at the student's pace practically eliminates the possibility of classroom lectures for all students.

Instead, the teacher must be adept at handling the various questions posed by each

individual student. No longer will student questions concentrate on the topic of the

day; the teacher must evolve to address many different mathematical themes, in the

course of a single class period. Once the adjustment has been made, however,

teachers of Accelerated Math are excited with the change. *Differentiating Math*

Instruction: A Large-Scale Study of Accelerated Math: Final Report" summarizes in

its abstract,

> "Teachers of Accelerated Math classrooms spend more
> time providing individual versus group instruction and
> feel better able to meet the needs of their students"
> (Ysseldyke and Tardrew, 2003, p. 2).

CHAPTER III

METHODS AND PROCEDURES

Overview:

This study compared the improvement of test scores for a strand of the

Minnesota Basic Standards Test between remedial mathematics students receiving

instruction via a traditional approach versus students receiving instruction through the

Accelerated Math software program. The study, conducted over a period of six

weeks, was expected to show an increase in test scores for students utilizing the

Accelerated Math software because of its focus on allowing students to proceed at

their own pace.

Subjects:

Remedial mathematics students in grade seven at the middle school were

chosen for this study. These students qualify for remedial mathematics based upon a

consistent set of criteria for inclusion: scoring between two and three on the

Minnesota Comprehensive Assessment test in mathematics during sixth grade

(Minnesota identifies these students as making inadequate progress) and failing to

qualify for special services.

Eighty-three seventh grade students were enrolled in a remedial mathematics

course at the middle school, and all participated in this study. The remedial course,

entitled Target Math, was held on alternating days throughout the school year. For

this study, students on A days were selected to be members of the traditional

approach group while students on B days were selected to be members of the

Accelerated Math group. The traditional approach group consisted of four classes averaging ten students per class while the Accelerated Math group consisted of five classes averaging nine students per class.

Research Design:

The study was conducted over a period of six weeks. Due to the alternating day schedule for the Target Math students, each group essentially participated for 15 days. The first and last days of the study consisted of completing a pre-test and post-test of the material covered during the six weeks. One additional class period was utilized for the Accelerated Math group prior to the beginning of the study to provide training on the use of the Accelerated Math software and material. All class work was performed within the 45 minute class periods; no homework or computer access was provided outside of the classroom.

Strand A of the Minnesota Basic Standards Test was selected as the study material. This strand assesses knowledge of problem solving with whole numbers and fractions. A thorough comparison of the material used to instruct to the traditional approach group versus the question set provided with the Accelerated Math software was completed to ensure delivery of the same content.

Instruments / Measuring Devices:

A test was developed to compare the progress achieved by the two groups. This test contained questions used in past sixth grade Minnesota Comprehensive Assessment mathematics exams. Questions were selected that were consistent with the unit on problem solving of whole numbers and fractions (appendix A).

The test, consisting of fifteen multiple-choice questions, was administered to all students on the first day of the study. Students were allowed the entire class period to complete the test. Results were calculated and recorded but the test was not returned to the students nor was a review of the test provided for the students. On the final day of the study, all students completed the identical test a second time. Again, these results were calculated and recorded. Following the study, students were provided with their pre-test and post-test scores, and a review of the test questions was completed. Analysis of the data was completed utilizing Microsoft Excel.

Validity Measures:

The validity of the assessments should be consistent. Students in each group completed the same test at the beginning and end of the study. The tests were conducted within one day of each other. There is a possibility of students sharing the test with each other between class periods but this risk is minimized for two reasons. First, the test had no impact on the grade the students received in Target Math; therefore there was little incentive for students in subsequent classes to receive information regarding the test. Second, sharing of test information between subjects of the differing groups was less likely because of the team structure at the middle school. Students in the traditional approach group (A day) are members of one team while students in the Accelerated Math group (B day) are members of another team. Academic socializing between members of each group was limited due to having different teachers, pace, and content in their subjects.

Reliability Measures:

The form of assessment used for this research should increase the reliability of the study. The identical test was provided to the students prior to and concluding the study. Students received the test during the same class period each time it was completed. All students were able to complete the test within the allotted class period time. The same instructor monitored all tests and provided no assistance during the test. Finally, the test questions utilized were from a test bank of questions used by the State of Minnesota for conducting Minnesota Comprehensive Assessments.

Procedures:

Following the completion of the pre-test during the initial class period, instruction for students in the traditional approach group consisted of the following routine: a short period of instruction covering the day's topic (typically five minutes), whole class demonstration and practice (five to ten minutes), followed by independent practice via a worksheet or textbook assignment (sample worksheets in appendix B). The teacher provided assistance to all students during independent practice, and confirmed completion and accuracy of each student's work.

Instruction for the Accelerated Math group proceeded at the students' individual pace. On the first day of use with the software, each student received a printed worksheet with twelve problems based on the first objective of the strand (sample problems in appendix C). The software randomly generates problems from a test bank of questions, limiting the possibility of multiple students receiving the same problems. Students worked on the problems at their own pace and were provided assistance by the teacher whenever requested. All problems were multiple-choice

questions but students were required to show their work on the worksheet for later review.

When a student completed an answer key for the worksheet, the key was fed into the Accelerated Math software for correction. Subsequently, the software provided the students with the results and a new worksheet for the students to complete. Students were required to review the results with the teacher. The teacher and student would discuss the results and review the work shown on the worksheet. One on one instruction would be provided at this point to help the student improve on the subsequent worksheet.

The new worksheet generated by the software would either consist of additional problems for the current objective, or new problems on the next objective if the student mastered the current objective. Mastery was obtained by successfully answering 90% of the problems on the worksheet. This pattern of work continued throughout the study. Students completed an average of sixteen problems per day during the fourteen days of use with the software (appendix D).

CHAPTER IV

RESULTS AND DISCUSSION

Statistical Analysis:

Strand A of the Minnesota Basic Skills Tests measures competency in four areas of problem solving: whole numbers, fractions, decimals, and integers. The test utilized in this study consisted of questions that covered each of these four areas. Therefore, statistical analysis in this study is available for the entire contents of Strand A as well as within each subgroup of this strand.

As expected, each group in the study improved in the percentage of correct answers following the study period. The traditional group improved by an average of 9% on the contents of the strand, from 39% on the pre-test to 48% on the post-test, with each sub-group showing comparable gains.
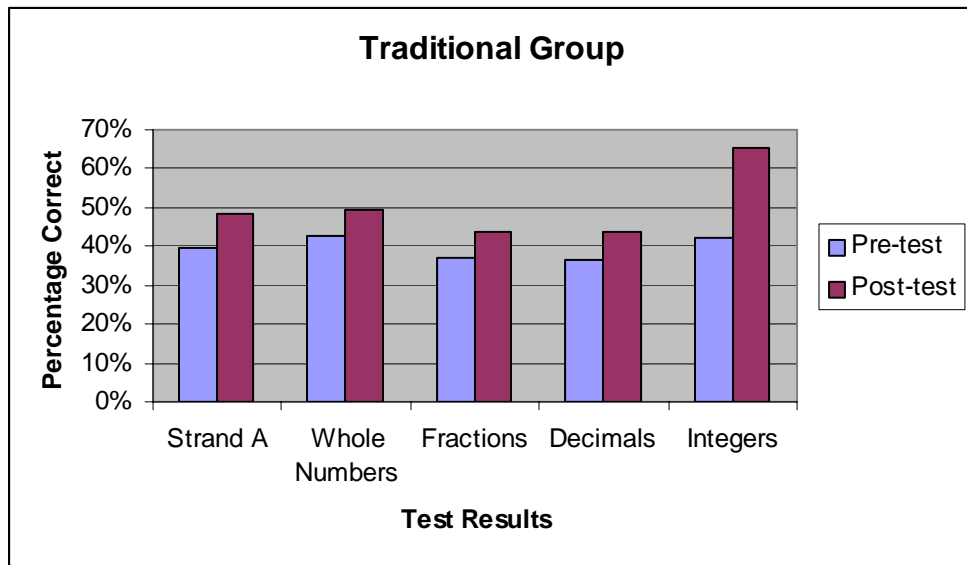
Similarly, growth occurred as well with the Accelerated Math group, although at a higher rate of improvement. This group had a pre-test percentage correct of 32%, improving to 45% on the post-test. Once again, comparable improvements were shown for each of the subgroups of Strand A.

Accelerated Math Group
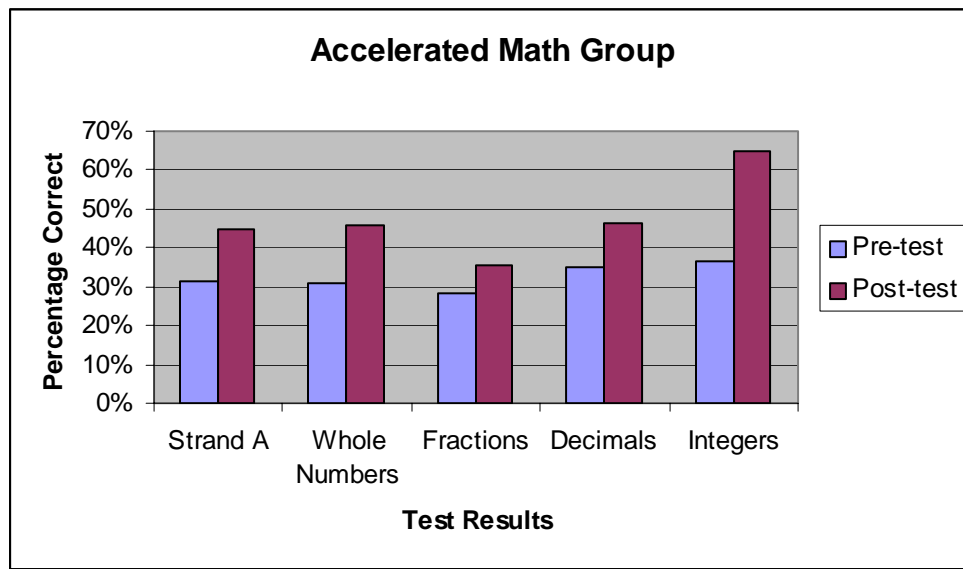
A comparison of the rate of improvement between the traditional group and the Accelerated Math group highlights the higher gains achieved with the Accelerated Math software.

Traditional vs Accelerated Math

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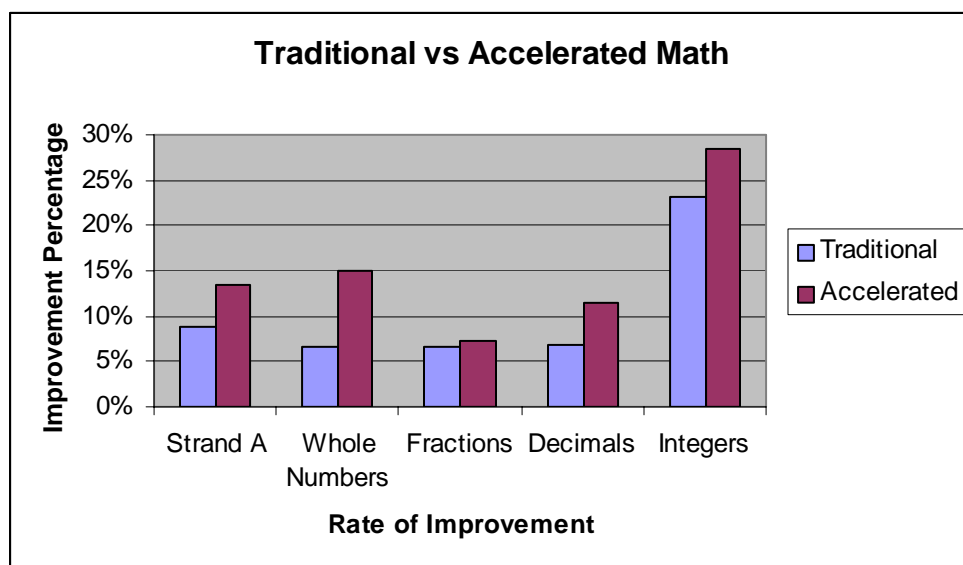
Statistical analysis is also provided for sub-classification of the student

population in the study. Each group had a comparable percentage of English as

Secondary Language (ESL) students, as classified by the middle school. The

traditional group consisted of 35% ESL students (14 of 39) while the Accelerated

Math group consisted of 32% ESL students (14 of 44). The results show a significant

improvement in test results for non-ESL students of both groups. The Accelerated

Math group showed higher improvement for both sub-classifications when compared

to the traditional group. However, while this improvement appears for both ESL and

non-ESL students, the software does not appear to benefit either sub-classification as

the percentage of gain (4%) is equal.
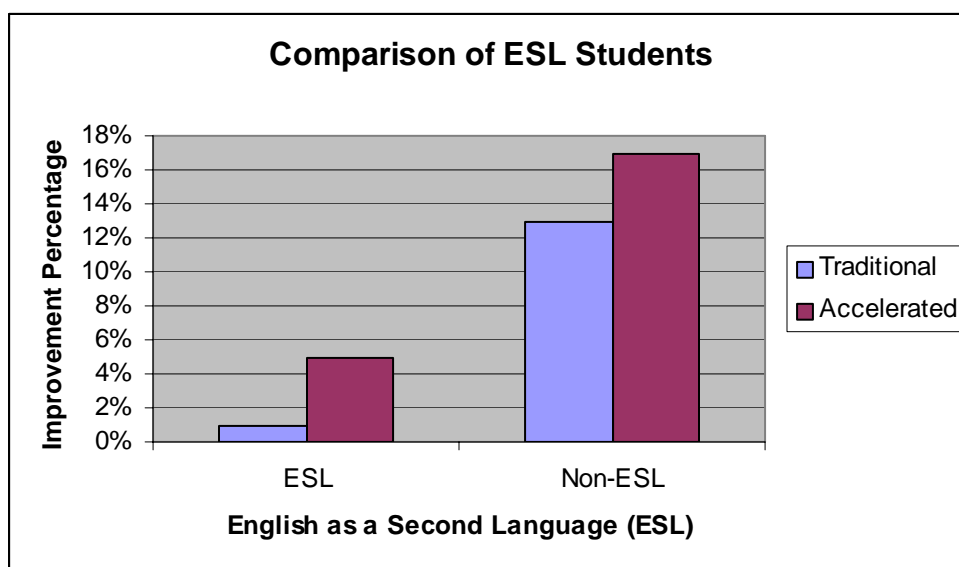
A sub-classification by race is also provided. The study groups contained

comparable percentages of minority students, with 48% in the traditional group and

34% in the Accelerated Math group. A comparison between races within the groups

(black, Asian, Hispanic, and white) shows similar improvements in test results of the

Accelerated Math group, with the exception of the Hispanic students. The results of

this sub-classification, however, may be significantly affected by the high percentage
of minority students classified as ESL. Fourteen of the 21 minority students in the
traditional group are ESL students, including the entire population of Asian students.
Similarly, 10 of the 15 minority students in the Accelerated Math group are ESL
students, including the entire population of the Hispanic students.
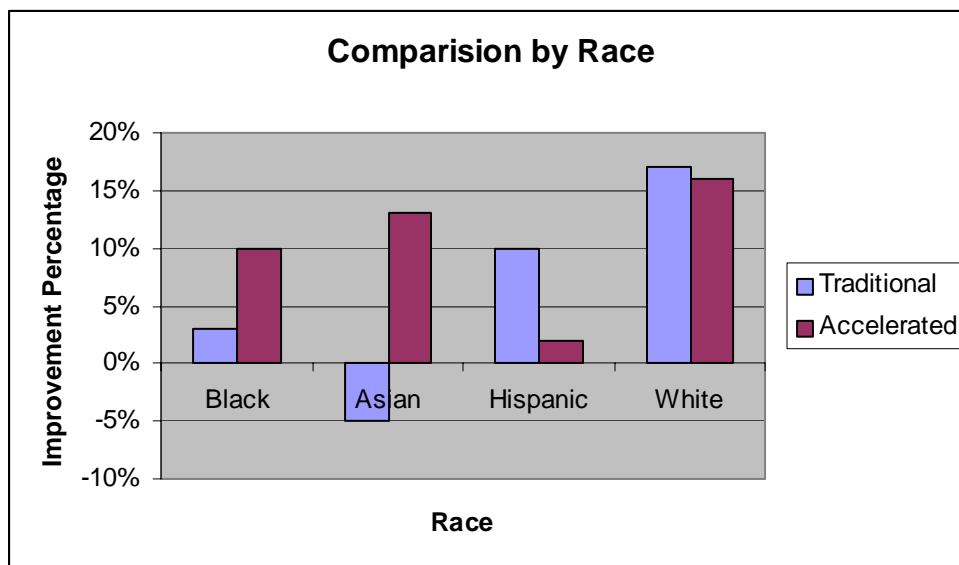
Observations:

The statistical analysis performed for ESL and race sub-classifications makes
for interesting discussion. During the design of this study, ESL students were not
factored into the delivery. At this middle school, ESL students are not allowed into
the remedial mathematics program until they have three years of English as a
Secondary Language preparation. The majority of these students have acquired
average to above average verbal skills in English. However, their ability to read
English is unknown, although it is realistic to presume they are below the majority of
the non-ESL students. In theory, the traditional approach would favor ESL students
because of the heavier reliance on verbal instruction and demonstration.

The same logic could be applied to the students who are struggling with reading skills. The approach of Accelerated Math, whereby students receive worksheets assuming an adequate reading ability, may actually be detrimental to students who struggle with reading. These students will either need to approach the teacher for assistance immediately upon receiving the worksheet or, more likely, attempt the problems and receive assistance at the time a review is performed. This pattern effectively will slow the progress of these students using the Accelerated Math software.

A final observation of this study relates to the attitude of the students in the Accelerated Math group. It became readily apparent as the study moved into the second week that the students in the Accelerated Math group were beginning to dislike the daily problems they faced with Accelerated Math. Instructors typically alter their delivery approach from day to day or week-to-week in order to keep their students interested and motivated. Accelerated Math follows the same routine day in and day out. Its very nature of self-paced instruction also precludes the teacher from changing this routine to any significant degree. Motivation techniques by the teacher to get the students to successfully attempt the work, such as rewarding completion of problems, became necessary to maintain student interest and effort.

CHAPTER V

SUMMARY AND CONCLUSION

Summary of Results:

This study investigated the use of self-paced instructional software, specifically Accelerated Math, as a method to improve math competency for remedial math students. The results certainly bear out that such an improvement is made, evidenced by the overall improvement in test results of 13% compared to 9% via a traditional approach. The improvement applies in all areas of the test strand being measured, and applies as well to English as a Secondary Language and minority students, although to a lesser degree.

Conclusion:

Extension of this study leads to the conclusion that improvement in math competency can be achieved by self-paced instructional software of any means. Assuming the software requires a mastery of content prior to continuation to a new objective, it is logical that the repetition and redundancy required will increase competency. Similarly, this argument can be further extended to apply to self-paced instruction in and of itself, with or without computerized instruction. Again, the assumption is mastery of an objective before proceeding to the next objective, as well as allowing students an indeterminate length of time to achieve this mastery.

The difficulties of the implementation of this process are two-fold. First, the definition of self-paced instruction is, at heart, allowing the student to proceed at their pace. While educators hope this is at an adequate pace to pursue the majority of the

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annual curriculum, the reality is many students are unable or unwilling to maintain

such a pace on their own. The balance educators must face is the tradeoff between

mastery of some of the objectives in the annual math curriculum versus the basic

understanding of the entire math curriculum.

Second, self-paced instructional software requires students to be self-

motivated. It quickly became obvious that the majority of students viewed

Accelerated Math as uninteresting and repetitious. Long term, strict implementation

of this software could easily lead to decreases in math competency compared to a

traditional approach due to the unwillingness of students to maintain even a

satisfactory pace. This study reports the results of the use of Accelerated Math over a

short period of time; a longer, more in-depth comparison would need to be made to

justify its usefulness as a full-time replacement to a traditional remedial math

approach.

Recommendation:

Based on the results of this study, a formal recommendation was made to the

principal of the middle school to purchase self-paced instructional software.

However, this recommendation did not include the recommendation to purchase the

Accelerated Math software program. Instead, the recommendation suggested pursuit

of alternative software that not only satisfies the expectation of self-pace and mastery

but also provides delivery of instructional content and allows teachers to manage pace

to some degree. The principal agreed with this recommendation; subsequently

alternative software was investigated and purchased for use during the 2005-2006

school year.

CHAPTER VI

REFERENCES

Bley, N., & Thornton, C. (2001). *Teaching Mathematics to Students with Learning Disabilities.* 4th ed. Austin, TX: Pro-Ed.

Hollenbeck, K., Rozek-Tedesco, M., Tindal, G., & Glasgow, A. (2000). An Exploratory Study of Student-Paced Versus Teacher-Paced Accommodations for Large-Scale Math Tests. *Journal of Special Education, 15(2),* 1-24.

Humphreys, D. (1988). *Techniques in Teaching Remedial Math.* Fulton, MO: William Woods College.

Interactive Educational Systems Design, Inc. (IESD). (1999). *Research Report on the Effectiveness of Technology in Schools: Executive Summary.* 6th ed. Washington, DC: Software Publishers Association.

Ironsmith, M., Marva, J., Harju, B., & Eppler, M. (2003, December). Motivation and Performance in College Students Enrolled in Self-Paced Versus Lecture-Format Remedial Mathematics Courses. *Journal of Instructional Psychology,* 49-53.

Quinn, D., & Valentine, J. (2001). NMSA Research Summary #19: What impact does the use of technology have on middle level education, specifically student achievement? *NMSA Research Summary Series.* Retrieved October 22, 2005, from the World Wide Web: http://www.nmsa.org/research/ressum19.htm

Spicuzza, R., & Ysseldyke, J. (1999). *Using Accelerated Math™ to Enhance Instruction in a Mandated Summer School Program.* Minneapolis, MN: University of Minnesota.

Wenglinsky, H. (1998). *Does It Compute? The Relationship Between Educational Technology and Student Achievement in Mathematics.* Princeton, NJ: ETS Policy Information Center – Research Division.

Ysseldyke, J., & Tardrew, S. (2003). *Differentiating Math Instruction: A large-scale study of Accelerated Math: final report.* Wisconsin Rapids, WI: Renaissance Learning, Inc.

Appendix A – Strand A Assessment Test

Problem Solving: Whole Numbers and Fractions Test

1. Carla's daily work-out at a gym lasts for 30 minutes. She looks at her watch and sees that she has exercised for 9 minutes. What fractional part of her work-out has she completed?

    A. 4/5
    B. 1/3
    C. 3/10
    D. 1/9

2. A gallon of asphalt paint will cover about 250 square feet of surface area. This is sold in gallon cans only. About how many gallon cans are needed to paint a driveway with an area of 490 square feet?

    A. 2 gallon cans
    B. 3 gallon cans
    C. 250 gallon cans
    D. 400 gallon cans

3. Jacinta's mother bought 2 1/2 feet of gold chain at $21.98 a foot. How much did she pay for the chain?

    A. $5.50
    B. $24.48
    C. $43.96
    D. $54.95

4. How many ribbons 2/3 yard long can be cut from 3 1/2 yards of ribbon?

    A. 2 1/2 ribbons
    B. 3 5/6 ribbons
    C. 4 1/2 ribbons
    D. 5 1/4 ribbons

Appendix A – Strand A Assessment Test

5. **How many students are going on a field trip if 2/3 of the 690 students are participating in the field trip?**

    A. **230 students**
    B. **345 students**
    C. **460 students**
    D. **500 students**

6. **Ping pong balls are packed in boxes each containing 12 balls. The boxes are packed in crates each containing 12 boxes. If a sports store orders 100 crates, how many ping pong balls will it receive?**

    A. **1,200 balls**
    B. **1,440 balls**
    C. **12,000 balls**
    D. **14,400 balls**

7. **The temperature on Sunday was 12°. Monday the temperature was -8°. How much colder was Monday?**

    A. **4°**
    B. **6°**
    C. **20°**
    D. **30°**

8. **Sally is 65 3/4 inches tall. Jake is 64 1/2 inches tall. How much taller is Sally?**

    A. **3/4 inch.**
    B. **1 1/4 inches.**
    C. **1 1/2 inches.**
    D. **1 3/4 inches.**

Appendix A – Strand A Assessment Test

9. **The school cook bought 89 pounds of hamburger at $1.46 a pound. What was the total bill?**

     A. $57.00
     B. $90.46
     C. $129.94
     D. $146.00

10. **Dora traveled 20 miles in one hour. How many miles did she travel in 4 hours?**

     A. 4 miles
     B. 5 miles
     C. 80 miles
     D. 100 miles

11. **Nate worked for 7 days at the Minnesota State Fair and made $397.60. If he worked 8 hours a day, what was his hourly pay?**

     A. $6.67
     B. $7.10
     C. $26.50
     D. $56.80

12. **A recording star sold 847,691 copies of her new album in two months. How many more must she sell in order to sell one million copies?**

     A. 152,309 copies
     B. 747,691 copies
     C. 1,847,691 copies
     D. 9,152,309 copies

Page 3

Appendix A – Strand A Assessment Test

Tran saw the following advertisement in the newspaper:

T-Shirts
$12.50 each

BUY 1 AT FULL PRICE AND
BUY THE 2ND SHIRT
AT HALF PRICE!!

13. How much will Tran spend for two shirts?

    A. $6.25
    B. $18.75
    C. $24.50
    D. $25.00

14. The filing cabinet in Mr. Holland's music office contains 11 dozen file folders of classical and pop music. If 49 folders contain classical music, how many folders contain pop music?

    A. 38 folders
    B. 60 folders
    C. 61 folders
    D. 83 folders

15. At 7:00 a.m. Saroja's outdoor temperature registered 5° F. If there was an 18° drop in temperature, how cold did it get that day?

    A. –23° F
    B. –13° F
    C. 3° F
    D. 23° F

Appendix A – Strand A Assessment Test

Problem Solving: Whole Numbers and Fractions Test Answer Key

1. **C**
2. **A**
3. **D**
4. **D**

5. **C**
6. **D**
7. **C**
8. **B**

9. **C**
10. **C**
11. **B**
12. **A**

13. **B**
14. **D**
15. **B**

Appendix B – Sample Traditional Worksheets

BASIC SKILLS TEST
(HELP-SESSION)

STRAND "A"
PROBLEM SOLVING:
(WHOLE #'S &
FRACTIONS)

Appendix B – Sample Traditional Worksheets

NAME _____

Lesson 11   Addition and Subtraction

Study how to add or subtract when the denominators are the same.

Add the numerators. ————

$\frac{2}{9}$
$\frac{5}{9}$
$\frac{8}{9}$
$+\frac{8}{9}$

$\frac{2}{9}+\frac{5}{9}+\frac{8}{9}=\frac{2+5+8}{9}$

Use the same denominator.

$=\frac{15}{9}$

$=1\frac{2}{3}$

$\frac{15}{9}$ or $1\frac{2}{3}$

Subtract the numerators.

$\frac{7}{8}$
$-\frac{3}{8}$

$\frac{7}{8}-\frac{3}{8}=\frac{7-3}{8}$

Use the same denominator.

$=\frac{4}{8}$

$\frac{4}{8}$ or $\frac{1}{2}$

$=\frac{1}{2}$

Write each answer in simplest form.

	a	b	c	d	e	f
1.	$\frac{3}{5}$ $+\frac{1}{5}$	$\frac{7}{8}$ $+\frac{6}{8}$	$\frac{3}{4}$ $+\frac{3}{4}$	$\frac{4}{5}$ $-\frac{3}{5}$	$\frac{5}{8}$ $-\frac{2}{8}$	$\frac{3}{8}$ $-\frac{1}{8}$
2.	$\frac{9}{10}$ $-\frac{1}{10}$	$\frac{3}{4}$ $-\frac{1}{4}$	$\frac{7}{8}$ $-\frac{1}{8}$	$\frac{7}{12}$ $-\frac{5}{12}$	$\frac{5}{6}$ $-\frac{3}{6}$	$\frac{7}{10}$ $-\frac{7}{10}$
3.	$\frac{1}{8}$ $\frac{3}{8}$ $+\frac{3}{8}$	$\frac{2}{7}$ $\frac{3}{7}$ $+\frac{4}{7}$	$\frac{7}{10}$ $\frac{9}{10}$ $+\frac{9}{10}$	$\frac{4}{15}$ $\frac{4}{15}$ $+\frac{7}{15}$	$\frac{7}{10}$ $\frac{2}{10}$ $+\frac{9}{10}$	$\frac{5}{12}$ $\frac{11}{12}$ $+\frac{11}{12}$

Appendix B – Sample Traditional Worksheets

Problem Solving

Stock-Market Report for McTavish Dog Supplies
(changes given in dollars)

Monday	Tuesday	Wednesday	Thursday	Friday
up $\frac{7}{8}$	up $\frac{3}{4}$	up $1\frac{1}{2}$	up $2\frac{7}{8}$	

Solve. Write each answer in simplest form.

1. How much greater was Monday's gain than Tuesday's?

   Monday's gain was _____ dollar greater.

2. What was the combined gain for Monday and Tuesday?

   The combined gain was _____ dollars.

3. What was the combined gain for Wednesday and Thursday?

   The combined gain was _____ dollars.

4. The price before trading Monday was $23\frac{5}{8}$ dollars. What was the price after Monday's trading?

   The price was _____ dollars.

5. The price after Thursday's trading was $29\frac{5}{8}$ dollars. The price after Friday's trading was $26\frac{1}{2}$ dollars. How much did the stock go down on Friday?

   It went down _____ dollars.

6. A recipe calls for $\frac{3}{4}$ cup flour and $\frac{2}{3}$ cup ground nuts. How much more flour does the recipe call for than ground nuts?

   The recipe calls for _____ cup more flour.

7. A gallon of water is poured into a jug that weighs $2\frac{9}{10}$ pounds. The water weighs $8\frac{1}{3}$ pounds. What is the combined weight of the water and the jug?

   The combined weight is _____ pounds.

1.

2.   3.

4.   5.

6.   7.

Appendix C – Sample Accelerated Math Worksheets

Objectives: (1 of 1 listed)
39. Compare decimals

---

1. Which of the following statements is true?

    [A] 7.6 is less than 7.57   [B] 42.2 is less than 42.04

    [C] 0.9 is less than 0.009   [D] 5.0529 is less than 5.065

2. Which of the following is *not* a true statement?

    [A] 29.16001 > 29.16   [B] 22.42 = 22.04200000   [C] 30.117 > 30.107   [D] 23.80009 < 23.81

Objectives: (1 of 1 listed)
40. Decimal standard form to word name

---

7. Write the word name for 432.51.

    [A] four hundred and thirty-two and fifty-one hundred

    [B] four hundred thirty-two and fifty-one thousandths

    [C] four hundred thirty-two and fifty-one hundredths

    [D] four hundred and thirty-two and fifty-one tenths

8. Write the word name for 151.33.

    [A] one hundred fifty-one and thirty-three thousandths

    [B] one hundred and fifty-one and thirty-three tenths

    [C] one hundred and fifty-one and thirty-three hundred

    [D] one hundred fifty-one and thirty-three hundredths

Objectives: (1 of 1 listed)
41. Word name to decimal standard form

---

13. Write as a decimal in standard form:
     two thousand, one hundred eight and sixty-three thousandths

     [A] 20,108.63   [B] 2108.63   [C] 2018.63   [D] 2108.063

14. Write as a decimal in standard form: [A] 51.028   [B] 51,028   [C] 51.28   [D] 0.5128
     fifty-one and twenty-eight thousandths

Appendix C – Sample Accelerated Math Worksheets

Objectives: (1 of 1 listed)
45.   Add 3+ decimals

Add:

37.   66.59   [A] 198.7977   [B] 199.4487   [C] 198.7446   [D] none of these
      131.146
      +   1.5927

38.   29.83   [A] 545.1060   [B] 546.4266   [C] 545.3166   [D] none of these
      511.234
      +   4.2526

Objectives: (1 of 1 listed)
46.   Add money expressions

Add:

43. $13.86 + $9.64   [A] $26.30   [B] $16.22   [C] $22.22   [D] none of these

44. $22.23   [A] $33.25   [B] $23.21   [C] $21.21   [D] none of these
      +   1.02

Objectives: (1 of 1 listed)
47.   WP: Add decimals

49.   Joyce bought a shirt for $46.74, a poster for $15.51, and a pen for $6.29. What did her purchase total?
      [A] $68.54   [B] $68.64   [C] $69.64   [D] none of these

50.   Ivana bought a robe for $40.04, a videotape for $19.18, and a calendar for $2.29. What did her
      purchase total?
      [A] $60.41   [B] $62.51   [C] $61.51   [D] none of these

Appendix D – Accelerated Math Diagnostic Reports

Diagnostic Report   Page 1
Accelerated Math®   Tuesday, March 22, 2005, 9:41:01 AM
Report Period : 09/01/2004-05/31/2005

Class: 701-1B   Teacher: Theisen, William J.

Diag. Codes	Objectives Mastered					Problems Attempted	Average % Correct					
	Avg. Level	Diag. Test	Reg. Test	Total Tests	% of Full Pace		Practice	Exercise	Diag. Test	Reg. Test	Total Tests	Review
	--	--	--	--	--	306	83	--	--	--	--	--
	--	--	--	--	--	186	81	--	--	--	--	--
	--	--	--	--	--	240	85	--	--	--	--	--
	--	--	--	--	--	270	87	--	--	--	--	--
	--	--	--	--	--	300	79	--	--	--	--	--
	--	--	--	--	--	186	78	--	--	--	--	--
P	--	--	--	--	--	252	45*	--	--	--	--	--
P	--	--	--	--	--	210	62*	--	--	--	--	--
	--	--	--	--	--	269	88	--	--	--	--	--
Average	--	--	--	--	--	247	76	--	--	--	--	--

Class Summary
Includes all of the students enrolled in this class.

Number of students:	9
Objectives mastered on diagnostic tests:	0
Objectives mastered on regular tests:	0
Total objectives mastered:	0
% of full pace (school year to date):	0
Median of objectives mastered:	0
Number of students who did not take any regular tests:	9
Number of students below 85% on regular tests:	0 (0%)
Number of students at risk:	2 (22%)

Diagnostic Codes	Number of Students	Percent of Students	Description
M	0	--	Less than 1/2 median objectives M astered
P	2	22%	P ractice Percentage lower than 75%
T	0	--	T est Percentage lower than 85%
R	0	--	R eview Percentage lower than 80%
I	0	--	Teacher I ntervention needed (for details, see Status of the Class Report)

Appendix E – Traditional Group Test Results

Student #	Class	AM/PM	Race	ESL	A	A1	A2	A3	A4
					Increase or Decrease Between Pre-Test and Post-Test				
1	702-2 A	AM	African	No	0%	-40%	0%	33%	50%
2	702-2 A	AM	African	Yes	7%	20%	0%	0%	0%
3	702-2 A	AM	African	No	20%	0%	40%	33%	0%
4	702-2 A	AM	African	Yes	0%	-40%	60%	-33%	0%
5	702-2 A	AM	African	Yes	-13%	-60%	0%	33%	0%
6	702-2 A	AM	Asian	Yes	-13%	-20%	0%	-33%	0%
7	702-2 A	AM	Latin	No	20%	20%	0%	33%	50%
8	702-2 A	AM	Latin	Yes	33%	40%	40%	33%	0%
9	702-2 A	AM	White	No	27%	60%	0%	-33%	100%
10	702-2 A	AM	White	No	33%	20%	20%	100%	0%
11	702-2 A	AM	Asian	Yes	-7%	0%	-20%	0%	0%
12	702-4 A	AM	African	No	0%	0%	-20%	33%	0%
13	702-4 A	AM	White	No	13%	0%	40%	0%	0%
14	702-4 A	AM	White	No	13%	20%	0%	-33%	100%
15	702-4 A	AM	White	No	53%	80%	20%	33%	100%
16	702-4 A	AM	White	No	7%	0%	20%	33%	-50%
17	702-4 A	AM	White	No	7%	20%	20%	-33%	0%
18	702-4 A	AM	Latin	No	-7%	-20%	0%	0%	0%
19	702-4 A	AM	African	Yes	0%	-20%	0%	33%	0%
20	702-4 A	AM	White	No	13%	40%	-20%	33%	0%
21	702-4 A	AM	African	No	27%	40%	20%	0%	50%
22	702-7 A	PM	Asian	Yes	13%	20%	0%	0%	50%
23	702-7 A	PM	White	No	20%	20%	40%	0%	0%
24	702-7 A	PM	White	No	-13%	20%	-40%	-67%	50%
25	702-7 A	PM	White	No	-13%	-40%	0%	-33%	50%
26	702-7 A	PM	Latin	No	-33%	-20%	-40%	-33%	-50%
27	702-7 A	PM	White	No	-13%	0%	-40%	0%	0%
28	702-7 A	PM	Asian	Yes	-13%	0%	-60%	0%	50%
29	702-7 A	PM	African	Yes	20%	20%	20%	33%	0%
30	702-8 A	PM	White	No	7%	0%	0%	0%	50%
31	702-8 A	PM	White	No	7%	0%	-20%	33%	50%
32	702-8 A	PM	Latin	Yes	20%	40%	0%	33%	0%
33	702-8 A	PM	African	Yes	0%	0%	0%	0%	0%
34	702-8 A	PM	African	Yes	-20%	-40%	0%	-33%	0%
35	702-8 A	PM	African	Yes	-7%	-60%	40%	0%	0%
36	702-8 A	PM	White	No	27%	20%	0%	33%	100%
37	702-8 A	PM	White	No	27%	60%	20%	0%	0%
38	702-8 A	PM	White	No	53%	20%	100%	0%	100%
39	702-8 A	PM	White	No	33%	40%	20%	33%	50%

A1 = Whole Numbers   All Students   9%   7%   7%   7%   23%

A2 = Fractions

A3 = Decimals

A4 = Integers

Appendix F – Accelerated Math Group Test Results

Student #	Class	AM/PM	Race	ESL	Increase or Decrease Between Pre-Test and Post-Test				
					A	A1	A2	A3	A4
1	701-1 B	AM	White	No	13%	20%	20%	0%	0%
2	701-1 B	AM	White	Yes	20%	80%	-40%	33%	0%
3	701-1 B	AM	White	No	20%	20%	0%	0%	100%
4	701-1 B	AM	White	No	53%	60%	40%	67%	50%
5	701-1 B	AM	White	No	40%	60%	20%	33%	50%
6	701-1 B	AM	White	No	-7%	-40%	20%	0%	0%
7	701-1 B	AM	White	No	33%	40%	40%	0%	50%
8	701-1 B	AM	White	No	20%	40%	-20%	67%	0%
9	701-1 B	AM	African	Yes	-7%	0%	-20%	0%	0%
10	701-2 B	AM	White	Yes	0%	0%	-40%	67%	0%
11	701-2 B	AM	White	Yes	0%	-20%	20%	0%	0%
12	701-2 B	AM	White	No	40%	60%	20%	33%	50%
13	701-2 B	AM	White	No	7%	40%	20%	-67%	0%
14	701-2 B	AM	White	No	13%	40%	0%	0%	0%
15	701-2 B	AM	Asian	Yes	47%	40%	60%	33%	50%
16	701-2 B	AM	Latin	Yes	0%	0%	0%	33%	-50%
17	701-2 B	AM	Latin	Yes	0%	-20%	20%	-33%	50%
18	701-2 B	AM	African	No	-7%	0%	-20%	-33%	50%
19	702-5 A	AM	African	Yes	-13%	-20%	-20%	0%	0%
20	702-5 A	AM	African	No	0%	-20%	20%	0%	0%
21	702-5 A	AM	White	No	27%	20%	40%	33%	0%
22	702-5 A	AM	White	Yes	-13%	0%	-20%	0%	-50%
23	702-5 A	AM	African	Yes	27%	0%	40%	67%	0%
24	701-7 B	PM	African	No	7%	0%	-20%	0%	100%
25	701-7 B	PM	Asian	Yes	-20%	-60%	0%	-33%	50%
26	701-7 B	PM	White	No	33%	40%	60%	-33%	50%
27	701-7 B	PM	Latin	Yes	-13%	-20%	20%	-33%	-50%
28	701-7 B	PM	Latin	Yes	20%	40%	0%	0%	50%
29	701-7 B	PM	African	No	20%	20%	20%	0%	50%
30	701-7 B	PM	White	No	0%	-40%	20%	0%	50%
31	701-7 B	PM	White	No	0%	20%	-40%	0%	50%
32	701-7 B	PM	White	No	0%	-20%	-20%	33%	50%
33	701-7 B	PM	White	No	13%	40%	0%	0%	0%
34	701-8 B	PM	White	No	0%	-20%	40%	33%	-100%
35	701-8 B	PM	White	No	40%	40%	20%	67%	50%
36	701-8 B	PM	White	No	7%	40%	-20%	-33%	50%
37	701-8 B	PM	White	No	7%	0%	-40%	67%	50%
38	701-8 B	PM	White	No	27%	20%	20%	33%	50%
39	701-8 B	PM	White	No	13%	20%	20%	-33%	50%
40	701-8 B	PM	White	No	33%	20%	20%	33%	100%
41	701-8 B	PM	African	No	27%	60%	0%	33%	0%
42	701-8 B	PM	White	No	27%	20%	20%	33%	50%
43	701-8 B	PM	White	No	7%	-20%	-20%	33%	100%
44	701-8 B	PM	African	Yes	33%	60%	20%	-33%	100%

A1 = Whole Numbers			All Students		13%	15%	7%	11%	28%
A2 = Fractions									
A3 = Decimals									
A4 = Integers									

WILL THE ONGOING PRACTICE OF PRESIDENTIAL PHYSICAL FITNESS

SKILLS HELP STUDENTS TO IMPROVE THEIR FITNESS TESTING SCORES

THROUGHOUT 8 WEEKS?

by

Jacob P. Tietje

B.S. Winona State University, Spring 2003

A capstone submitted to the Faculty of the Graduate School of Winona State

University in partial fulfillment of the requirement for the degree of

Master of Science

Department of Education

May, 2006

This capstone entitled

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The Capstone presentation has been approved for the Winona State University

Department of Education by

_____

_____

_____

Date _____

Tietje, Jacob, P (M.S., Education)

WILL THE ONGOING PRACTICE OF PRESIDENTIAL PHYSICAL FITNESS

SKILLS HELP STUDENTS TO IMPROVE THEIR FITNESS TESTING SCORES

THROUGHOUT 8 WEEKS?

Capstone directed by Dr. Thomas Sherman

Abstract

      In today's society, there is a growing problem with childhood obesity and lack of exercise. If these trends continue, one out of every four young individuals with experience obesity in there life (Super Size Me, 2004). One of the factors influencing this problem is lack of exercise for our youth. Society has instilled in our youth a lifestyle of video games, T.V., fast food, and lack of exercise. The many youth in America have lost the love for athletics and physical activity.

      Two tenth grade classes were selected for my experiment. These classes were not adjusted in any way, to ensure accurate assessment of the data collected. These two classes were classified as two different groups, a control group and an experimental group. The control group performed presidential physical fitness testing at the start of the quarter and performed all the curriculum activities designed by the instructor to improve their post fitness test scores. The experimental group performed the presidential physical fitness testing at the start of the quarter and did not perform the curriculum activities designed by the instructor to improve their post test scores. The experimental group replaced these activities with various physical education games. At the end of the quarter, the experimental and control group were given a post test of the presidential physical fitness skills performed at the start of the quarter and there scores were evaluated.

While comparing the difference between scores of the control and experimental group, I noticed that the experimental group had very minimal or no improvement in most of the skills tested. The control group showed improvement in all areas tested except the shuttle run. This test was conducted to observer the student's individual improvement throughout the quarter on their personal fitness test. The experiment found that the curriculum used to improve the students physical fitness scores are benefiting the students in six of the seven areas tested

CHAPTER 1

Introduction

<u>Need for the Study</u>

The United States is a country that is second best to none. We strive to have the best cars, homes, businesses, schools, leaders, and environment. The U.S. is truly a beautiful place to live that allows us to make our own choices and live our lives freely. The U.S. gives us an opportunity for great employment and wonderful cities to live in. The U.S. also gives us a large variety of foods created from various cultures. Some of which are very healthy and some of which are very unhealthy.

The opportunity to consume such a large variety of foods, combined with the fast pace U.S. lifestyle, has turned a family dinner into a three, maybe four time a year occurrence. As a result, the youth of America has developed a regular dietary intake of fast foods and T.V. dinners. To make matters worse, fewer of America's youth are active in extracurricular activities and many schools are considerably cutting back on physical education classes. This epidemic is leading a large chunk of America's youth being overweight or obese.

The educational system is putting an emphasis on core courses such a math, science, history, and English, but is forgetting about one of the most beneficial class for young individuals. Physical education offers students the opportunity to burn built up energy, calories, fat, and also is proven to increase brain activity making it easier for them to concentrate in all other classes. It also teaches kids how to make life long healthy choices and prevents them from increased risk of heart disease, cancer, diabetes, stroke, high blood pressure, and obesity.

How does one assess the importance of physical activity? The answer is in fitness testing in physical education. Fitness testing allows the student and the instructor the opportunity to evaluate there fitness at the start of the term, work on skills necessary to improve these scores, and at the end of the term they can retest for improvement. Fitness testing gives the student an opportunity to strive toward reaching goals of bettering their fitness which can be carried with them throughout there lives.

<center>Statement of the Problem</center>

In my physical education classes I perform two series of physical fitness tests. One series of tests is performed at the beginning of a nine-week quarter (pretest) and one is performed at the end of the same quarter (posttest). I have noticed throughout the past year that the improvement levels for the posttest have varied from class to class.

Throughout the quarter, my students perform various push-up, sit-up, pull-up, weight training, and cardiovascular workouts. My goal for this project is to assess the validity of these workouts by comparing a control group with an experimental group.

The control group will perform every push-up, sit-up, pull-up, weight training, and cardiovascular workout that is designed for my physical education curriculum.

My experimental group will only perform the activities designed for each day. My experimental group will not be performing the push-up, sit-up, pull-up, weight training, and cardiovascular workouts that the control group will perform.

At the beginning and end of each quarter, the control group and experimental group will perform the series of physical fitness testing. The results of the tests will be compared to assess the validity of the fitness training in my curriculum.

Purpose of the Study

The purpose of this study is to determine if the curriculum developed to improve student's presidential physical fitness scores is successful. To determine if the curriculum is valid I choose two physical education classes. One class, the control group, will perform all physical activities designed to improve the student's fitness test scores throughout the quarter combined with the daily game play. Another class, the experimental group, will enter the class and immediately begin the game play for each unit.

At the beginning and end of each quarter, the control and experimental group each will perform a series of seven tests (presidential physical fitness test) to asses their fitness level. These tests included the 3-minute run, push-up, pull-up, curl-up, body squat, v-sit, and the shuttle run. Students will recorded this information on a personal fitness sheet and this information will be evaluated. The data collected will inform me if the skills performed throughout the quarter by the control group are benefiting the student's physical fitness test scores.

<u>Statement of the Hypothesis</u>

I believe my research will determine that the physical fitness test preparation activities performed in physical education are contributing to the improvement of my students physical fitness test results.

<u>Definition of Terms</u>

1. Physical Fitness- a level of health in which you have muscular endurance, muscular strength, flexibility, cardiovascular endurance, and a lean body composition.

2. Muscular Strength- the amount of force that your muscles can exert against resistance.

3. Muscular Endurance- the ability to continue using muscular strength.

4. Flexibility- the ability to move the body through a full range of possible motion.

5. Cardiovascular Endurance- the ability to sustain vigorous activity that requires increased oxygen intake for extended periods of time.

6. Body Composition- the percentage of fat tissue and lean tissue in your body.

<u>Limitations and Delimitations</u>

The following factors may influence the effectiveness of this study:

- Class Size
- Age of the student
- School District rules/policies
- Quality of facilities used

Chapter II
Literature Review

The term physical education means *instruction in the development and care of the body ranging from simple callisthenic exercises to a course of study providing training in hygiene, gymnastics, and the performance and management of athletic games* (Merriam-Webster Online Dictionary, 2005). I believe that individuals tend to overlook the true definition of physical education. A physical educator must teach students the proper way to improve and care for their body. Also they must teach students activities they can perform throughout their life to maintain life-long fitness and enjoyment.

Fitness testing is the key to improving life-long fitness for physical education students. It allows kids to set goals to improve their scores and ultimately, improve their health. The presidential fitness test covers all key areas of a child's fitness. Cardiovascular, upper body, lower body, flexibility, and agility skills are tested. By performing these tests at the beginning of the quarter, it allows the student and instructor to analyze what area of fitness they need to improve. Post-testing at the end of the quarter gives the student and instructor an assessment of whether there hard work paid off.

Fitness testing gives students the motivation to work hard and exercise throughout the entire quarter. This is where the life long lesson is learned. After a few weeks of solid training the student begins to feel "in shape," and the suffering and pain of training starts to pay off. Before long, the student has developed a level of fitness that makes them feel good when they perform exercise and bad when they are deprived of it. Similar to caffeine, the student has developed an addiction to exercise. Once this occurs, the

individual starts to reap the benefits of good health. Proper exercise can lead to the following health benefits.

- Moderate daily physical activity can reduce substantially the risk of developing or dying from cardiovascular disease, type 2 diabetes, and certain cancers, such as colon cancer. Daily physical activity helps to lower blood pressure and cholesterol, helps prevent or retard osteoporosis, and helps reduce obesity, symptoms of anxiety and depression, and symptoms of arthritis.

- Physical activity among children and adolescents is important because of the related health benefits (cardio-respiratory function, blood pressure control, weight management, cognitive and emotional benefits).

- Significant health benefits can be obtained by including a moderate amount of physical activity (e.g., 30 minutes of brisk walking or raking leaves, 15 minutes of running, 45 minutes of playing volleyball). Additional health benefits can be gained through greater amounts of physical activity.

(The presidents Council on Physical fitness and Sports, 2005)

In adequate exercise can lead to the following health problems.

- Cardiovascular disease (heart attacks, strokes) is the number one killer of men and women in the United States. Physically inactive people are twice as likely to develop coronary heart disease as regularly active people. The health risk

posed by physical inactivity is almost as high as risk factors such as cigarette

smoking, high blood pressure, and high cholesterol.

- Poor diet and inactivity can lead to overweight/obesity. Persons who are

  overweight or obese are at increased risk for high blood pressure, type 2

  diabetes, coronary heart disease, stroke, gallbladder disease, osteoarthritis,

  sleep apnea, respiratory problems and some types of cancer.

- Poor diet and sedentary lifestyles can lead to type 2 diabetes. In 2003, 17

  million Americans had type 2 diabetes and 16 million more had pre-diabetes.

  Each year, there are 1 million new cases, and 200,000 people die from

  diabetes. The cost to the economy is $132 billion in direct and indirect

  medical costs.

(The presidents Council on Physical fitness and Sports, 2005)

The literature is indisputable, physical activity must continue to be a factor in the

lives of our youth. We must monitor and maintain a proper assessment of these activities

to ensure constant improvement of their individual fitness. Should this take place, we

will decrease the amount of childhood illnesses such as diabetes and increase the

likelihood that our youth will live long healthy lives.

Chapter III

Methods and Procedures

<u>Overview</u>

At the beginning of this study two classes were chosen. One class, the control

group and another, the experimental group. At the beginning of the quarter, both the

control and experimental group perform a series of pretest skills called presidential physical fitness testing. This test includes the three minute run, push-ups, pull-ups, curl-ups (sit-ups), body squats, V-sit, and the shuttle run. After the pretest was administered, students logged their results on a personal fitness sheet. The control group analyzed their scores and performed various push-up, curl-up, pull-up, weight training, flexibility, and cardio activities targeted to improve their pretest scores. The control group also performed all the game play activities designed for the physical education curriculum. The experimental group put their pretest in a folder and did not look at them until the end of the quarter. The experimental group did not perform any activities designed to better their pretest scores throughout the quarter. Upon the arrival to class, the experimental group would immediately begin the game play activities designed for the physical education curriculum.

Design

Throughout the quarter, the control group would enter class, perform a cardiovascular workout, upper body workout, abdominal workout, and weight training workout consisting of approximately 40 minutes. These workouts are designed to target movements and skills of the presidential fitness test and better their scores. At the completion of the workout, the control group would then begin the game play activities for the day (volleyball, baseball, football, etc…). The experimental group would enter the class, take attendance, and immediately begin the game play activities (volleyball, baseball, football, etc…) deigned for the day. The experimental group would not perform any exercises targeting the improvement of their presidential physical fitness test scores.

Selection of Students

The study selected tenth grade physical education students. The two classes of physical education students were divided into two groups, a control group and an experimental group. The control group consisted of 31 students, 16 boys and 15 girls. The experimental group consisted of 31 students, 12 boys and 19 girls. Both groups had a balance of students that performed extracurricular activities and ones that did not. Each group consisted of two special needs students experiencing very low motor functioning skills. There was a slight imbalance of girls to boys in the experimental group, but due to the fact that we were experimenting to see if the skills performed in class increased the students personal fitness test scores, I believe this not to be a factor.

Validity and Reliability Measures

In this study, the control group and the experimental group were administered the exact same pretest and posttest, during the exact same days of the quarter. This test included the three minute run, push-ups, pull-ups, curl-ups (sit-ups), body squats, V-sit, and the shuttle run. These tests were administered with the same equipment using the same facilities. The data collected from the control and experimental group for the pre and post testing was compared and analyzed in the same manor. Due to the format of testing and format of evaluation, I believe this data to be completely valid and accurate.

Field Procedure

Selection of two group studies took place, a control group and an experimental group. After selection of the two groups, both were given a pre presidential fitness test. This test targets seven areas of fitness, the three minute run, push-ups, pull-ups, curl-ups (sit-ups), body squats, V-sit, and the shuttle run. Each member of the class recorded the results of the test on a personal fitness sheet. The control group analyzed their data and determined which areas of fitness they need to improve. Everyday throughout the quarter, the control group performed various cardiovascular, upper body, abdominal, and weight training workouts lasting approximately 40 minutes. After these workouts were performed, the control group would perform the daily game play activities designed for the physical education curriculum (volleyball, baseball, football, etc…). Everyday throughout the quarter, the experimental group would perform only the game play activities designed for the physical education curriculum (volleyball, baseball, football, etc…). The experimental group would not perform any activities targeting the betterment of the student's presidential physical fitness test scores. At the completion of the quarter, the control and experimental group were given the same presidential physical fitness test. There scores were compared to examine the validity of the cardiovascular, upper body, abdominal, and weight training workouts in comparison to increasing the students post test scores.

Conclusion

In conclusion, two groups were administered the presidential physical fitness pretest, a control group and an experimental group. Throughout the quarter the control group performed various fitness activities to improve their scores while the experimental

group performed only game play. At the end of the quarter (9 weeks), the presidential physical fitness posttest was administered. Results of this test were compared to results of the pretest. The information showed the effectiveness of the fitness activities and the study, and I am confident that it will prove that continued practice of physical fitness activities will result in increase performance of the skills tested.

WILL TEACHING 8th GRADE READING THROUGH FICTION OR

NONFICTION PRODUCE GREATER ACHIEVEMENT ON

DIAGNOSTIC TESTING?

by

BENJAMIN L. VOLKER

B.A., South Dakota State University, 1996

A capstone submitted to the

Faculty of the Graduate School of Winona State University

in partial fulfillment of the requirements for the degree of

Master of Science

Department of Education

2006

This action research project entitled:

WILL TEACHING 8th GRADE READING THROUGH FICTION OR

NONFICTION PRODUCE GREATER ACHIEVEMENT ON

DIAGNOSTIC TESTING?

Written by Benjamin L. Volker

Has been approved for the Department of Education by

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Becky Breeser   Craig Erickson

_____   _____
Molly Fernholz   Heather Klees, Facilitator

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Cheryl Moertel, Facilitator   Karl Wilhelm, Outside Consultant

_____   _____
Dr. Thomas Sherman, Graduate Advisor   Date

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.

Volker, Benjamin L. (M.S., Education)

Will Teaching 8th Grade Reading through Fiction or Nonfiction Produce Greater

Achievement on Diagnostic Testing?

Capstone directed by Dr. Thomas Sherman

Abstract

Improving test scores in the area of reading has been a focal point in many

schools in recent times. A myriad of strategies have existed in education to

accomplish this goal. Knowing the effectiveness of different avenues of instruction

seemed a bit ambiguous at best. The focal point of this study was to compare the

effectiveness of teaching reading through fiction-based instruction as opposed to

nonfiction based instruction. All of the students took a diagnostic reading pre-test.

Two sections were a part of the action research process.

One set of students then received instruction that utilized fictional reading

resources. The other set of students concurrently used nonfictional resources for their

curriculum. The project culminated with a post-test to measure student achievement

with reading. Both sections had emphasis placed on vocabulary improvement and

writing in reading journals, as well as comprehension checks in the format of study

guides.

The teacher strove to facilitate the two sections as equitably as possible. Most

all of the instruction was similarly delivered, with the exception of one section

reading fiction and the other reading nonfiction. Instruction included vocabulary and

etymology research in both arenas.

Minnesota Basic Standards practice diagnostic tests were the assessment measure used in this project. A different test was used for the post-test than what was used for the pre-test. Each test question was classified based on the type of knowledge that was being assessed. Some questions were inference based; some were fact based, and so on. Students were able to use the diagnostic results to determine which areas in reading needed to be improved upon.

The results of the study showed that both sections averaged a small amount of regression from the time of the pre-test to the post-test. The students in the group reading fiction had less regression than those reading nonfiction. The results may not have supported the hypothesis that teaching reading through fiction would result in higher reading test scores. However, the data may indicate that comprehensive testing at the end of the school year may garner results to be unreliable due to the amount of student fatigue and lack of effort and clarity.

ACKNOWLEDGMENTS

CONTENTS

CHAPTER I

INTRODUCTION

The importance of reading in all areas of learning has been somewhat of a focal point for researchers and educators in recent years. Reading is a subject that can be taught in a multitude of ways at the secondary level. Finding which teaching methods work best for each individual teacher can be a challenge at times.

Often times teachers teach in a pattern that is similar to the way that they were taught at that particular level. Finding the time to experiment and review the research that has been done on this topic can be a daunting task.

Yet another challenge in this area can be providing students with a rich curriculum in reading that is not merely a "one size fits all" type approach. Many students are at reading levels that may be several grade levels above or below that of their classmates. Developing strategies to engage all of these learners is a challenging, yet worthwhile endeavor.

Proficiency in reading is of interest not only to those that teach students. State leaders and even national leaders have established agendas to push high accountability in areas such as reading. High school students in our state must pass a basic standards test in reading to receive a conventional diploma. The Minnesota Comprehensive Assessment (MCA) has also been used to measure comprehension in the area of reading.

This action research project allowed the researcher to investigate and implement new methods to engage secondary students in effective reading strategies.

Need for the Study

Reading has permeated all segments of secondary classroom instruction. While many different outcomes may be tied to reading, "make no mistake, comprehension is what reading is all about" (Rasinski et al., 2000, p.1). While it has seemed clear that it is important for students to be able to comprehend complex texts in today's world, choosing the most beneficial curriculum for instruction can be a daunting task with today's diverse learners. A trial and error approach to developing an effective reading program may be difficult at best.

There have seemed to be different learning objectives and ideologies that have entered the genre of education only to be replaced a few years later. What has continued to be a catalyst for change in reading instruction has been low standardized test scores.

Examining which teaching methods produce the most success for students on standardized tests has been an on-going question for educators. All too often the demands imposed educators make research and experimentation in this area too cumbersome.

Solely teaching to the competencies assessed on the standardized tests could yield negative repercussions not only in student enjoyment, but also in cognitive dissonance and apathy that may develop due to disinterest in a highly rigorous, yet bland curriculum.

Statement of the Problem

Reading at the primary grades has long been centered on the use of fiction for developing rich units to guide improvement in this skill. "To read well we have to see clearly what is being read" (McGann, 2000, p. 145).

Struggling readers may not be able to visualize or conceptualize some types of reading materials. At the secondary level the rigor of academia increases markedly. Some students have discovered at the onset of the secondary stage that they have a great deal of confusion and frustration comprehending complex scientific, mathematical, and scientific information.

If teachers merely continue to teach the way that they were taught and ignore some of the challenges that arise early on at the secondary level, many students may become disenchanted with the learning process. Perhaps this sheds light on why so many 13-17 year olds seem to read very little, when several years earlier reading was enjoyable and fruitful.

Purpose of the Study

The purpose of this research has been to better understand whether teaching reading with fiction or nonfiction is more beneficial to readers when assessment is given in diagnostic standardized tests.

Statement of the Hypothesis

Initially it seemed that the difference in success between fiction and nonfiction based instruction would be negligible. Upon further reflection it seemed that much of the researcher's expertise and focus has been in works of fiction,

specifically the classics. Therefore the hypothesis was determined that teaching

reading using fiction would produce better scores on diagnostic testing.

<div align="center">Definition of Terms</div>

Assessment: Methods used to determine the amount of understanding and

> achievement that has taken place.

Comprehension: The act of coming to an understanding of some area of study.

Curriculum: The type of study provided for in a certain area.

Diagnostic Test: Testing that reveals areas in which the learner may need

> improvement.

Genre: A type or a class, such as in literature or art.

Inference: The ability to use information to make predictions, judgments, and

> conclusions.

Regression: The phenomenon of having one lose competency levels that were once

> achieved.

Rigor: The intensity and level of a given activity.

Standardized Test: Testing that measures whether a given level of achievement has

> been attained.

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

Independent Variables

The antecedent to what was measured in this project was dealing with two

different 8th grade reading class sections in two different ways. One section dealt

with a curriculum centered on nonfiction. The other group worked on reading using

texts from the genre of fiction.

Dependent Variables

Dependent variables were things such as quiz scores, unit test scores, and results from the sample diagnostic tests.

Control Variables

Many concepts were adhered to in order to provide for the control variables for the study. The curriculum was taught in the same format, using the same types of assessments. The students were motivated in the same manner. The same types of quizzes and tests were used. Both sections took the same versions of the diagnostic testing—the practice Minnesota Basic Standards Test (BST) for reading. Assignments and expectations were the same for both sections. The instructor was the same for both sections. The same classroom was used for both sections. Both sections were made up of 8th grade students.

Moderator Variables

There were factors that may have affected the conditions of the study. The researcher often senses the ability to have the highest concentration level and amount of enthusiasm in the first half of the day.

Another factor here may be the gender of the instructor. The researcher in this study was male. Many students have preferences for male of female instructors for a given discipline. This may reflect family dysfunctions, maturity, or a variety of different causes.

The teacher tends to teach the material in a concrete sequential format a great deal of the time. For an abstract random type learner, this may not be conducive to the most amount of effective learning possible.

<div align="center">Limitations and Delimitations of the Study</div>

Many factors may have limited the study in various ways. The time of day that the class is offered is a limitation of the study. Some students may get drowsy after lunchtime. These students may not perform as well as students that have the class earlier in the day.

Band and choir classes are held during the first two periods of the school day. Since the size of the high school researched is relatively small, the students may be pseudo-tracked by band and choir only being offered in the first 90 minutes of the school day.

Students also have widely varied backgrounds and experiences when it comes to reading. These outside forces may present situations that are not within the control of the researcher.

The location of the school in focus may be considered a delimitation of the study. The socio-economic background of the community affects the amount, type, and frequency of the reading that takes place in this milieu.

CHAPTER II

REVIEW OF LITERATURE

Understanding some of the outcomes that have been valued and sought after in reading achievement can be fairly distinct and logical. Finding the teaching methods and resources to get to that desired level might be a bit more ambiguous. "Devising a successful reading instruction program can be difficult for even the most experienced teachers" (Youth Matters Here [YMH], 2006, p. 1). Evaluating the past has shown us that some reading methods are more effective than others. Reading instruction that is effective has been a goal for many instructors.

An understanding of where we currently are as a culture has emphasized that some of our current difficulties do not lie in just the fact that people cannot read. "Research on reading and literacy is converging on the conclusion that the 'literacy crisis' is not that people can't read—in westernized societies, a higher percentage of people *can* read than ever before. The problem is that too small a proportion of readers read well enough to cope with the complex literacy demands of modern society" (Ross, 2002, p.4). Teaching reading in an age where complex texts abound in our society has meant that the educator must strive to use teaching resources that effectively meet these needs.

Early reading instruction has often been structured so that visual information is the focal point in the literature. The information in the text is important to comprehension, but visual cues are often stressed with more emphasis. At the start of the secondary level, the focus has shifted to much more rigor and investigation of literature related to textual information. *Transitional texts* have been utilized at this

stage to forward students' progress toward higher-order thinking skills. *Transitional*

texts include:

- Longer text segments
- Story lines that sustain interest and meaning over a few hours or a few days
- Increasingly challenging words and concepts
- Literary language
- Character development that demonstrates distinct, recognizable personalities (Pearson Learning, 1996, p.1)

Some perspectives have stressed an instructional approach in reading that has

addressed both cognitive and affective domains. Thomas F. Mandeville utilized an

approach called "KWLA." This strategy implemented a new approach to the

traditional "KWL" reading lesson format. "KWL" used a three-column chart to

synthesize reading comprehension. In the first column the "K" stood for things the

reader already knew. The "W" column included things the reader wondered about

while reading. And the "L" column was used to provide an outlet for students to list

the things that they had learned from that reading. Mandeville provided for the

addition of an affective part to this strategy. He listed a "W" column, which was an

outlet for questioning *what* the reader found interesting. This proved to be a highly

effective hybrid to the traditional reading strategy (cited in Rasinski et al., 2000, pp.

20-21).

Engagement in reading has been shown to be a crucial factor when

synthesizing which teaching methods are most effective in reading. "There is

increasing evidence that the way ideas are presented in texts affects the quality and

quantity of the information students gain from reading. Hence the quality of texts

affect the quality of a reader's engagement" (Guthrie and Alvermann, 1999, p. 88).

Becoming cognizant of what is going on in the mind of the learner is a key element that has become critical for reading educators. Teaching in a rote fashion with little attention paid to feedback from students could be quite ineffective. "Teachers who listen to their student's understanding are more capable of picking effective texts for classroom use" (Guthrie and Alvermann, 1999, pp. 88-89).

In the book *Read It Aloud!* (Richardson, 2000), Judy Richardson discusses how middle and high school teachers have helped students benefit from reading aloud. Richardson stated that this might be done with a variety of texts across all disciplines in education. "Vary the types of material you read. I used to read only prose and skim the newspaper. Over time, I discovered that journalistic writing can be fascinating. Chatwin's (1987) *The Songlines*, about Australian Aboriginals, and *Pilgrim at Tinker Creek*, about the author's observations of nature, have entertained while teaching me" (2000, p.5).

While educating and entertaining may be desirable, it may also be advantageous to transfer success in a specific reading class to an entire school system. Success in Linda L. Caruso's classroom in Cape Coral, Florida led to a school wide goal of reading improvement. As a result, the school as a whole read over 12,000 books with an average of 85% accuracy on comprehension checks (Caruso, as cited in National Association of Elementary School Principals [NAESP], 1998). These figures may simplify the situation to some degree. Implementation of a reading program district-wide could be an enormous undertaking. Nonetheless, the researcher's findings support that such an endeavor may be quite fruitful.

Research can vary widely when it comes to looking at comparing reading achievement using fiction as opposed to nonfiction. Often times the standardized assessments may rely solely on one genre of literature to determine competencies. ". . . experience with only a particular type of text can create the expectation that all texts are structurally the same and that one way of reading works for all texts. This expectation can increase children's fluency with controlled texts, but it produces errors and frustration when they encounter different and more complex material" (Pearson Learning, 1996, p. 2). It seems that a wide variety of literature may be more effective than traditional basic texts.

Taking into account the many different intricacies involved in reading instruction may be a convoluted task. While the challenge may present its difficulties, the goal has seemed to be a crucial one in education. Current research has seemed to say that our society may have attained a great deal of competency in reading basic types of literature. While this accomplishment is more than what has been attained in previous generations, it has not seemed to be enough to be effective for understanding today's complex forms of rhetoric. The utilization of reading strategies has seemed to be of great importance to this evolution. And learning to utilize instructional methods that are engaging to the reader is crucial here. It seems that there are a multitude of different aspects to this area of learning. The research seems to conclude that a wide variety of literature must be read and facilitated in order to prepare students to succeed in reading. If a system of academia is implemented that solely stresses fiction or nonfiction, this will limit students in what they are able to do. Flexible reading strategies that use fiction and nonfiction will

provide a good foundation for reading education. If students are properly exposed to

fiction and nonfiction, a well-balanced assessment should accurately reflect quality

reading proficiency.

CHAPTER III

METHODS AND PROCEDURES

Overview

The research took place in two 8th grade reading classes. Both sections were given a pre-test at the start of the quarter to determine achievement on a sample diagnostic reading test for the Minnesota Basic Standards Test (BST) for reading. One section was taught with solely reading nonfiction; the other section was taught exclusively with reading materials that were fiction. At the conclusion of the quarter, the students were given a new BST diagnostic post-test to measure achievement in reading. Samples of the types of questions that were given are given in Appendix A. A t-test was then performed to check for statistical significance. The objective was to determine whether students made more reading gains through instruction using fiction or nonfiction.

Research Design

All students took a 40 question diagnostic test that measured their reading ability through the use of newspaper articles originating from the Minneapolis *Star-Tribune*. Each test consisted of four several page news stories followed by ten comprehension questions over what had been read. Students were informed that the tests would count for a grade, however not for the full value of the test.

After students finished the diagnostic test, the tests were graded and questions were grouped into which reading comprehension element each question dealt with. The questions were categorized into the following diagnostic areas: main ideas, details, inferences, facts or opinions, and author's opinion.

The goal of these assessments was to chart each student's growth in reading ability. The diagnostic element of the testing was beneficial in honing in on which elements of reading comprehension were areas in which students had success or needed improvement.

Selection of Test Subjects

The research took place with two sections of 8th grade reading in the spring of 2005. The courses were taught concurrently. The nonfiction group was comprised of 24 students. The fiction group included 33 students. The students were chosen randomly and were of a mix of cognitive levels including both genders.

Instruments / Measuring Devices

The measuring devices were sample BST reading tests that were developed to prepare students for the actual BST in reading that was given at the end of the 8th grade school year. The diagnostic tests were developed by the American Book Company (American Book Company [ABC], 1999).

Validity Measures

The same practice reading pre-test was given to both sections in the research project. The same post-test, which was different from the pre-test, was given to both sections. Both tests were made by the American Book Company and were of a comparable level. Comparing the results from the pre-test to the post-test would allow the researcher to be able to evaluate whether students were making more gains from fiction-centered instruction or nonfiction-centered instruction. The same instructor administered all of the diagnostic tests to insure validity.

Reliability Measures

Using the same pre-test for each section helped to ensure that the results of the pre-test would be uniform. Likewise, use of the same post-test would measure students from the two sections at the conclusion of the research on the same playing field. This particular class of 8th graders was comprised of three different sections. However, the researcher did not have all three sections in reading class at the same time. Therefore conducting the action research with just the two reading sections that took the class at the same time was more practical.

Field Procedures

The procedures utilized in the research project included the independent variable being whether or not students received instruction using reading material that was fiction or nonfiction. The dependent variable in the study was how the students' achievement would be on the post-test at the end of the quarter as compared to their initial achievement on the pre-test at the start of the quarter.

The administration of the test was uniform for both sections. The timing of when the testing took place was also the same during the quarter. Before the testing students were encouraged to be sure to get plenty of sleep before the start of the examinations. Students were also advised that it might be a good idea to be sure to eat breakfast on the days of the testing.

At the start of the diagnostic testing, the instructor read through the instructions to the test orally. A sample test question was done together in both sections as a class. The testing took two class periods to complete for both groups.

Conclusion

The aim of this action research project was to come to a better understanding of whether using fiction or nonfiction for reading instruction is more conducive to achievement on BST testing and in reading achievement in general. In this sense the study was effective in providing insights for the researcher.

The dependent variable in the study involved taking a look at the two different sections' performance over time on a practice BST test. The study involved measurements based on whole test scores and the diagnostic piece, which allowed for focus on competencies and challenges for each learner. Areas here were broken into groupings such as achievement with inferences, facts and opinions, and so on.

The research study was an insightful piece of information, but the validity of the results was questionable due to the amount of regression that took place.

CHAPTER IV

RESULTS AND DISCUSSION

The research project allowed for measuring the two group's pre-test achievement on a BST practice reading test and the group's post-test achievement on a BST practice test. The students were tested before the units began to get a baseline of where each individual would be ranked in reading comprehension and fluency. Then, the post-test would examine whether a change had occurred by the end of the unit, taking into consideration that either fiction or nonfiction had been the singular genre of instruction.

The test scores derived at the end of the action research project allowed the researcher to evaluate the effectiveness of different modes of instruction as applied to preparation for BST testing. It should be noted that passing the BST reading test and mathematics test is required before a student is allowed to graduate.

Results

The research project involved two 8th grade reading sections that met for 45 minutes periods every day for two quarters. The study took place over the span of one quarter.

The first test group, the 4th hour section, was comprised of 24 different students. The second group, the 6th hour section, contained 33 students. This was undoubtedly a very large section.

There were 40 questions on the four-part BST practice test. The 4th hour section had a mean score of 29.6 on the pre-test at the start of the unit. At the culmination of the unit, the 4th hour groups scored 26.2 as a mean on the post-test that was given. See Figure 4.1.

Figure 4.1
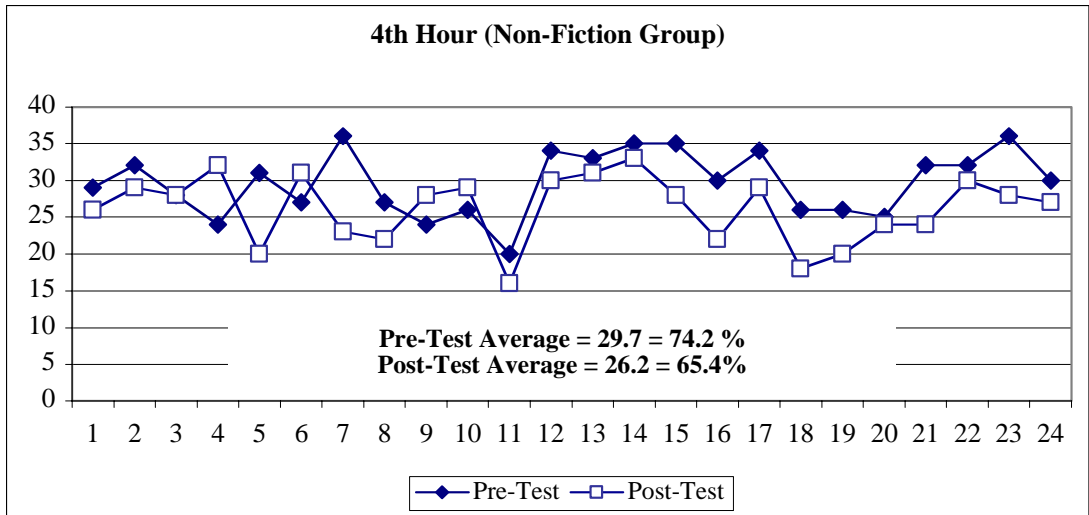
In comparison, the 6th hour group had a mean score of 31.3 on the pre-test. The 6th hour group had a mean score of 30.2 on the post-test after the unit was completed. Statistically the data collected from this group ended up showing a significant difference as proven by the t-test. See Figure 4.2.

Figure 4.2

6th Hour (Fiction Group)

Pre-Test Average = 31.3 = 78.3 %
Post-Test Average = 30.2 = 75.6%

◆ Pre-Test ☐ Post-Test
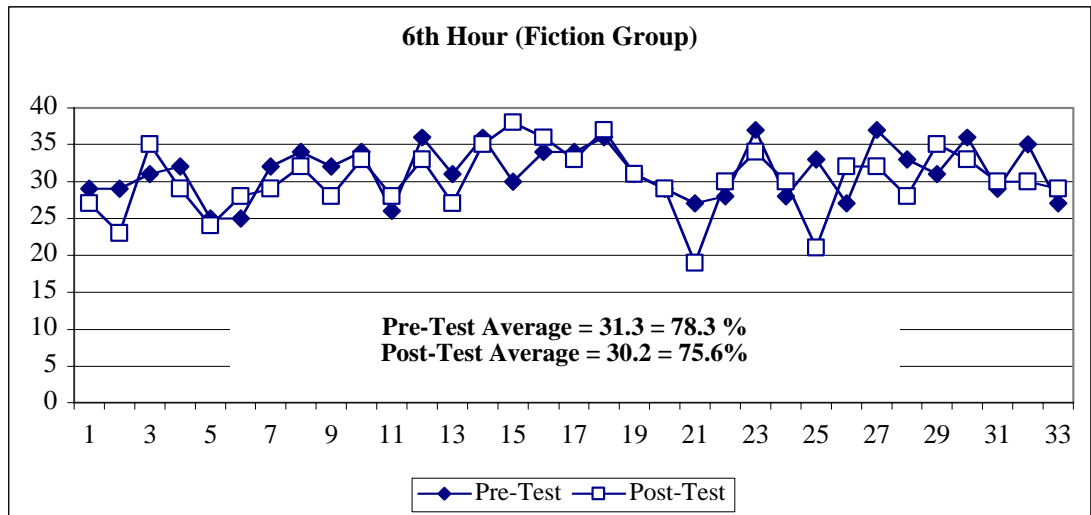
The amount of regression with the 6th hour fiction group could easily be evaluated as having been less than the regression from 4th hour's nonfiction group.

A t-test applied to just the pre-tests from both the 4th hour and 6th hour class revealed that these group's were not statistically significantly different. Calculating a t-test comparing the 6th hour fiction group to itself indicated that the t-value was 1.12, which shows no significant difference. However, running a t-test comparing 4th hour's nonfiction group to itself indicated that the t-value was 2.69, therefore showing a definite significant difference—almost with alpha level of .01, but not quite.

Comparing the pre-test scores may also show some significant dynamics of the groupings in the study. See Figure 4.3.

Figure 4.3
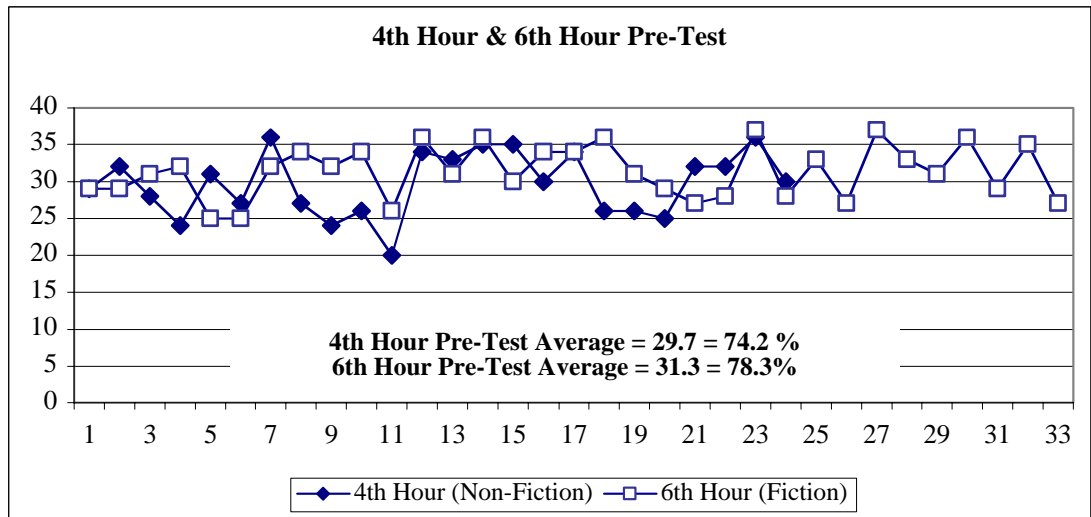
The data comparing the pre-test standardized test scores of the two groups

seemed to indicate that both groupings were of comparable cognitive levels. The data

retrieved from comparing the two class's post-tests was surprising, however. See

Figure 4.4.

Figure 4.4
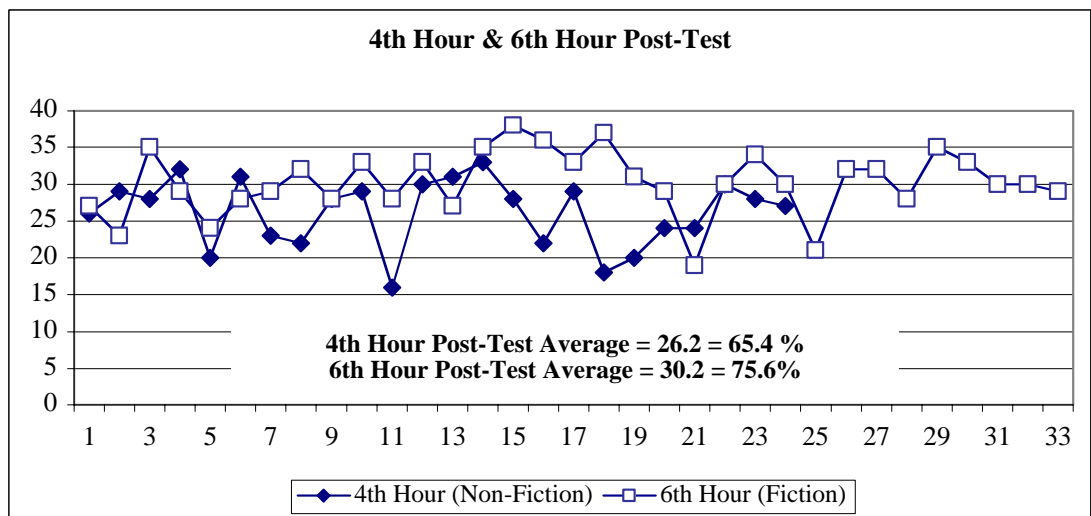
Figure 4.4 seemed to indicate that the non-fiction group regressed at a rate

far more significant as compared to the group reading fiction.

Another format of analysis is provided to show the implications that were determined in the study. See Figure 4.5.

Figure 4.5

Mean Scores Pre-Test & Post-Test
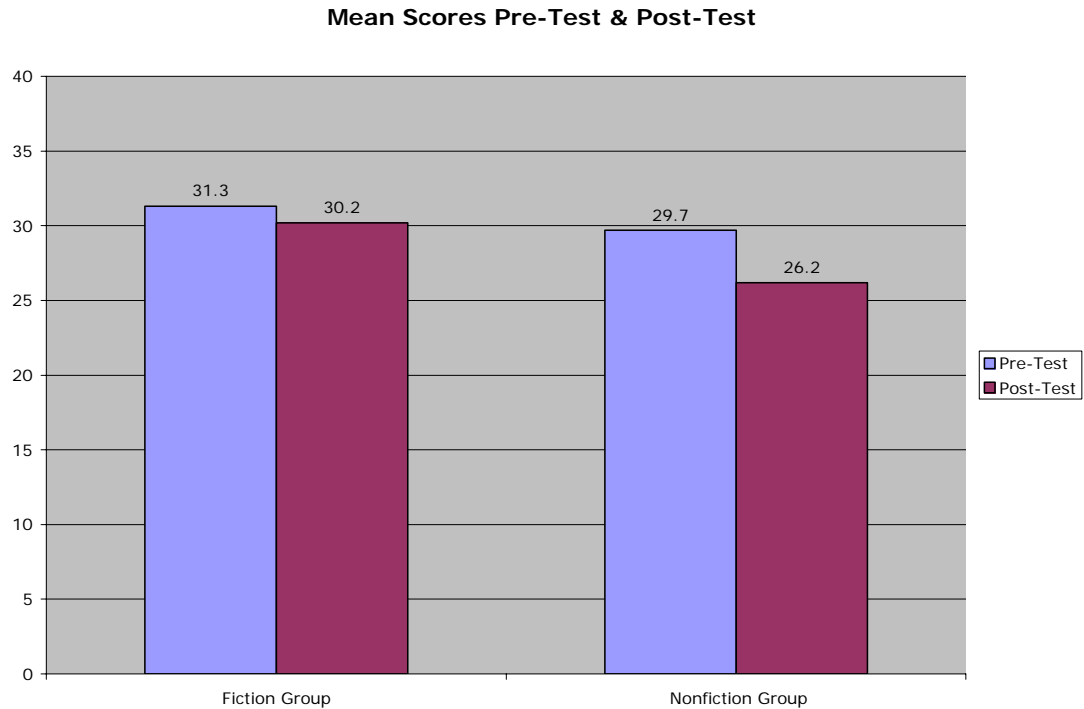
Discussion

The results indicated in Figure 4.5 have indicated that the discrepancy between the regression that occurred between the pre-test and post-test is significantly higher for the group that had read nonfiction.

To be sure that an accurate comparison had been made, it might be important to maintain a study group population that was as equitable as possible. Having had so many more students in the fiction group could have distorted the findings, though the cause of this may seem ambiguous.

CHAPTER V

SUMMARY AND CONCLUSIONS

Summary

Understanding the importance of success in reading is easy to see in today's complicated world with complex modes of discourse. People in education have felt pressure for some time now to help students perform at exemplary levels in this arena. While merely focusing on teaching-to-the-test may be shortsighted and ignorant, one cannot underestimate some of the knowledge that is gained from diagnostic assessments that show a road map of students' skills in regards to reading.

The study provided concrete results that indicated that significant testing at the end of the school year might reveal results that may not truly measure students' ability levels in reading.

An overwhelming majority of the students concluded the research study with a significant amount of regression. This was not an isolated event by any means. The obvious difference in the amount of regression is something that is quite interesting, yet questionable.

Conclusions

In theory it could be concluded that since the fiction group had a significantly less amount of regression that this may indicate that fiction is the most advisable genre with which to provide reading instruction. This would probably be shortsighted, however. The fact that both sections regressed during the study should not be ignored. This fact, taking into account all of the instruction that had taken

place during the unit, may disqualify and skew many of the conclusions that one could try to make at the end of this study.

Many variables seemed to have a great amount of effect on this piece of research. The springtime is often one of the busiest times of the school year. This, combined with fatigue from nine long months at school, may make the final assessment that was taken invalid.

The study did not take into account the proportions of gender that were involved in the study. This area would be very interesting as it relates to the achievement that these students were able to have on the standardized testing.

Another item that probably should have light shed on it is the fact that the Minnesota BST has utilized non-fictional articles taken from the Minneapolis *Star Tribune*. This brings into question the matter of comparing apples to oranges. One might conclude that students would obviously do better on a test made using nonfiction by preparing for the assessment in a class that uses fiction as the main area of discourse for the course's curriculum. The fact that the fiction group had far less regression on a diagnostic test that was made up of nonfiction newspaper articles makes the matter a bit more puzzling.

So many factors and variables play into a study like this that the findings, while informative and stimulating, might be a bit difficult to comprehend and pinpoint.

Recommendations

To provide a definitive answer to the question posed in this research would require a great deal more investigation and analysis to take place. While this study has been quite insightful to the researcher, the findings may not be as didactic to an educator reviewing this data from a different setting.

Ensuring that the study is done in a manner that is equal must be at the forefront of the objective for a study such as this. Comparing "apples to apples" would help to increase the validity of the data that is derived at the end of the study.

Perhaps the amount of standardized testing that takes place in schools today is too large. Students often times do not enjoy or become engaged in certain types of standardized testing. Another question that hints toward has to do with the relevance of the standardized testing. Could more be gained by providing instructional time instead of spending so much time taking tests to measure what has been learned?

If one fourth of students' time in school is spent taking standardized tests it seems that over-testing our students may lose valuable time. It seems that it would be desirable if the testing could be lessened and applied or utilized by the same entities more so. For example, perhaps the BST tests could be accomplished through the use of the same test as the ACT. Surely the test makers must have the ability to create a test that would meet the objectives of both assessments.

After conducting the research it seems that the researcher has learned that it can be a useful thing to be open to change in education. Through all of the research and review of literature the research became quite well-informed of current trends and teaching practices in regards to reading instruction. The researcher's 7th and 8th grade

courses were quite traditional at the start of the study. The instructor led the reading

through a lecture-centered type of traditional instruction. Now, after considerable

reflection and analysis, the researcher has transformed the reading sections into

literature circles that are implementing cutting edge theories on how to implement

reading so that students will become life-long readers. This type of instruction

seemed too idealistic and impractical at the start of the study. Now, however, the

researcher has seemed to have made many gains in teaching methods in the reading

classroom.

CHAPTER VI

REFERENCES

Guthrie, J. T., & Alvermann, D. E. (Eds.). (1999). *Engaged Reading: Processes, Practices, and Policy Implications*. New York and London: Teachers College Press.

McGann, J., (2000). *Reading Fiction / Teaching Fiction: A Pedagogical Experiment.* Durham: Duke University Press.

National Association of Elementary School Principals. (1998). *Best Ideas for Reading from America's Blue Ribbon Schools: What Award-Winning Elementary and Middle School Principals Do.* Thousand Oaks: Corwin Press, Inc.

Pearson Learning. (1996). *Destination Literacy: How Reading Transitional Chapter Books Helps Children Develop Higher-Order Thinking Skills.* Retreived February 5, 2006, from http://www.pearsonlearning.com.

Pintozzi, F., & Pintozzi, D. (Eds.). (1999). *Passing the Minnesota Basic Standards Test in Reading*. Woodstock: American Book Company.

Rasinski, et al. (2000). *Teaching Comprehension and Exploring Multiple Literacies: Strategies from the Reading Teacher.* Newark: International Reading Association.

Richardson, J. S., (2000). *Read It Aloud! Using Literature in the Secondary Content Classroom.* Newark: International Reading Association.

Ross, C. S., (2002). *Reading in a Digital Age.* London: The University of Western Ontario.

Youth Matters Here. (2006). *Best Practices Research Project: Reading by Third Grade.* Retrieved February 5, 2006, from http://scholar.google.com.

DOES STUDENT ACADEMIC ACHIEVEMENT INCREASE WHEN PARENTS

HAVE ONLINE ACCESS TO GRADES?

By

ANDREW WIEME

B.S. Moorhead State University 1999

A capstone submitted to the faculty of the Graduate School of Winona State University

in partial fulfillment for the degree of

Master of Science

Department of Education

April 2006

This capstone entitled:

Does student academic achievement increase when parents have online access to

grades?

Written by Andrew Wieme

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The final copy of the capstone 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

Wieme, Andrew (M.S., Education)

Does student academic achievement increase when parents have online access to

grades?

Capstone directed by Dr. Thomas Sherman

Abstract

   Communication between parents and the school has been a problem

throughout education. Through technology in the past decade, computers and

electronic mail has helped bridge the gap between parents and teachers. In

today's age, parents are more aware of the school's events either through teacher

webpages or e-mails. Technology has increased parent's awareness of the

happenings at school, furthermore, allowing parents to be more involved in their

child's education.

        This study looks at an online grade program that allows parents to access

their child's grades online at anytime. With a login name and password, parents

have the ability to see their child's progress, daily assignment scores, test scores

and any assignments the child might be missing.

        This study compares 75 fifth grade students of Byron Middle School

during the 2003 – 2004 school year to 75 fifth grade students during the 2004 –

2005 school year. Through out the 2003 – 2004 school year online grade

accessibility was not available to parents; however during the fall of 2004, online

grades became available. The same curriculum, teaching strategies and styles were used during the two years this study was implemented.

Upon completion of the study, no growth was found in student academic achievement. Although the availability of online grades did not impact student achievement, the JMC online program was still found to be beneficial to the students, parents, and teachers.

The means of the classes taught during the 2004 – 2005 school year were found to be lower than those during the 2003 – 2004 school year. Even though there was a decrease in academic achievement, it was not significant. Albeit of the decreasing achievement, an increase in parent involvement and student's initiative to check their own grades online was observed.   Emails were frequently sent by parents inquiring on ways to improve their child's grades as well as increased awareness and interests in upcoming tests. This increased progress, awareness and involvement highlights JMC's online program benefits for the students, parents, and teachers.

TABLE OF CONTENTS

INTRODUCTION

With computers being more affordable and practical, having a home computer is common. Students and parents are becoming more comfortable with computer technology and have the opportunity to communicate electronically with their school and teachers from home and the workplace. Web-based computer technology is proving to be a useful tool to promote communication between home and school, encouraging active collaboration among teachers, parents, and students in order to build greater achievement in school (Patrikakou, Weissberg, & Rubentstein, 1998). The school district felt having grades available online to parents will not only increase parent involvement, but will also increase parent awareness in their child's education, thus making the students and parents more accountable for their learning. This will then increase achievement and grades; a win-win situation for the school, parents, and students.

Need for the study

The 2004 – 2005 school year was the first year online grades were accessible to parents. Teachers were hesitant about the grades being available online because they felt it took away the freedom and flexibility they had when giving grades. Teachers also felt students who did well in school prior to grades being available online would continue to do well anyway because their parents were already involved and active in their child's learning at home. In addition, some staff members were unsure there would be any improvement in the children's performance whose parents didn't own a computer. After having the

grades available online for one school year, the opportunity to study the data and determine any and all benefits for the school district was present.

Statement of the Problem

Parents want to be more involved and aware of their child's progress and grades. When report cards go home, teachers often get phone calls from parents asking why their child received the grade they did. The parents said, "If I knew my child was failing and missing assignments, I would have made sure homework was getting completed correctly, and tests were getting studied for." Students asked on a weekly basis what their grades were. Having grades available online would eliminate the questions and problems teachers received from parents and students.

Statement of the Hypothesis

The 2004 – 2005 grades will be higher than the previous year's grades because the grades are available online for parent accessibility.

Definition of Terms

Grade Summary- A feature present in the JMC grade book has that shows the class mean, median, maximum and minimum grade in percentage form.

Purpose of the Study

This research is being conducted in order to determine whether the implementation of JMC online in the Byron School District is beneficial to the students' grades and achievements.

Describing the population

The study was conducted in a school district with an enrollment of 1500 students kindergarten through twelfth grade. The majority of the students came from middle to upper class Caucasian families.

Variables

Independent Variable

Grades online being available during the 2004-2005 school year.

Dependant Variable

Changes in the class means are the results being measured in this study.

Control Variable

The study was conducted in the same classroom, the same lessons were taught using the same curriculum and teaching styles during both years.

Moderator Variables

Increased awareness of teaching practices, having one more year of teaching experience, and being part of a learning community are all moderator variables that could affect the outcome of the study.

Limitations of the Study

Comparing two groups of 75 different students, children's ability, attitude, and work-ethic are major factors that are uncontrollable. Some classes contain higher achieving students than others. Parent involvement, socio-economic status, and computer accessibility include other uncontrollable factors. Even though most of the students come from similar backgrounds, there could be economic differences that affect the outcome.

Just because parents have a computer at home or at work and have the ability to check their child's grades does not guarantee the grades are checked. Regardless of student performance in school, some parents still rely on their child to tell them their current grades, not the internet.

Help received at home was a limitation. Most of the students in the classes had some parental support and feedback with their studying. However, some received more support than others. This made it difficult to keep the overall results accurate.

LITERATURE REVIEW

Researchers and educators have long agreed that when parents get involved in education, children try harder and achieve more at school. (Maynard & Howley, 1997). The internet has opened many doors of communication and made parents more aware of school's events either through e-mail or teacher webpages. As times change and technology is implemented into everyday society, schools too should keep up with technology and the way schools communicate with the community and parents. The Byron School District has implemented JMC online and made progress reports available to parents on the internet at anytime. With a username and password, parents have the ability to see their child's grades anywhere the internet is available. This accessibility makes the parents more aware of their child's grades, furthermore making the parent more active in the child's education. By engaging parents in the education process through the power of the internet, the district realizes several benefits in school business administration, from improved communication to increased efficiency. (Beverly 2003).

Beverly stated, "Many parents find it difficult to get time off from work to attend conferences. In addition, parents were concerned conferences provide only a one-shot picture of their child's education." By having the grades available online, the parents have up-to-date report cards at all times. Because there are more two-parent incomes in today's society, parents' have a hard time communicating with the teacher on a regular basis. The website allows the parent to look at the current grade, furthermore allowing the teacher to not spend as

much time reviewing what has happened, but be able to jump into the solution part of the conversation. (Beverly 2004). Parents are obviously using the online tools provided to them by the schools. A middle school teacher stated, "They're definitely in touch with me all the time. They're not waiting until November to express their concerns." JMC online and other web-based tools allow the parents to be proactive instead of reactive. When parents see their child is struggling two – three weeks into the quarter, the parents make the initial contact with the teacher. Before grades were available online, the teacher always had to contact parents. Trejos states, (2000) "Virtual report cards have a lot better chance of making it home than the traditional note out of the book bag does if the student is struggling."

It's been found when parents are involved in the children's education, the schools as well as the students profit. The benefits are increased teacher self-confidence, better teacher ratings by parents, greater family support of the school, and higher student success. (Faucette, 2000). Making schools parent-friendly and inviting to the community is only going to benefit the students. Barricades need to be removed and the doors need to feel as if they are open to the community. "When children are surrounded by adults and communities that value education, they get the message that their education is important. (Riley, 2005). Parent involvement makes a difference in the scholastic progress of children. Culyer (1988) acknowledged three important parental responsibilities: send the children to school to learn, support the school, and compensate the children for academic gains. Research has found, that the main indicator isn't the family's financial

situation or social status, but the degree to which children's families are able to create an environment that supports learning, provides high expectations of their children, and includes active involvement in their children's learning. (Hampton, Anderson, Sigman 2002). Web-based information sites such as JMC Online and PowerSchool are such effective tools that allow that information to be easily available to parents; furthermore, increasing their activity and collaboration with the schools.

Besides parents checking their child's grades on a daily basis, students, as young as ten years old check their grades regularly too. Using the same username and password provided to parents, the children are checking their up-to-date grades. Students want to know how they're doing after a test has been put into the grade book. There have also been incidents when teachers have entered the wrong grade for an assignment or accidentally not put the assignment in the grade book for the student and the student found the error. The student then showed his/her graded paper to the teacher and the inaccuracy was changed in the grade book. Situations like this, make JMC online just that more effective and justifiable for the school district. A 1996 Department of Education study confirmed that technology has a positive influence on students' attitudes, self-confidence and self-sufficiency toward learning. As students learn to use technology to take control of their learning, it is a reasonable leap to use technology to give them easy access to information about their academic performance. (Hampton, et al. 2002).

METHODS AND PROCEDURES

Overview

 This study tested the effects of having student grades available to parents online and compares 75 fifth grade students in Byron Middle School during the 2003 – 2004 school year to 75 fifth grade students during the 2004 – 2005 school year. Prior to the 2004 – 2005 school year, grades were not available online for parents viewing. The purpose was to prove that student achievement does increase now that grades are available online.

Research Design

 This study comprised of 150 fifth graders; 75 students during the 2003 – 2004 school year, and 75 students during the 2004 – 2005 school year. Prior to the 2004 – 2005 school year, grades were not available online to parents. In the fall of 2004, a letter was sent home to all parents notifying them of their username and password.

 The school district's parents are very involved and a majority of them have the resources available to check their child's grades online. A survey was conducted in the fall of 2004 to determine if parents had online access, how often grades were checked, and if checking grades by parents would help student achievement. The results of the survey are seen in figure 1.

Figure 1

Results from parent Survey	Percentages
Percentage of surveys returned (68 out of 75 surveys returned)	91%
Parents had access to the internet on a daily basis. (At home or work).	80%
Parents who feel online grade accessibility will increase student achievement	65%
Parents checked their child's grades at least once a week	56%
Parents who didn't check the grades because of no internet accessibility	16%
Parents who didn't check the grades because they didn't know or forgot about the access	28%

During quarter one, network issues were being solved to get the grades online, so grades did not become available online until the beginning of the second quarter during the 2004-2005 school year. At the end of each quarter during this study, a grade summary was printed off for each of the four classes taught. The grade summary from Quarter two during the 2003 – 2004 school year was compared to Quarter two during the 2004 – 2005 school year. This procedure was then repeated for the following quarters. An overall grade summary was also compared between the two school years.

Subjects

150 fifth graders were used for this study; 75 students during the 2003 – 2004 school year, and 75 students during the 2004 – 2005 school year. All 150 of the students were taught using the same curriculum and teaching style.

Instruments and Measuring Devices

The JMC grade book is a program purchased by the school district that contains many teacher-friendly features. It allows the teacher to see the class mean on any given assignment or test, a specific progress report showing a complete assessment of a particular student's assignment and test scores, a grade summary showing the class mean during the quarter, and a report highlighting missing assignments. Grade summary will be used to determine the performance relationships between the two years.

Validity Measures

Of the two school years compared in this study, the 2003 – 2004 school year grades were not available online. JMC online was implemented into the district during the fall of 2004 and to be used during the remainder of the school year. At the end of each quarter, grade summaries for each class was printed off. Scores from quarter two from the 2003 – 2004 school year was compared to quarter two during the 2004 – 2005 school year. This procedure was repeated for the remaining part of the study.

Reliability Measures

The same curriculum, lessons, and teaching styles were used while this study was conducted. At the end of each quarter, a grade summary was printed to show the class mean during that particular quarter. Corresponding quarters and an overall class mean were compared between the two years to show if student achievement did improve once the grades were available online. With 75 different students being tested in the 2004-2005 school year, a difference in

student ability and work ethic can be seen. Also, online grade availability does

not mean grades will be checked by all parents that have internet accessibility.

Those variables were considered during this study.

Conclusion

This study was designed to determine if having grades online had a

positive effect on student achievement. The survey given to parents and results

from the study helped determine if JMC online is a program that increases student

achievement.

RESULTS AND DISCUSSION

The 2003 – 2004 and 2004 – 2005 class means were analyzed and

compared following the second, third, and fourth quarters. Having grades online

did not increase student achievement (see figure 2). There is not a large

discrepancy between the two years, but the means did not increase from the

2003 – 2004 to the 2004 – 2005 school year.

Figure 2
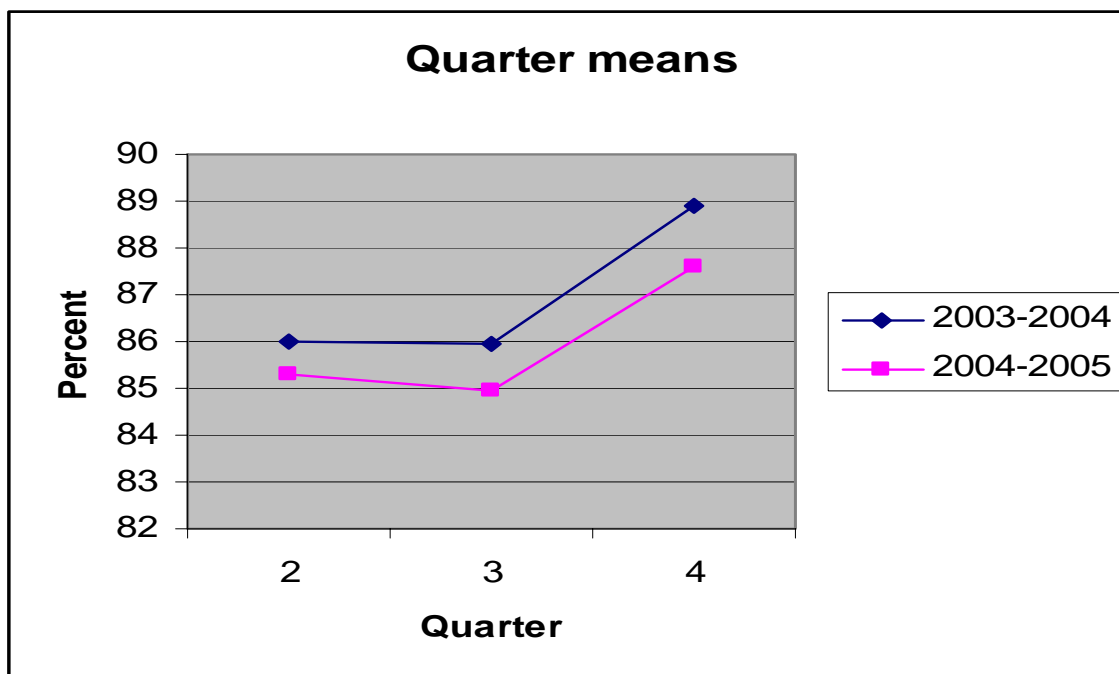
During the 2003 – 2004 school year the class averages during quarter two, three,

and four are as follows: 85.98%, 85.93% and 88.88%. The 2004- 2005 class

averages during those same quarters are: 85.32%, 84.95%, and 87.6%. Overall,

the class mean for the 2003 – 2004 school year was 86.9% and while the 2004 –

2005 school year mean was 85.9% (see figure 3).

Figure 3
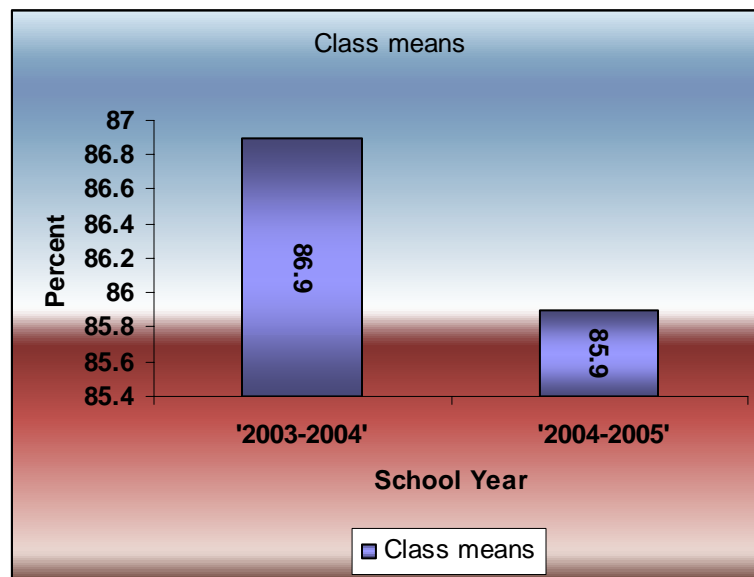
A t-test analysis of the data showed that the t-value was 1.17 with 41 degrees of freedom. A t-value of 1.17 does not show a significant difference. Even though the class mean percentage dropped from the 2003 – 2004 school year to the 2004 –2005 school year an increase was seen in parent questions and concerns about their child's grades during the 2004 – 2005 school year. This verity may identify that JMC online is being used by parents and students and serves as a viable tool.

Students frequently requested time during school to look at their grades online. The students were always eager to see their up-to-date grades in all their classes. There were also incidents when the teacher entered the wrong grade and the student or parent verified with the teacher the correct score on an assignment. Without having JMC online and immediate grade accessibility, this type of clerical error would not have been brought to the teacher, parent, or student's attention.

There were also times when parents called and wanted to discuss their child's grades after seeing a score online. The conversation was seen to be more productive and be more in depth because the parents and teacher both have access to the grades, as opposed to previous years when only teachers had the admittance to grades. The parent can see exactly what particular area their son/daughter is struggling in and what needed to be worked on (tests, daily assignments etc…).

SUMMARY AND CONCLUSION

Communication and getting parents involved in their child's education can be a challenge because of the hectic lifestyle many adults have grown accustomed to. Even though the results of the study did not support the hypothesis, information about parent communication and involvement in the students' learning process was gathered. It provided more in depth look at the resources available and highlighted whether or not parents use the resources that are accessible to them to be more active in their child's education.

CONCLUSION

In the end result parents, students, and teachers seem to have benefited because of JMC's online availability. The class mean of the 2004 – 2005 school year was 1% lower compared to the 2003 – 2004 school year, the study did not support the hypothesis. Without JMC online being available, the discrepancy between the two school years could have been larger.

The students enjoyed looking at their grades and were amazed to see their grades change after one test. Seeing their grades improve motivated the students to keep working hard, study for tests, and make sure their work was done right and handed in a timely manner. Even though the explanation of why the class averages in the 2004 – 2005 school year went down compared to the 2003 – 2004 school year, could not be obtained, benefits were observed. Some parents were not surprised at grades when mid-quarter progress reports went home. Parents were calling, e-mailing, or being proactive in finding out why their child was

struggling in a particular subject. Furthermore, when parents and teachers are working together, the student is the one that benefits the most.

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

If this research project was conducted again, a few changes could be made. The study would need to be of longer duration. One could compare at least three years of online access to three years without. This would provide a larger sample size, thus making the results more dependable.

One should also follow a student's grades individually and compare their achievement when the grades were not available online to when they were available online. This could be compared amongst a group of several students; including those that are high achievers, and those students that struggle in school. By doing this, one could see if those students who do receive low grades without online grade availability, improves once parents have online access. Of great importance, a survey would be sent out to evaluate parent assess to the internet and how often grades are checked. A greater look at the high achieving students would also be done in order to determine if grades increase or stay consistent once they are available online.

The survey provided insight to some students who did very well in school whose parents never checked their grades, however it also showed that the parents of the high achievers requested or demanded their child to bring home all the homework and tests to make sure their child understood the concept.

In conclusion, having grades online is not going to solve all the problems teachers have with parents and their lack of involvement and communicating with

the school. It is felt however that JMC online may be another effective

communication tool and another way of getting parents involved in their child's

education.

REFERENCES

Beverly, D. (2003). Making the connection with parents. *Educational Leadership*, *69*(4), 15-17.

Culyer, R. (1998). Accountability as a Partnership: Professionals, Parents, & Pupils. Clearing House, 6 (8), 365-369.

Faucette, E. (2000). A Recipe for Increasing Achievement! Multimedia Schools, 7 (6), 56-61.

Hampton, L. F.; Anderson, Cathie; Sigman, Donna. (2002). The impact on student achievement using an online process provided to students and parents. *National Educational Computing Conference Proceedings*, , .

Maynard, S., & Howley, A. (1997) Parent and Community Involvement in Rural Schools. (Eric Digest no. EDI-RC-97-3). Charleston, WV: ERIC Clearinghouse on Rural Education and Small School. (ERIC document Reproductive Service No. ED408143).

Patrikakou, E. Weissberg, R., & Rubenstein, M. (1998). Five "P's" to Promote School Family Partnership Efforts. Spotlight on Student Success, 304, 1-5.

Riley, R. (). Back-to-school time is not just for kids anymore. 11. Retrieved March 15, 2005, from http://www.ed.gov/Family/agbts/secsoped.html.

Trejos, N. "Internet Makes Kids Grades an Open Book." The Washington Post. 2000. 15 March 2005 <http://www.ed.gov/Family/agbts/secsoped.html>.

Appendix A

Dear 5th grade parents-

As part of getting my masters degree, I'm doing a study to see if student grades

increase now that parents have access to their child's grades on the internet.

Please answer this quick survey and return it with your son or daughter.

Thank you. Mr. Wieme

_____

1. Since the grades have been available, how many times a week do you check their progress.

2 or more times a week   1 time a week   O times a week

2. Do you feel having access to your son/daughters grades will increase student achievement?

                    Yes   No

3. If you haven't checked your child's grades, what is the reason why?
     No access to internet   forgot about the access

     Not able to access the grades because I forgot   No time

     the username and password

              Other _____

Reminder: To check the grades, go to the Byron School District homepage at

bears.byron.k12.mn.us and click on parent access. If you don't know your username

and password, please call the middle school (775-2189) and we can get

     that information for you.

        Thanks again.

         Mr. Wieme

WILL EARLIER EXPOSURE TO HIGH-FREQUENCY WORDS, COMPARED
TO GRADUAL EXPOSURE, INCREASE STUDENTS' MASTERY OF THESE
WORDS ?

by

KELLY YOLCH

B.S. University of Minnesota, 1997

A capstone submitted to the

Faculty of the Graduate School of Winona State University

in partial fulfillment of the requirements for the degree of

Master of Science

Department of Education

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This capstone entitled:

WILL EARLIER EXPOSURE TO HIGH-FREQUENCY WORDS INCREASE
STUDENTS' MASTERY OF THESE WORDS?

written by Kelly Yolch

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WILL EARLIER EXPOSURE TO HIGH-FREQUENCY WORDS, COMPARED TO GRADUAL EXPOSURE, INCREASE STUDENTS' MASTERY OF THESE WORDS?

Capstone directed by Dr. Thomas Sherman

Abstract

Kindergarten students' mastery of high-frequency words is an essential beginning to their overall academic success. Students often exhibit varying degrees of literary skills at the beginning of the school year. As a teacher, the ultimate objective is for all students to successfully recognize certain high-frequency words by the end of the year, irrespective of their initial capabilities.

In this study, two different kindergarten classrooms were tested on their recognition of the same list of 37 high-frequency words at the end of each academic quarter. The morning class was instructed by the traditional method of only learning two new words from the list of 37 each week. The afternoon class was provided with the entire list of 37 high-frequency words at the beginning of the study to further expose them to these words. The entire list of words was also displayed during the afternoon classroom session and included during word games. The students from both classes were assessed on their recognition of these words through a simple word test each quarter.

Upon reviewing the word recognition scores of both classes each quarter, it is evident that an early introduction to high-frequency words helped those students

recognize these words earlier in the academic year. However, classroom results by the end of the year were not statistically different.

The strategy of introducing the entire list of high-frequency words to be mastered by the students at the end of the academic year yielded several positive results. The student recognition scores at the end of the second and third quarters showed that the study group recognized these words much earlier than the control group, who had not been exposed to all of the words. However, by the end of the study the control group of students achieved the same level of word mastery as the study group.

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CHAPTER I: INTRODUCTION

Need for the Study

Literacy is an essential component to the overall academic success for every student. Recognizing the importance of literacy in all areas of student education, many school districts continually investigate new approaches and tools to improve the linguistic abilities of students who struggle behind their peers. Beginning reading skills are taught as early as kindergarten, with most school districts focusing on letter and phonemic recognition at this early student age to develop a solid foundation for future student reading and writing abilities. Research demonstrates that the mastery of certain high-frequency words is an important component to this foundation (Honig, 1997).

The typical kindergarten classroom exhibits an extremely wide range of student academic capabilities. Professional literature suggests there are many background factors that affect this variance in student abilities including attendance at a preschool, exposure to reading and letter practice at home, involvement of parents, and emotional and social maturity. Although some students might recognize multiple letter sounds, others do not know the letters in their own name. Therefore, a primary objective for the kindergarten teacher is to connect the bridge between the skills of phonemic awareness into beginning literacy for all students in the classroom (NEA.org, 2005).

Locally, the Minnesota Department of Education established the *Minnesota Academic Standards in Language Arts* through the Minnesota Academic Standards Committee in 2003.   The first strand of these standards for kindergarten students is

Reading and Literature with the first sub-strand focusing on word recognition, analysis, and fluency. One of the ten benchmarks for measurement is that students will be able to read and recognize at least 10 high-frequency words (MinnesotaDepartmentofEducation.com, 2005).

<div align="center">Statement of the Problem</div>

Kindergarten is usually a child's first exposure to being taught the mechanics of word recognition and eventually how to read. If a student does not master the majority of the expected high-frequency words by the end of the kindergarten year, chances increase that they will continue to struggle with their high-frequency words in first grade. Consequently, this will affect the child's success at reading fluency and comprehension during their beginning years of elementary education (Honig, 1997).

These literacy skills also impact many other curricular disciplines. For instance, without the mastery of reading grade-level high-frequency words, students will struggle with daily reading and writing assignments that occur in other subjects. Frustration levels will continue to mount for students if they are struggling academically. It is important to help these children succeed early in their academic careers, as this is a crucial time when their feelings of academic self-worth and self-confidence are developing (Strickland, n.d.). Because difficulty with high-frequency words can lead to such an escalating effect in other academic areas, it is the kindergarten teacher's goal to use the best practices available to help their students meet grade-level expectations.

Purpose of the Study

 The purpose of this study was to determine if earlier exposure to high-frequency words will help increase students' overall mastery of these words by the end of the school year, compared to students who are exposed to these same words gradually throughout the school year.

Statement of the Hypothesis

Introducing the entire list of high-frequency words at the beginning of a school year will help students increase the number of words that they recognize by the end of the school year, compared to students who are gradually exposed to these same words. Exposure to all of the high-frequency words to be learned throughout the school year will improve the student's retention and mastery.

Definition of Terms

High-Frequency Words: words that are frequently used in daily reading and writing assignments which need to be visually recognized and understood by the student. Many of these words have different pronunciations than their spellings would indicate, hence the importance of recognizing to improve the fluency of using these words.

Fluency: the ability to read text accurately and quickly and with expression and comprehension

Word Wall: a visual display in the classroom that promotes the list of high-frequency words expected to be mastered by the end of the academic year.

Variables

Independent Variables

There are two separate kindergarten classes in this study. One kindergarten

class (control group) will be exposed to the high-frequency words gradually,

with approximately two new words introduced each week. The second

kindergarten class (study group) will be exposed to all of the high-frequency

words from the beginning of the study.

Dependent Variable

The total number of high-frequency words mastered by the students at end of

4th quarter.

Control Variables

All of the students are kindergarteners of the ages of 5, 6, and 7 years old.

The students will be exposed to the identical 37 words and be taught utilizing

the same teaching methods. The same teacher and classroom will also be

control variables for this study.

Moderator Variables

The classes were taught at different times during the day. One kindergarten

class was held in the morning, and the other was in the afternoon. The

afternoon classroom was also equipped with a word wall to remind the

students of the entire list of high-frequency words.   The student demographic

composition of these classes will be another variable.

Limitations and Delimitations of the Study

The enrollment figures of the classes are different, with the morning class having 16 students and the afternoon class having 20 students. Furthermore, the amount of time that each student spent at home practicing the high-frequency words varies depending on the involvement of parents or guardians. There are also a range of different academic statuses within the classes; with some students having special education needs that affect their learning capabilities.

CHAPTER II: REVIEW OF RELATED LITERATURE

Reading fluency is a skill that all teachers hope their students will successfully achieve. If a student struggles with reading fluency, this will typically lead to multiple obstacles in the student's overall academic career. A student's development for the necessary skills that contribute to reading fluency begin early in the kindergarten classroom, with the teaching of high-frequency words. High-frequency words are defined as those words that occur most often in print. Rather than students having to sound out each individual letter, children will be able to read more fluently if they are able to more easily recognize or "automatize" these words (Feldman, n.d.). High-frequency words may also be referred to as "sight words" or "instant words". This study explores one control factor that may increase the mastery of these important high-frequency words in the kindergarten classroom.

High-frequency Words

There are two high-frequency word lists that are most commonly referred to: the *Fry Instant Word List* and the *Dolch Word List* (Appendices A and B). The first 100 words on these two lists are very similar to each other, and they constitute the most commonly used words in the printed language. Moreover, the English language contains millions of words; however, over 50% of all text is composed with these 100 words (ReadingA-Z.com, n.d.). A further analysis on the importance of certain words in the English language resulted with Robert Hillerich stating that, "…just three words *I, and, the* account for ten percent of all words in printed English…." (Eduplace.com, n.d.)

There are two main reasons why high-frequency words are such an important necessity with building the skill of reading. Foremost, many of these words do not sound like their spellings might suggest, therefore it is difficult for students just beginning to read to sound-out these words. Secondly, an accomplished reader cannot afford the time to dwell on a word, as this counter-affects the speed and fluency integral to decoding the author's message (LiteracyConnections.com, *High Frequency Sight Words*, n.d.).

The author of a LiteracyConnections.com article concludes best by stating, "we enable our students to greatly increase their reading efficiency when we teach them more of the words that they encounter in a quick and automatic manner" (LiteracyConnections.com, n.d.).

Strategies to Teach High-Frequency Words

In order for students to successfully recognize high-frequency words, the words should be used in context and not "drilled" by the instructor. Children respond better to games and activities where they can be involved (Feldman, n.d.). Furthermore, if the students are enjoying a certain educational activity, they will probably feel less likely that they are actually doing school work. Depending on a school district's curriculum and the grade-level taught, some of these strategies may be helpful:

Word of the Day/Week – Introduce one or two words daily or weekly and add it to a displayed list. Have students use the word in sentences, identify it in books and handouts, and point to it in the classroom.

Show Me – Place word cards on the floor. Call out a word and have a child "show me" the word and use it in a sentence.

Screen Saver – Put high-frequency words on your computer screen saver.

Word Hunt / Word Detective – Pass out books, magazines or newspapers. Show the children a word, and ask them to find it in print (may want to highlight it). Students might also look for the words appear within the room.

Line up – Pass out a word to each child. When you call out their word, they may line up or move to another activity.

Games – Use high-frequency words in file folder games and card games such as "Bingo", "Go Fish", and "Concentration".

Memory – Use two sets of word cards and spread out on the floor or table upside-down. Have children take turns, turning over two cards at time (they need to read aloud each word they turn over), and look for two words to match. If they find a match, they get to hang on to the pair.

Sentence Maker – Have students create sentences in a pocket chart using their word cards.

Word Wall – Display a word wall in your room and play the various games and activities (chants, cheers, special pointer sticks) that work with a word wall.

Appropriate Text – Have students listen to and discuss stories that use their high-frequency words. Have the students read their own books (grade-level appropriate) that contain their words. Give students their own copy so they may circle their words and bring the book home to read repeatedly.

Journals – Have students create sentences and stories using their words. (Feldman, n.d., Eduplace.com, n.d., ReadingA-Z.com, n.d.).

It is firmly believed that implementing the above strategies will assist to improve students' retention of high-frequency words. Students learn "…best by active involvement and practice with the task at hand, which allows us to see the word and letter patterns for ourselves" (LiteracyConnections.com, *Working and Playing with Words*, n.d.). Research has shown that "…the brain is a *pattern detector* rather than an *applier of rules* (Cunningham, 2004)" (LiteracyConnections,com, *Working and Playing with Words*, n.d.).

Students Need a Clear Aim

Another factor to consider when teaching high-frequency words is the timing of introduction. Most researchers agree that children should only be taught a few reading words per session, taking into account the grade level and academic readiness of the students. In kindergarten, most reading series teach one to two new words each week. However, the question is raised; do the students know what is expected of them by the end of the year? "The most important aspect of measuring information is clearly articulating to students and their parents the information to be learned by a designated time" (Jenkins, 1997). By giving students a clear aim, they are able to "…put the puzzle together faster when they see where they are going…" (Jenkins, 2005). In reference to high-frequency words, this would imply that the entire list of words that is expected to be mastered by the end of the year should be *introduced* at the beginning of the school year. This does not mean the student should be trying to learn all of these words at once, but simply be exposed to them throughout the year. This would be accomplished through a word wall displaying all of their sight words, as well as making a reference to these words when they are incidentally encountered during the school year, until they are more formally *taught* the words through the curriculum.

Rarely teachers clearly state what information is expected to be known at the end of a course, which unfortunately can confuse students on precisely what they should be learning and practicing (Jenkins, 1997). Once a teacher has clarified their expectations to their students, then these expectations should effectively transfer over to become the students' own goals. When both the educator and their students are

working on the same set of clear expectations, it focuses the students' energy and allows the class to work together as a team to reach these objectives (McClanahan & Wicks, 1993).

Explaining to the students and their parents as to why these expectations exist is the next important step in building literacy skills. Students should realize that by knowing all of these high-frequency words by the end of their kindergarten year will result with them becoming more accomplished readers and better prepare them for the curriculum in first grade. The teacher needs to emphasize the focus will be on just a few words at a time, so that none of the kindergarteners feel overwhelmed. It is a gradual process. Once the children and parents understand why the teacher has these expectations, the teacher's goal has expanded to become the entire classroom's goal. The goal now has value and ownership (McClanahan & Wicks, 1993).

CHAPTER III: METHODS AND PROCEDURES

Overview

This study examined the effects of outlining all of the high-frequency words in the beginning of the year that are expected to be mastered by the end of the kindergarten year. The 37 high-frequency words used in this study are part of the Scott Foresman Reading series, at the grade level of Kindergarten. The words are taught throughout the school year at a gradual pace, with approximately two new words being introduced each week. Research indicates the more often students are exposed to the same high-frequency words, the higher their retention rates are for these words.

Research Design

The students involved in this study were separated into two classes, the morning kindergarten class, consisting of 20 students; and the afternoon kindergarten class, consisting of 16 students. Both classes were taught the same 37 high-frequency words throughout the entire school year, with the emphasis on the same two new words each week. However, the morning class (the control group) was never presented with the entire list of words. This class was informed of their two new words every Friday in a newsletter that also came with their two new word flashcards.

The afternoon class was also informed on Friday in a newsletter what their two new words would be for the upcoming week. However, the afternoon class and their parents were given the entire list of high-frequency words and all of the word flashcards at the beginning of this study. The afternoon class was also exposed to all of the high-frequency words they would be expected to learn on a bulletin board in

the classroom. They were not required to recognize the words at an earlier timeline than the morning class, but they were exposed to all of the words earlier in the school year.

Subjects

The students in this study included 36 students enrolled in kindergarten during the 2004-2005 school year. The student's ages ranged from 5 to 6 years old, with two students turning age 7 during the study period. Of these 36 students, 17 were boys and 19 were girls. Two of the students received special education services for speech, and two other students had previously attended Early Childhood Special Education classes and were held back a year to begin kindergarten. These factors explain the occurrence of two students reaching age 7 while in kindergarten. One student was diagnosed with Attention Deficit Hyperactivity Disorder (ADHD) and was taking medication to help his attentiveness. Ten of the students were enrolled in the Extended Day Kindergarten program; an optional program for kindergartners to attend school the opposite half of the day they are not in their regular kindergarten classroom. The program is limited in size and students may qualify for services if their reading and math assessment scores are low.

The school is located in a small rural community in southeastern Minnesota that is predominantly Caucasian and middle-class. The ethnic composition of the kindergarten classes were also predominantly Caucasian, with two students of African-American heritage and one student of Asian-American heritage. Two of the students lived in single-parent homes, and two other students spent time at both divorced parents' homes.

Instruments

The students' mastery of their high-frequency words were assessed at the end of each quarter during the time when the study occurred, specifically at the end of the 2nd, 3rd, and 4th academic quarters. The data collection tool utilized was a high-frequency word checklist (Appendix C). The assessment measure included only two options of grading; either the child could recall the high-frequency word, which resulted in a checkmark on the list (positive response), or the child could not recall the word, which resulted in no checkmark (negative response).

Validity and Reliability Measures

A study's validity is defined as the degree to which a particular measure reflects the intended measurement. In this study, the use of the same high-frequency word checklist for every student by the same assessor (teacher) at the end of each quarter resulted in the overall validity of this study being positive. The measured data was restricted to only two possible outcomes (positive or negative word recognition), with no interpretation or "second tries". The use of these discrete variables further contributed to study validity. The face-to-face application of these word recognition tests by the teacher to each student further minimized any systematic error in the validity of the outcomes.

Possible threats to external validity were not a factor with this study, as neither selection bias, reactive effects of experimental arrangements or testing/pretest sensitization, nor multiple treatment inference occurred. Internal validity also proved to be strong with only 2 out of 13 possible threats possibly occurring. Threats that had no impact on the study's validity included: loss of subjects, location,

instrumentation, instrument-decay, data collector bias, testing, history, Hawthorne

Effect, John Henry Effect, resentful demoralization of the control group,

implementation, and compensatory equalization of treatment. The first factor that

may have impacted internal validity was subject characteristics, because the teacher

had no way of controlling students' previous knowledge. One group could have

contained students that possessed higher academic knowledge than the other. The

other threat that may have occurred relates to subject maturation. Since the study

occurred over a long period of time, almost an entire school year, some of the results

might be due to the academic maturity of the students, not entirely from the teacher's

teaching strategies. However, both external and internal threats to validity were held

to a minimum, therefore, the conclusion can be made that validity was strong with

this study.

The reliability or degree that the measurement instrument yielded consistent

results throughout repeated applications of this study was also strong. The same

teacher taught in both classrooms and conducted each individual student test on

recognition of high-frequency words which minimized misinterpretation of the results

and strengthened the stability of the measurement tool. Furthermore, the identical test

was used for all student subjects to measure their mastery of the same high-frequency

words. This contributed to the overall internal consistency of the study. The test-

retest reliability measurement was not applicable to this study. Although the students

were tested at multiple times with the same instrument throughout the study, they had

also been taught more high-frequency words by the time each of the four tests were

administered. Results from each subsequent test were expected to improve because more words had been reviewed through classroom instruction.

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

The morning and afternoon kindergarten students were expected to master 37 high-frequency words by the end of the school year, as outlined in the district's selected reading curriculum, Scott Foresman. The high-frequency words were introduced, taught, and focused upon through instruction at an average of two words each week, with an allowance for some weeks off in order to review previously introduced words. Both classes were taught and focused on the same words each week.

Although the same high-frequency words were introduced and taught to both classrooms each week, the afternoon class was informed of the entire list of high-frequency words at the beginning of the study. The high-frequency test was initially administered at the end of the 1st quarter to provide some baseline data. The study actually commenced at the beginning of the 2nd quarter. Additionally, the parents of afternoon students were given a complete list of the high-frequency words expected to be learned throughout the academic year, as well as flashcards to assist with review and learning at home. This enabled the families of the afternoon students to practice additional words not necessarily assigned that week if they chose to, even if those words had not yet been formally taught in the classroom.

The afternoon students also had exposure to the entire list of words in their classroom. In addition to their usual word wall, where the two new words of the week were always introduced, they also had an extra poster board that displayed all of

the words they would be expected to know by the end of the school year. On occasion, the teacher also included some of the untaught high-frequency word flashcards during classroom games and activities that focused on word recognition practice. The afternoon class had exposure and knowledge of the complete high-frequency word list through experiences at school, and possibly at home, depending on the parents chosen level of involvement. Although these words were never formally *taught* at any time earlier than the morning class, the afternoon class did have introduction and exposure to these words before the morning class even knew what they were.

The morning class (control group) was introduced to the high-frequency words pursuant to the same process utilized by the school district in prior academic years since the current reading series curriculum was selected. This was the practice implemented by all of the kindergarten teachers of the remaining four classes. This process included teaching and focusing on two new words a week, with the expectation that all 37 words would be known by the end of the year. Neither the parents nor the students knew what words would be introduced the following week, therefore, at no point was the entire list of 37 high-frequency words revealed to the control group until the end of the 4th quarter. The morning class learned of the two new words each Friday, via a newsletter, along with the two word flashcards attached. The extra poster board that displayed all 37 high-frequency words to the afternoon class was removed from the classroom during the morning class instruction.

The 37 high-frequency words were then assessed in the morning and afternoon classes at the end of 2nd, 3rd, and 4th quarters. Each consecutive quarter meant that an increased number of words had been formally taught in the classroom.

Conclusion

This research project was designed to determine if an early introduction of a complete high-frequency word list would help students to increase their mastery levels of these words by the end of the academic year. The students in the study group were exposed to all words in the classroom using indirect teaching methods; the students also had the opportunity to practice the words at home if the parents chose to work with their child. The control group was not exposed to the entire word list at any point in the study, with the words being introduced at the usual pace that they were outlined in the curriculum. The researcher believed this study would demonstrate an increase in the total number of high-frequency words mastered by the end of the academic year by the students who had more exposure to these words at school and possibly at home.

CHAPTER IV: RESULTS AND DISCUSSION

The purpose of this study was to determine if earlier exposure to high-frequency words would help to increase the number of high-frequency words mastered by the students at the end of the school year. The morning kindergarten class was exposed to an average of two new words a week, as informed through a weekly newsletter (which also had the two word flashcards attached to it), and the teacher's instructional methods in the classroom. The afternoon kindergarten class was exposed to all 37 high-frequency words at the beginning of the 2nd quarter of school. They were formally taught the same words as the morning class at the same instructional pace, but had exposure to the entire list of high-frequency words. This exposure included a word list and word flashcards sent home, a poster board containing these words displayed during their class, and occasional interjection of these words during the regular teaching methods.   Mastery of the high-frequency words was measured by using a word checklist. The student received credit if they were able to recall a word correctly.

Words Recognized Correctly

Four high-frequency word checklists were administered during the school year, each at the end of the academic quarter. The 1st quarter's word checklist only tested the students on nine words versus all 37 words. This was because the study had not begun yet and that was the practice used in the past, to test only the words that had been formally taught up until that point. The study was in place at the end of 2nd, 3rd, and 4th quarter, therefore those three word checklists contained all 37 words. Individual student results may be further examined (Appendix D).

Both classes demonstrated growth each quarter in the number of words recognized correctly. The morning class (control group) average increased from 20.0 words at the end of 2nd quarter, to 28.1 at the end of 3rd quarter, and to 35.5 at the end of 4th quarter.
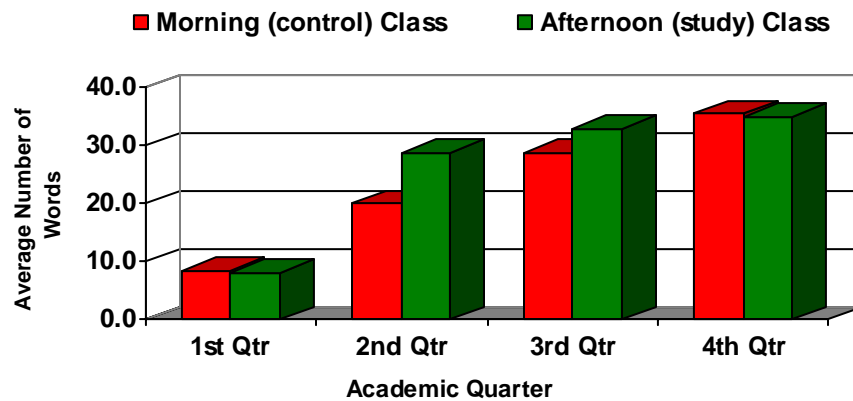
Figure 4.1 Class Comparison of Average Number of High-Frequency Words by Quarter

The afternoon class (study group) average of high-frequency words mastered increased from 28.8 at the end of 2nd quarter, to 33.0 at the end of 3rd quarter, and to 34.9 at the end of 4th quarter. (Figure 4.1) The percentage of high-frequency words recognized by each class at the end of each quarter is illustrated in Figure 4.2.
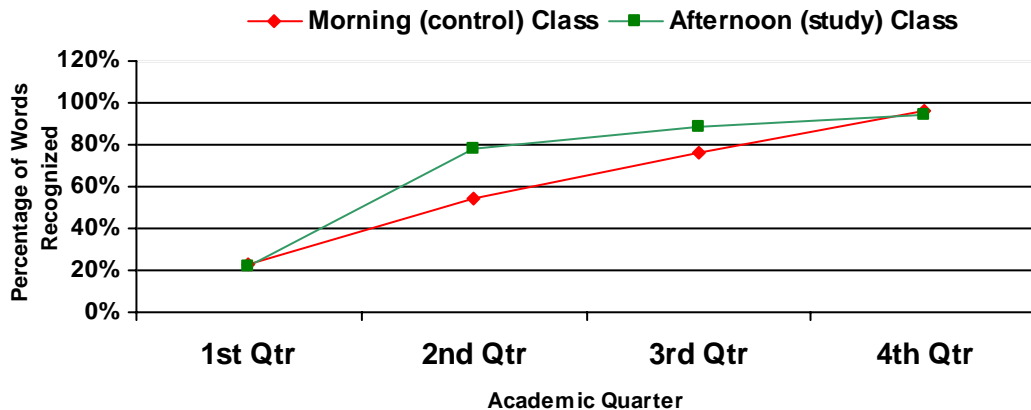
Figure 4.2 Class Comparisons on Percentage of High-Frequency Words Mastered by Quarter

The mean score for the control group (morning class) at the end of the study was 35.5

(96%) words recognized correctly with a median score of 36.5 (99%). The variance

for this group was 7.74 and had a standard deviation of 2.78. The mean score for the

experimental group (afternoon class) at the end of the study was 34.9 (94%) words

recognized correctly with a median score of 37 (100%). The variance for this group

was 11.72 and had a standard deviation of 3.42. Table 4.1 shows the mean, median,

variance, and standard deviation values for each group. The pooled variance was

9.49.

Table 4.1   Statistical Analysis of Word Recognition by Classroom

	AM Class Control Group	PM Class Experimental Group
Mean	35.5	34.9
Median	36.5	37.0
Variance	7.74	11.72
Standard Deviation	2.78	3.42

To determine if there is any statistical significance between the difference of

two means, a t-test assuming equal variances from the two classroom results was

performed. The alpha level (p = probability) used for the calculations was at 95% or

0.05 with 34 degrees of freedom (df). The calculated t value from the students' final

high-frequency word recognition scores at the end of the 4th quarter was 0.567

(*p=0.5, df=34*). Because this value was less than 1.697 at these confidence intervals

and probability, the hypothesis is rejected and the conclusion is that there is no

statistically significant difference for the final high-frequency word mastery between

the control and study groups

CHAPTER V: SUMMARY AND CONCLUSIONS

Summary

The purpose of this study was to determine if earlier exposure to high-frequency words would help increase students' overall mastery of the words by the end of the school year. By analyzing the number of high-frequency words correctly identified by students who had earlier exposure to these words against the control group, the significance of the results can be determined. It is evident from these figures that an early introduction to high-frequency words helped those students recognize the words earlier in the academic year. However, these short-term gains in words mastery were minimized by the end of the study, as the final high-frequency word recognition data between the study and control group were not statistically significant.

Conclusions

The strategy for introducing the entire list of high-frequency words expected to be learned by the end of the academic year yielded several positive results. Students in the study group clearly recognized more of these words earlier than their peers who were not exposed to these words, scoring an average of 23% higher than the control group during the 2nd and 3rd quarter tests. Although the students in the control group eventually achieved the same mastery level as the students in the study group (even exceeding the study group's scores by 2% at the conclusion of the study) the hypothesis still has some value.

Because the study or experimental group had increased exposure to the high-frequency words, their retention rate may be higher than the control group throughout

the summer. This would yield interesting results to see if a particular group has a better retention rate once they begin first grade, since one group has had mastery of these words for a longer period of time. Administering the high-frequency word recognition test at the beginning of the next school year would also provide further information on the test-retest reliability of the study. Due to the fact that the experimental group had earlier mastery of the high-frequency words, it is also known that these students were able to apply this knowledge in their daily academic activities for a longer period of time than the control group, who had not been introduced to those words yet. The experimental group was able to practice incorporating those words into their journals and other writing activities and practice recognizing them in daily texts and books for a longer period of time than the control group.

This study did not measure word recognition beyond the 37 high-frequency words taught. It is possible that the experimental group was able to master a higher number of words beyond the 37 words taught because they had mastered their high-frequency words at an earlier point in time. This does not mean that this is where the students' learning stopped. It is very likely that these students gained mastery of other words not included in the 37 high-frequency word list. If this factor was examined in this study, it could create different conclusions because it would demonstrate that the experimental group mastered the majority of the 37 high frequency words and exceeded those expectations by also learning more words. They may actually possess a higher level of word mastery than the control group due to their increased time to learn other words.

Another factor to consider is how the limitations of the study may have negatively affected the study's outcome. It is unknown how much time was spent at home practicing the high-frequency words by the experimental group's parents. This extra practice and time could have greatly increased the mean's outcome. Also, although not calculated, the relatively small sample size of students in this study might have contributed to the final results. It would be interesting to apply this study to larger classrooms and review the results.

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

Although the study's hypothesis was found to be statistically null, the researcher believes there are several benefits to introducing high-frequency words earlier in the school year. The data has shown that students were mastering the words at an earlier time in the school year. The academic schedule outlined in the curriculum does not need to be changed; however, informing parents of grade-level expectations and promoting an increased exposure to these words at school does increase word recognition earlier in the year. This allows the children to apply these words in their daily school work, reading, and life experiences earlier than the control group. The students might be ready to learn an increased number of words and decode unfamiliar words earlier in the school year because they have this knowledge earlier.

Although the study's results did not conclude any statistical difference between the study and control group at the end of the year, the kindergarten teacher's team at this school felt the results were significant enough to change the current curriculum practices. The team now implements the teaching methods used with the

experimental group throughout the entire grade level. At the beginning of each school year, the entire list of high-frequency words and flashcards are given to parents. All 37 high-frequency words are also displayed on a classroom bulletin board throughout the entire school year.

Due to this study's positive results, current curriculum practices have been changed that will in turn improve kindergarten children's literacy skills. It is hoped that this improvement will in turn better prepare these students for academic success throughout their school years.

REFERENCES

Eduplace.com. (n.d.). *High-Frequency Words and Vocabulary*. Retrieved September 8,
         2005, from http://www.eduplace.com/rdg/res/frequent/html

Feldman, J., Dr. (n.d.). High-Frequency Words: Classroom Activities. *Ready Set Read*!
         Retrieved September 8, 2005, from
         http://www.literacyconnections.com/DrJeanHiFrequency.html

Honig, B. (1997). Reading the Right Way: What research and best practices say about
         eliminating failure among beginning readers (Electronic version). *The School
         Administrator.* Retrieved December 13, 2005 from
         http://www.aasa.org/publications/saarticledetail.html

Jenkins, L. (1997). *Improving Student Learning: Applying Deming's Quality Principles
         in Classrooms*. Milwaukee, WI: ASQ Quality Press.

Jenkins, L. (2005). *Permission to Forget: and Nine Other Root Causes of America's
         Frustration with Education*. Milwaukee, WI: ASQ Quality Press.

LiteracyConnections.com. (n.d.). *High-Frequency Sight Words: The Fry List, Instant
         Words, Dolch Words, and Word Wall*. Retrieved September 8, 2005, from
         http://www.literacyconnections.com/Dolch.html

LiteracyConnections.com. (n.d.). *Working and Playing with Words*. Retrieved
         September 11, 2005, from http://www.literacyconnections.com/WordStudy.html

McClanahan, E. & Wicks, C. (1993). *Future Force: Kids That Want to Can, and Do!*
         Chino Hills, CA: PACT Publishing.

MinnesotaDepartmentofEducation.com (2005). *Language Arts Standards.* Retrieved
         December 13, 2005 from
         http://children.state.mn.us/mde/Academic_Excellence/Academic_Standards/Stan
         dards_in_Language_Arts/index.html

NEA.org (2005). Why We Care about the K in K-12 (Electronic version). *Young
         Children*. Retreived September 8, 2005, from
         http://www.nea.org/ealrychildhood/careaboutk.html

ReadingA-Z.com. (n.d.). *High-Frequency Word Strategies Bank.* Retrieved September
         8, 2005, from http://www.readinga-z.com/more/highfreq_strat.html

Strickland, Dorothy (n.d.). *What Research Has to Say About Reading Instruction*
         (Electron version abstract). Retrieved from
         http://www.ira.org/publications/bbv/books/bk177/abstracts.html

APPENDIX A
FRY INSTANT WORD LIST

Words 1-25	Words 26-50	Words 51-75	Words 76-100
the	or	will	number
of	one	up	no
and	had	other	way
a	by	about	could
to	word	out	people
in	but	many	my
is	not	then	than
you	what	them	first
that	all	these	water
it	were	so	been
he	we	some	call
was	when	her	who
for	your	would	oil
on	can	make	its
are	said	like	now
as	there	him	find
with	use	into	long
his	an	time	down
they	each	has	day
I	which	look	did
at	she	two	get
be	do	more	come
this	how	write	made
have	their	go	may
from	if	see	part

Common suffixes: -s, -ing, -er, -ly, -est

* Fry, E.B., Kress, J.E., & Fountoukidis, D.L. (1993). The reading teacher's book of lists. Englewood Cliffs, NJ: Prentice Hall. By permission.

APPENDIX B
Dolch® Sight Word List

Pre-primer	Primer	First	Second	Third
a	all	after	always	about
and	am	again	around	better
away	are	an	because	bring
big	at	any	been	carry
blue	ate	as	before	clean
can	be	ask	best	cut
come	black	by	both	done
down	brown	could	buy	draw
find	but	every	call	drink
for	came	fly	cold	eight
funny	did	from	does	fall
go	do	give	don't	far
help	eat	going	fast	full
hers	four	had	first	got
I	get	has	five	grow
in	good	her	found	hold
is	has	him	gave	hot
it	he	how	goes	hurt
jump	into	just	green	if
little	like	know	its	keep
look	must	let	made	kind
make	new	live	many	laugh
me	no	may	off	light
my	now	of	or	long
not	on	old	pull	much
one	our	once	read	myself
play	out	open	right	never
red	please	over	sing	only
run	pretty	put	sit	own
said	ran	round	sleep	pick
see	ride	some	tell	seven
the	saw	stop	their	shall
three	say	take	these	show
to	she	thank	those	six
two	so	them	upon	small
up	soon	then	us	start
we	that	think	use	ten
yellow	there	walk	very	today
you	they	where	wash	together
too	this	when	which	try

APPENDIX C
High Frequency Word Checklist

	Yes		Yes		
1. like		14. for		27. three	
2. is		15. a		28. here	
3. but		16. to		29. little	
4. I		17. not		30. two	
5. red		18. at		31. we	
6. go		19. see		32. that	
7. am		20. big		33. you	
8. blue		21. in		34. yellow	
9. the		22. up		35. my	
10. have		23. where		36. and	
11. can		24. get		37. look	
12. it		25. what		38.	
13. do		26. one		39.	

APPENDIX D
CLASSROOM RESULTS

AM Class	End 1st Qtr	End 2nd Qtr	Percent	End 3rd Qtr	Percent	End 4th Qtr	Percent
1	6	16	43%	29	78%	35	95%
2	9	14	38%	24	65%	36	97%
3	9	16	43%	27	73%	33	89%
4	9	17	46%	27	73%	36	97%
5	9	30	81%	36	97%	37	100%
6	9	32	86%	37	100%	37	100%
7	9	23	62%	28	76%	35	95%
8	8	14	38%	25	68%	33	89%
9	7	19	51%	30	81%	37	100%
10	9	23	62%	29	78%	37	100%
11	9	24	65%	32	86%	37	100%
12	9	18	49%	27	73%	36	97%
13	9	22	59%	29	78%	37	100%
14	8	17	46%	28	76%	37	100%
15	9	24	65%	28	76%	37	100%
16	5	9	24%	13	35%	25	68%
17	9	18	49%	26	70%	35	95%
18	9	21	57%	29	78%	37	100%
19	8	25	68%	30	81%	37	100%
20	9	17	46%	27	73%	36	97%
PM Class	End 1st Qtr	End 2nd Qtr	Percent	End 3rd Qtr	Percent	End 4th Qtr	Percent
1	8	22	59%	31	84%	33	89%
2	9	32	86%	35	95%	36	97%
3	9	32	86%	37	100%	37	100%
4	9	37	100%	37	100%	37	100%
5	9	34	92%	36	97%	37	100%
6	9	24	65%	29	78%	34	92%
7	9	37	100%	37	100%	37	100%
8	9	34	92%	36	97%	37	100%
9	9	37	100%	37	100%	37	100%
10	4	20	54%	27	73%	30	81%
11	9	33	89%	34	92%	37	100%
12	9	29	78%	35	95%	37	100%
13	6	13	35%	20	54%	25	68%
14	5	16	43%	29	78%	32	86%
15	9	32	86%	34	92%	35	95%
16		29	78%	34	92%	37	100%

DOES TIMED PRACTICE VERSUS NOT TIMED PRACTICE AFFECT THE

MASTERY OF MULTIPLICATION FACTS

by

ERIKA YOULDEN

B.S. University of Wisconsin at River Falls, 1997

A capstone submitted to the

Faculty of the Graduate School of Winona State University

in partial fulfillment of the requirement for the degree of

Master of Science

Department of Education

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This capstone entitled:

Does Timed Practice versus Not Timed Practice

Affect the Mastery of Multiplication Facts?

written by Erika Youlden

has been approved for the Winona State University Department of Education by

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Heather Klees   Dr. Thomas Sherman
Facilitator   Faculty Advisor

Date_____

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.

Youlden, Erika (M.S., Education)

Does Timed Practice versus Not Timed Practice Affect the Mastery of Multiplication Facts?

Capstone directed by Dr. Thomas Sherman

Abstract

Students need to know basic math facts before entering the upper grades of elementary school. During those intermediate years, students start to use basic math facts to perform high mathematic skills.

This study examines 2 methods for testing multiplication facts in a 4th grade classroom. One method is to administer a 5 minute multiplication timed test to the students. The students stop the test when the 5 minute timed period is done. By administering the test in this manner, the students are not able to complete all of the problems and miss out on the practice of completing all of the problems. Another way is to give the students as long as they need to complete the multiplication test with the goal of completing the test in less than 5 minutes. By administering the test in this manner, the students are able to complete the entire test and have the practice of figuring out all of the problems.

The 4th graders in this study were divided into 2 groups. One group was given 5 minutes to take the timed test (Group A), and the other group was given as long as they needed to complete the test (Group B). All of the students took multiplication test each school day for 2 weeks, which totaled 10 tests.

Group B contained a greater percentage of students able to complete the test in less than 5 minutes at the end of the 2 week testing period. Groups A and B had the same accuracy for the number of problems correct on the test.

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CHAPTER 1: INTRODUCTION

Need for the Study

There is a need to develop an effective way for students to increase mastery of multiplication facts. These facts are necessary for students to know in order to perform higher mathematic skills. If students do not have mastery of these facts, it makes it more difficult to carry out other math operations such as finding multiples, least common denominators, reducing fractions, or multiplying and dividing fractions. Students need to develop basic math skills early in their education to be successful in mathematics classes in the future. (Allen, 2003a)

Statement of the Problem

Students enter the upper elementary grades without mastery of the basic facts in addition, subtraction, multiplication, and division. While teaching sixth grade, one teacher would give all students a four minute timed test of the basic facts for the four operations. Each test contained one hundred problems. Many of the students were unable to complete the tests in four minutes. Knowing these facts in sixth grade is essential because the students begin to learn higher level math skills, and they need to have mastery of the basic facts so that they can concentrate on the new skills that they are learning and not struggle with the math facts. Students need to master these facts in a younger grade.

Two ways have been tried to help the students learn the math facts. One way is to give them a timed test. Sixth graders are allowed four minutes to complete the tests. Fourth graders are allowed five minutes to complete the test. At the end of the

time, students stop where they are working and hand in the test. They may have some problems left unfinished, but still hand in the test.

Another way the test has been administered is to give the students as long as they need to take the test, but they have the goal of completing the test in four minutes for sixth grade and five minutes for fourth grade. The amount of time that has passed is written on the board every thirty seconds while they are working. They record their time on the test. The benefit of this method is that the students finish the test and are able to practice solving all of the problems.

Research needs to be conducted to learn which method is the most effective for developing mastery of the math facts. The second method for giving the test takes more class time than the first method. The research would determine whether or not the extra time is beneficial to the students.

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

Giving students as long as they need to finish a 100 problem multiplication test is not a more effective method for increasing students' speed and accuracy than stopping the students at the end of a specified time period.

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

The independent variable is changing the format for how the students take the test. One half of the class will take the test with a five minute time limit; the other half of the class will have as much time as they need to take the test and record the amount of time that they used. They will be given the goal of being able to complete all of the problems in less than five minutes.

The dependent variable is whether or not the students developed mastery of the multiplication facts after taking the timed tests. To determine how well that each group learned the multiplication facts, the whole group will be given the same five minute, one hundred problem test.

The control variables are each group will contain eleven students, have the same number of boys and girls in the group, and will be of mixed ability. Each group will be given the same test.

A moderator variable is the personality of the teacher conducting the research.

Limitations of the Study

One limitation of the study is the class size. The class consists of twenty-two students. There will be only eleven students in each control group. Some students may study at home to improve their time while other students may not.

Timeline

The students will take a multiplication skills test, one timed and one not timed, each school day for two weeks. On the final day, the students will all take the same five minutes timed test to determine the progress that they made during the testing time. That will be nine days of testing in the control group, and one day that they will all take a five minute test.

CHAPTER 2: LITERATURE REVIEW

The Importance of Knowing Basic Math Facts

Many people view math as an impossible, abstract subject to master, but in the days of high stakes testing and technology rich jobs, it is essential that students leave school proficient in mathematics. (Allen, 2003a) The No Child Left Behind Act, which was signed into law on January 8, 2002, requires all students to be proficient in mathematics and to be tested annually in math. (Association for Supervision and Curriculum Development [ASCD], 2002)

The National Academy of Sciences describes mathematic proficiency as being able to successfully perform tasks in five strands of mathematics. These five strands are understanding, computing, applying, reasoning, and engaging. In the understanding strand, students need to know mathematical concepts and operations. They must understand the meanings of mathematical symbols and procedures. The computing strand of mathematical proficiency requires the students to be able to perform operations such as adding, subtracting, multiplying, and dividing numbers accurately. The applying strand involves being able to solve mathematical problems using the appropriate procedures and operations. In the reasoning strand, students need to be able to explain the solutions to problems. In the engaging strand, students see mathematics as something doable and sensible. (National Academy of Sciences [NAS], 2002) The basis for many of these strands is the basic facts of addition, subtraction, multiplication, and division. A mastery of basic arithmetic skills is necessary for students to be successful in studying advanced math. (Allen, 2003b)

The five strands of mathematical proficiency are interdependent with each other. A student must develop all of the strands, and this proficiency develops over time. (NAS, 2002)

<div align="center">Math Fluency</div>

Damer (1997) states that mathematical fluency is as important as reading fluency for elementary students. Children who are fluent in answering math facts will have fewer problems completing more complicated math computations than students who do not have math fact fluency. Fluent students should be able to complete math facts at the rate of one every 2 seconds.

There are four stages to student learning. In the first stage, acquisition, students are taught to perform the skill accurately. The second stage, fluency, is when the information the student has learned becomes automatic. Maintenance is the third stage. In this stage, students maintain the information they have learned over time by routine practice and review of the skills. The fourth stage is generalization. In this stage, students are able to apply and transfer these skills to new situations in which they are needed. (Damer, 1997)

<div align="center">Relating Math Facts to NCTM Standards</div>

On standardized tests, the students in the upper grades are asked to solve complex problems that are based on the foundation of the students knowing the basic skills. (Gandal and Vranek, 2001)

The National Council of Teachers of Mathematics (2004) states in the numbers and operation standard that students in Pre-kindergarten through second

grade need to have an understanding of addition and subtraction. They also need to understand the relationship between the two operations. Students in third through fifth grade are expected to know how to multiply and divide and understand the relationship between the two operations. Students in sixth through eighth grades need to be able to use these operations to perform arithmetic operations with fractions and decimals. The students need to develop a strong foundation of these operations in the lower grades to perform the complex operations required in the upper grades. (National Council of Teachers of Mathematics, 2004)

<div align="center">Repetition and Memory</div>

Learning can be committed to short-term memory, working memory, or long-term memory. Short-term memory consists of information people hold onto for approximately 15 to 30 seconds. Working memory is short-term also, but in working memory, people are able to access the information for several hours. Information stored in long-term memory can be accessed for an indefinite amount of time depending on how often the memory is used. (Sprenger, 1999)

Long-term memory consists of five categories of storage. The categories are semantic memory, episodic memory, procedural memory, automatic memory, and emotional memory. The multiplication table is stored in automatic memory, which is stored in the cerebellum at the base of the brain. (Sprenger, 1999)

Memory should be thought of as a process rather than thought of as being stored in a specific location in the brain. (Jensen, 1998) Memory is made from interconnected systems that perform different functions while they are working together. (Hamachek, 1991) Memories are triggered by the retrieval process. Retrieval and memory cannot be separated. Researchers believe the process of the retrieval of memories is more consistent than the brain's way of storing information. (Jensen, 1998)

Jensen (1998) breaks memory into two groups: explicit memory and implicit memory. Explicit memory is sometimes referred to as the conscious memory. Implicit memory is memory that is imbedded in the brain. Jensen says, "We know it, but don't know we know it." (Jensen, 1998, p. 107)

Explicit memory comes in the form of semantic memory, which is word based memory and episodic memory, which is event based memory. Semantic memory is the recall of textbook information or facts. This type of memory can be short term memory or be information in our working memory. With active processing, information in semantic memory can be committed to long term memory.

Episodic memory is event based. This type of memory is associated with place or circumstance. This memory can also be accessed by smells, taste, sight, sounds, and touch.

Jensen (1998) further states implicit memory is memory imbedded in the

brain. There are two types of implicit memory: procedural and reflexive. Procedural

memory is known as motor or habit memory. A person would be able to perform a

task retrieved from procedural memory even if they haven't performed that particular

task for years.

Reflexive memory is automatic memory. This type of memory contains

instant recall and association. Flashcard repetition can be used to achieve reflexive

retrieval. The more practice students have, the more likely information will be

become reflexive. (Jensen, 1998)

"Lasting learning, or long term potentiation (LTP), has been accepted as

essential to the actual physical process of learning." (Jensen, 1998, p. 14) LTP

happens with repeated firing of neurons in the brain. These firings make a new

memory and the repetition of these firings strengthen the memory and make it easily

retrievable. (Sousa, 2001)

Retention is the process by which the brain preserves memories to be located

and retrieved in the future. The first step to retention is rehearsal. A person needs to

repeat, or rehearse, the information to be learned in order for the brain move the

information from working memory to long term memory. A person also benefits

from secondary rehearsal to review the information. (Sousa, 2001)

There are two types of retention: rote and elaborative. Rote rehearsal is when the information enters the working memory and needs to be stored in long term memory exactly the way it entered. Elaborative rehearsal is when information does not need to be stored exactly the way it is learned. Learners need to process the information, connect it to previous knowledge, and store it in a way that makes sense to the learner. Rote rehearsal is the method needed for learning the multiplication tables. (Sousa, 2001)

Automatic processing is built up over time through the learner's brain mapping the same information using the same input over many rehearsals. Automatic processing creates a relatively permanent memory, and once learned the memory is difficult to change. (McLaughlin, 1994)

Several strategies work to teach students facts to commit to automatic memory. Memory techniques are needed to effectively study. Mnemonics can be used to make retrieval of information easier. (Hamachek, 1990) Another strategy is to use music; teachers can use phrases and facts set to music to help students learn. Other strategies educators use to commit facts to automatic memory are flash cards and repetition. (Sprenger, 1999)

CHAPTER 3: METHODS AND PROCEDURES

Overview

This study examined two methods of helping students master single digit multiplication facts. All 22 students in the class had been introduced to multiplication during the previous school year, and the concept of multiplication had been reviewed during the current school year. The students were familiar with timed tests as they had taken timed tests for addition and subtraction facts prior to moving on to multiplication. Multiplication timed tests were given to the students each day during a two week period. Students graphed their progress of mastery of the facts during the two week period of testing.

Research Design

This study was an experiment which focused on the effects of the independent variable, the administration of the multiplication test, on student mastery of multiplication facts. The class was divided into two groups (Group A and Group B) with eleven students in each group. Each was given the same multiplication test consisting of one hundred single digit multiplication problems. The students in both groups completed the test ten times during a two week period. The number of facts correctly identified by Group A was compared to the number correctly identified by Group B. Group A was given five minutes to complete the test. At the end of the time limit, the group had to stop the test. Group B was given as long as they needed to complete the test. The amount of time that had passed during the test was written on the board by the teacher in 30 second increments.

Subjects

The participants of this study consisted of 22 nine and ten year olds in a fourth grade classroom. The community in which this school is situated is predominately middle class, Caucasian, and located in the Midwest of the United States. The students in this class were all Caucasian. The students were of mixed abilities, but none of the students in the class received special education services. The students were divided into two groups using previous math test scores from the work the students have done during the current fourth grade school year, teacher observation of mathematics proficiency, and Northwest Evaluation Assessment (NWEA) scores. NWEA is the standardized test that this school district uses to assess student progress. As a result of using these assessment tools, each group consisted of 11 students with mixed abilities.

Instruments

The students' knowledge of multiplication facts was assessed daily using a multiplication test consisting of 100 single-digit multiplication problems. (Appendix A) The multiplication test is production from Carson-Dellosa Publishing. After students completed the tests, they graphed the results of the tests. Group A completed a graph which recorded the number of problems completed within the time limit. (Appendix B) Group B completed a graph which recorded the amount of time needed to complete the test. (Appendix C) The accuracy of the students' answers was also recorded.   The students in Group A and Group B used the same multiplication test.

Validity and Reliability Measures

The internal validity of this experiment was high because the only difference in the test taking was the time limit which the students had placed upon them. The students were in the same classroom, taught by the same teacher, and completed the same test. The individual differences and the amount of time students practiced the multiplication fact outside of school time could not be standardized.

The external validity of this study is low because there a small sample of the population participating in the study. There are only 22 subjects in the study, so the results would be hard to transfer to the entire population of fourth grade students.

Procedures

Each student in the class was placed in either Group A or Group B. The students in Group A were told they would have five minutes to complete a 100 problem multiplication timed test. At the end of the five minutes, the students were asked to stop taking the test. Students in Group A graphed the number of problems completed in the five minute time limit and recorded the number of problem answered correctly.

Students in Group B were told they would have as much time as needed to complete the same 100 problem multiplication timed test. Students in Group B graphed the amount of time needed to complete the test and recorded the number of problems answered correctly. The goal for each group was to complete all 100 problems on the test with 95% accuracy.

The students took the test each school day for 10 days. They graphed the results of the test daily to monitor their progress.

The teacher administered the test each day. Both groups started on the tests at the same time, and the teacher used a timer to keep track of the time for the students. The teacher wrote the time passed on the white board in the classroom after each 30 second interval had passed. At the end of five minutes, the teacher asked Group A to stop. Group A stopped the test and turned the test paper over so they could not work on the problems anymore. Group B continued working if necessary. Group B recorded the amount of time needed to complete the test by writing the time the teacher had recorded on the board when they finished the test. When all students in the class finished the test, the teacher collected and corrected the tests. The teacher handed back the tests the next school day for the students to record the correct information on their graphs. On the tenth day of the experiment, every student in the class took the test with a five minute time limit.

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

This experiment studied if the method used in administering a multiplication timed test affected the students' mastery of the facts. Students were either given five minutes to take the test or not given a specified time limit for the test. However, each group was given the goal of completing the test in less than five minutes. The students took the test each day for 10 days. At the end of the 10 day period, the students were assessed according to the length of time needed to complete the test.

CHAPTER 4: RESULTS AND DISCUSSION

The purpose of this study was to determine the effect changing the method of administering a multiplication timed test on the percent mastery of fourth grade students. The mastery of multiplication facts was determined by observing and recording the number of multiplication facts completed in five minutes and the accuracy of the completed facts.

Tests Completed in Five Minutes

During the two week duration of the test, 10 multiplication tests were given. The students in Group A were given five minutes to take the test. At the beginning of the two testing period 3 of the 11 students were able to complete the test in the time given. Group A contained eight students who were able to complete the test in five minutes on the final day of testing. Group B had as long as needed to take the test with a goal of completing the test in less than five minutes. Group B had zero students who could complete the test in five minutes at the beginning of the testing period. At the end of the two weeks 9 of 11 eleven students were able to complete the test in five minutes. Group A showed a growth of five more students being able to complete the test in five minutes, and Group B showed a growth of nine more students being able to complete the test. Table 4.1 shows the beginning and ending numbers for the two groups.

Table 4.1
Number of Students able to Complete Test in Five Minutes

	Group A	Group B
Beginning of Testing Period	3	0
End of Testing Period	8	9
Growth in Number of Students able to Complete Test	5	9

A *t*-test of the data showed the *t*-value was 0.970 with 18 degrees of freedom. The p-value of this result is 0.924. The means for the sets of data have 95% confidence levels.

Figure 4.1

Tests Completed in Five Minutes
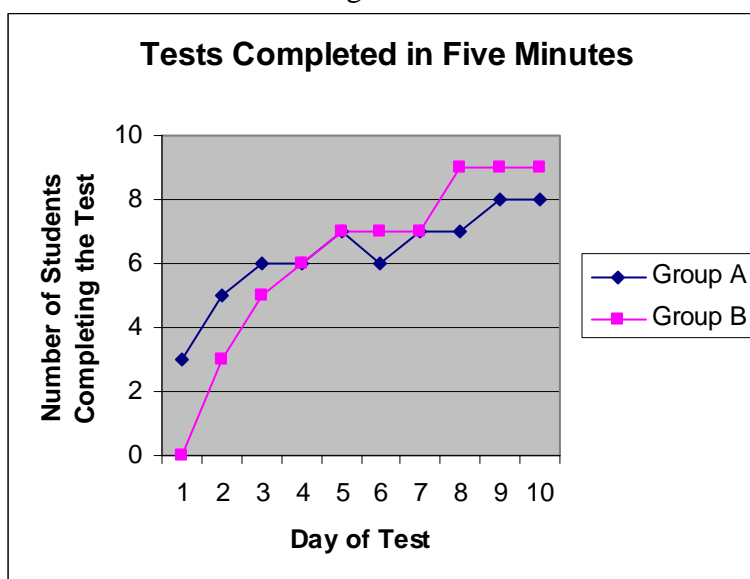
Figure 4.1 shows the progress of both groups of students in being able to complete the timed tests in five minutes. The line with diamonds shows the progress of Group A. This group increased from 3 students passing the test to eight students being able to pass. The line with square symbols shows the progress of

Group B. This group increased from 0 students passing the test to 9 students in the

group able to pass.

<center>Accuracy</center>

At the beginning of the testing period the students in Group A answered the

problems on the test with 92% accuracy. At the end of the study Group A completed

the test with 98% accuracy. Group A showed a growth of 6%. Group B answered

the problems on the first test of the study with 95.4% accuracy. At the end of the

study the students in Group B completed the test with 98% accuracy. Group B

showed a growth of 2.6%. Table 4.4 shows the percent growth for each group.

<center>Table 4.4</center>
<center>Percent of Growth of Accuracy</center>

	Group A	Group B
Percent of accuracy on first test of the study	92	95.4
Percent of accuracy on the last test of the study	98	98
Percent growth	6	2.6

.

Figure 4.2 shows a line graph of the increase in accuracy on the timed tests.

The line with the diamond symbol shows the increase for Group A from 92% to 98%

correct. The line with the square symbol shows Group B's increase from 95.4% to

98%.

Figure 4.2
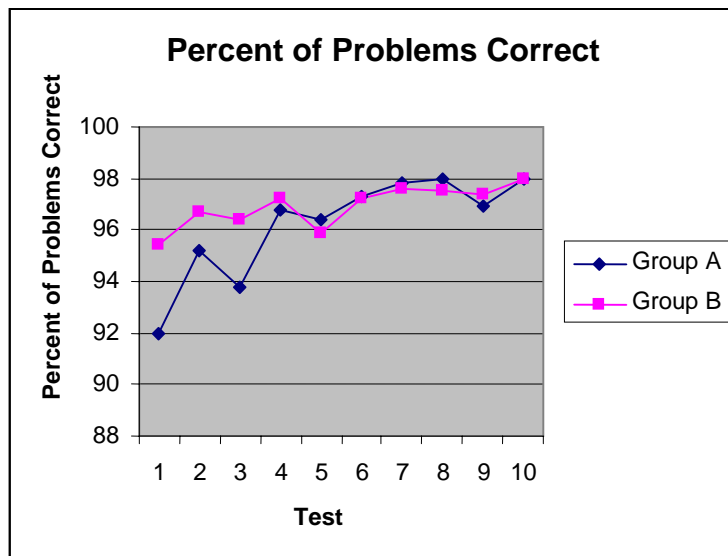
A *t*-test of the data showed the *t*-value was -1.04 with 18 degrees of freedom. The p-value of this result is 0.310. The means for the sets of data have 95% confidence levels.

The null hypothesis (Giving students as long as they need to finish a 100 problem multiplication timed test is not a more effective method for increasing students' speed and accuracy than stopping the students at the end of a specified time period.) is accepted. Group B showed a greater increase in the speed of the tests. More students in Group B were able to finish the test in five minutes than in Group A. The students in both group had the same percent of accuracy at the end of the testing period. Both groups were able to complete the multiplication timed test with 98% accuracy. The hypothesis is accepted because the difference in the number of students completing the test is too small to make a difference. The results for measuring the speed and accuracy of the students scored are not found to be statistically significant because the p-value for both groups was more than 0.05.

CHAPTER V: SUMMARY AND CONCLUSION

Summary of Results and Conclusion

The purpose of this research was to study the effects of two methods for administering multiplication facts tests. Students were either given as long as they needed to finish the 100 problem multiplication tests with a goal of finishing the test in five minutes, or they were given five minutes to take the test with the goal to finish in the time given. By examining the results of these two groups of students, the effects of the testing methods can be examined. Although the research was not found to be statistically significant, the results showed the group that was given as long as they needed to complete the test contained more students who were able to complete the test in five minutes than the group that was given five minutes to complete the test. The difference was too small to draw conclusive evidence. Both groups were able to complete the test with the same accuracy at the end of the research period.

Recommendations

Either method of testing described in this research would be effective to help students master the multiplication facts. Both ways of testing were effective for increasing the students' speed of finishing the tested tests. The group who had as long as they needed to finish the tests increased their speed slightly more than the group that only had five minutes to finish the tests, but the difference was not statistically significant. Both groups finished the testing period able to complete the multiplication tests with 98% accuracy. Time is found to be valuable in a classroom, so the recommendation is to use the five minute timed test to practice multiplication

facts. Both way of testing were effective, so the method that uses the least amount of class time should be used.

     If this research was performed again, there are a couple of factors a future researcher could take into consideration. It would be recommended that a larger sample size participate in the multiplication fact testing. The sample size used for this project was too small to obtain significant data. Another factor that could be considered would be student stress during test taking. It would be interesting to know if students are more stressed during a timed test versus a test that is not timed.

REFERENCES

Allen, R. (2003a). Embracing math. *Curriculum Update*, Retrieved August 13, 2005, from http://www.ascd.org/affiliates/articles/cu2003_allen.html

Allen, R. (2003b). Technology tools help math learners visualize, make connections. *Curriculum Update*, Retrieved August 13, 2005, from http://www.ascd.org/affiliates/articles/cu2003fall_allen_3.html

Association for Supervision and Curriculum Development. (2002, May). Focus on…ESEA. *EDPolicy Update*. *1*. Retrieved August 13, 2005, from http://www.ascd.org/portal/site/ascd/menuitem.74d518f89df7aafcdebffdb6210 8a0c/templ...

Damer, M. (1997). Math fluency. *Illinoisloop.org,* Retrieved January 4, 2005, from http://www.illioniosloop.org/md_math_fluency.html

Gandal, M., & Vranek, J. (2001, September). Standards: Here today, here tomorrow. *Educational Leadership*, *59*, 6-13. Retrieved August 13, 2005, from http://www.ascd.org/ed_topics/el1200109_gandal.html

Hamachek, A.L. (1990). Memory and study strategies for optimal learning. [Abstract]. (ERIC Document Reproduction Service No. ED320347). Retrieved November 1, 2005, from http://www.eric.ed.gov

Hamachek, A.L. (1991). Enhancing comprehension through the development of strategies for reading, learning, and remembering. [Abstract]. (ERIC Document Reproduction Service No. ED336723). Retrieved November 1, 2005, from http://www.eric.ed.gov

Jensen, E. (1998). *Teaching with the Brain in Mind*. Alexandria, VA: Association for Supervision and Curriculum Development.

McLaughlin, B. (1994). *Aptitude from an Information Processing Perspective*. Arlington, VA: Language Attitude Invitational Symposium Program Proceedings. (ERIC Document Reproduction Service No. ED461262).

National Academy of Sciences. (2002). What does it mean to be successful in mathematics? *Helping Children Learn Mathematics.* Retrieved August 13, 2005, from http://www.nap.edu/openbook/o3090843418/html/9.html

National Council of Teachers of Mathematics. (2000-2004). *Table of Standards- Number and Operations Standard*. Retrieved September 14, 2005, from http://standards.nctm.org/document/appendix/numb.htm

Sprenger, M. (1999) *Learning and Memory: The Brain in Action.* Alexandria, VA:
    Association for Supervision and Curriculum Development.

Sousa, D.A. (2001). *How the Brain Learns*. Thousand Oaks, CA: Corwin Press, Inc.
    A Sage Publications Company.

APPENDIX A
Multiplication Test

Name _____

Minutes							Score
1	2	3	4	5	6		

```
        8      9      4      9      1      3      0      9      5      2
A      ×3     ×6     ×6     ×0     ×2     ×3     ×8     ×3     ×4     ×4


        1      7      0      5      4      3      7      0      6      5
B      ×6     ×6     ×6     ×1     ×2     ×8     ×3     ×2     ×4     ×9


        8      2·     8      1      6      5      2      6      3      8
C      ×6     ×8     ×0     ×3     ×2     ×7     ×1     ×8     ×5     ×9


        7      1      0      7      4      3      5      9      0      8
D      ×9     ×1     ×4     ×2     ×5     ×2     ×0     ×5     ×9     ×2


        4      1      9      6      0      2      7      3      2      4
E      ×3     ×7     ×8     ×7     ×1     ×7     ×5     ×7     ×3     ×1


        3      2      1      8      6      5      9      2      9      1
F      ×4     ×5     ×8     ×5     ×3     ×6     ×4     ×0     ×9     ×5


        8      0      9      3      6      4      0      5      7      6
G      ×8     ×7     ×1     ×9     ×1     ×8     ×3     ×3     ×8     ×6


        4      3      2      7      0      9      4      1      3      8
H      ×0     ×6     ×2     ×1     ×5     ×7     ×4     ×9     ×1     ×7


        2      7      5      0      8      5      1      8      6      9
I      ×6     ×4     ×5     ×0     ×4     ×8     ×0     ×1     ×0     ×2


        6      1      5      4      7      2      7      6      3      4
J      ×5     ×4     ×2     ×9     ×7     ×9     ×0     ×9     ×0     ×7
```

8

Name: _____

Multiplication Timed Test Graph

Date	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100

Number correct

APPENDIX C

Name: _____

Multiplication Facts Untimed Test Graph
Length of Time

Date	3 min 30 sec	4 min	4 min 30 sec	5 min	5 min 30 sec	6 min	6 min 30 sec	7 min	7 min 30 sec	8 min	8 min 30 sec	9 min	9 min 30 sec	10 min