The Effectiveness of Walk-to-Math in 4th Grade

By Ability Grouping

Using Connecting Math

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A Special Project

Presented to

Dr. Audrian Huff

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_____

In Partial Fulfillment

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Master of Education

_____

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The Effectiveness of Walk-to-Math in 4th Grade

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Using Connecting Math

Approved for the Faculty

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(NOTE: Type in enough lines for the number of people that review the final project).

ABSTRACT

A one- year study was conducted in a fourth grade classroom to evaluate the

effectiveness of a mathematical curricula. A direct instruction program, Connecting Math

Concepts and the model Walk-to-Math was used. The students in the Connecting Math class had

significant growth and scored high on the computerized pre-test and posttest of Measures of

Academic Progress test. The curriculum Connecting Math concepts along with the model Walk-

to-Math was the critical variable responsible for higher student achievement.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

Introduction

Background for the Project

  After fourth grade teachers reviewed the students' Washington Assessment of Student Learning test scores in fourth grade and noticing students in fourth grade were not making gains in mathematics, the fourth grade teachers decided to try Walk-to-Math. The fourth grade team consisted of five teachers. The fourth grade teachers along with the Response to Intervention Team decided to try Connecting Math Concepts, a mathematical program to help meet the needs of students found to be very low academically in the mathematical area.

  The No Child Left Behind Act played a big part in deciding the curriculum most beneficial for intensive or at risk students. The main goal of the fourth grade teachers has been to help students be successful in mathematics and all academic areas. The No Child Left Behind Act's most important goal was to help students be successful." According to the act, the purpose is to improve student achievement by setting a goal of a full grade-level proficiency in reading and mathematics by 2014" (U.S. Department of Education, 2005. pg1).

Statement of the Problem

  Students in 4th grade at the rural elementary school made few gains in mathematical test scores as measured by the Washington Assessment of Student Learning.   Would walk-to-Math using Connecting Math Concepts help improve test scores?

<u>Purpose of the Project</u>

In order to help improve test scores in mathematics, fourth grade teachers decided to try Walk-to-Math using Connecting Math Concepts as one of the mathematical programs.   At the beginning of the school year fourth grade students were given the Measures of Academic Progress pre-test and at the end of the school year students were given the Measures of Academic Progress posttest to determine if students made adequate growth using Connecting Math Concepts. During winter students were given Measures of Academic Progress test again to compare scores from the beginning of the school year to the winter scores.   The purpose was to see if students using Connecting Math Concepts with Walk-to-Math were making improvement.

<u>Delimitation</u>

The town was an agricultural community in the state of Washington. The elementary school's population was 717 students. Overall 52.2% were males and 47.8% were females in the elementary school in the rural town. The ethnicity of the school was 0.3% Asian, 0.1% Black, 81.5% Hispanic, and 18.0% White. The school's special programs were 84.0% free and reduced meals, 12.7% special education, 55.7% transitional bilingual, and 25.1% migrant. The forty-one teachers of the school have been highly qualified as documented on statistics included in the Washington State Report Card (Office of the Superintendent of Public Instruction, 2007).

The demographics of the author's classroom were seventeen students, five girls and twelve boys. Two of the students were white and the other fifteen Hispanic. The classroom had one highly qualified teacher and a high school student helper. A high school student helped in the classroom for thirty minutes a day and assisted students as needed. The ability of all seventeen students in the classroom appeared to be at the same level with the exception of one monolingual student and one English Limited speaking student.

The environment in the classroom had been one of learning and respect. The behavior in the classroom had been a safe and comfortable environment with the exception of one student diagnosed as having behavioral and anger management problems. The student sometimes disrupted the classroom and interfered with student learning. The students in the author's class had been placed by the five 4th grade teachers and the Response to Intervention Team after analyzing the students' Measures of Academic Progress test scores. After looking at the Measures of Academic Progress scores students were placed in ability groups and started Walk-to-Math at the beginning of the 2008-2009 school years.

Assumptions

The fourth grade teachers and the Response to Intervention Team selected Connecting Math Concepts for the intensive students in the lower mathematic class. The Response to Intervention Team and the fourth grade teachers assumed by using Connecting Math Concepts with the Walk-to-Math model, fourth grade students of lower mathematical ability would improve test scores. In order to track student progress, all students were given a pre-test and posttest at the beginning and end of the school year by using the Measures of Academic Progress to determine individual student's academic growth in mathematics. Students were also given a Measures of Academic Progress test at winter to see if students were making progress in Connecting Math Concepts.   The teacher teaching the Connecting Math Concepts program had been a highly qualified teacher for over four years. The other four teachers were teaching Everyday Mathematics. The teacher teaching Connecting Math Concepts had been given all materials needed to teach the program and help students succeed. The program was taught with fidelity and responsibility during Walk-to-Math.

Hypothesis or Research Question

Low performing fourth grade students using Connecting Math Concepts and the Walk-to-Math model will make greater than expected growth in mathematics as measured by a pre-test/ posttest from fall to winter by the use of a t-test.

Low performing fourth grade students using Connecting Math Concepts and the Walk-to-Math model will make greater than expected growth in mathematics as measured by a pre-test/ posttest from fall to spring by the use of a t-test.

Null Hypothesis

Low performing fourth grade students using Connecting Math Concepts and the Walk-to- Math model will not make greater than expected growth in mathematics as measured by a pre-test/ posttest from fall to winter by the use of a t-test at the .05 level of significance.

Low performing fourth grade students using Connecting Math Concepts and the Walk-to-Math model will not make greater than expected growth in mathematics as measured by a pre-test/ posttest from fall to spring by the use of a t-test at the .05 level of significance.

Significance of the Project

After reviewing the Washington Assessment of Student Learning test scores from the Office of the Superintendent of Public Instruction, fourth grade teachers decided to change the way mathematics was being taught. Fourth grade teachers decided to try Walk-to-Math using Connecting Math Concepts for the lowest students and Everyday Mathematics for the rest of the students. The importance of the program was to make significant gains of 10% or more in test scores for the low group using Connecting Math Concepts and giving the school a greater possibility to meet Adequate Yearly Progress in fourth grade mathematics. The significance of

the students' progress would help determine if the elementary school would take the first step out of school improvement. If students failed to improve in mathematics and other areas like reading, writing, and science, the elementary school would stay in school improvement and would move to the next step of school improvement.

Procedure

The Connecting Math Concepts class started every day by taking a three minute thirty second multiplication timed test. The teacher then went over the mathematical lesson for the day with students. The teacher worked out some mathematical problems with the students to see if the students understood the concepts of the lesson. Students then worked on the lesson in the hardback book and student workbook during the last thirty minutes of the mathematical period. After ten lessons students took a mathematical test and, depending on the scores, students were moved to another group if necessary. The Response to Intervention Team performed Classroom-Based Assessments twice a month to track student progress. The fourth grade teachers and the Response to Intervention Team met twice a month to decide which, if any ,students would be moved up or down into another mathematical group.

At the beginning of the school year, all fourth grade students were given a Measures of Academic Progress pre- test to determine the academic level of each student. After all fourth grade students completed the Measures of Academic Progress pre-test the Response to Intervention Team sorted students by ability and placed students in appropriate mathematical groups. The fourth grade teachers were not involved in placing students into groups. At the end of the academic school year, student's Measures of Academic Progress pre-test scores were compared to the Measures of Academic Progress posttest scores to determine if students' academic growth was obtained using Connecting Math Concepts and Walk-to-Math.

<u>Definition of Terms</u>

        <u>Annual Yearly Progress</u>. Annual Yearly Progress had come about from the No Child Left Behind Act. Originally the Annual Yearly Progress meant the school had to make 10% growth from the previous year's Washington Assessment of Student Learning scores. Each school and district has been given a grade in the state of Washington and after students finished taken the Washington Assessment of Student Learning.

        <u>Connecting Math Concepts.</u>   Connecting Math Concepts has been a direct instruction mathematical program, students used to help improve in addition, subtraction, multiplication, division, and fractions and also designed for low academic level students.

        <u>Everyday Mathematics.</u>   Everyday Math has been created as a spiral mathematical program designed for student improvement in mathematical skills and recommended from the Office of the Superintendent of Public Instruction of the state of Washington and was a comprehensive pre-kindergarten through sixth-grade mathematics curriculum.

        <u>Measures of Academic Progress.</u>   Measures of Academic Progress was a computerized test given to students during the academic school year as a pre/posttest measuring student's progress in mathematics and reading.

        <u>Walk-to-Math.</u> Walk-to-Math has been a way to ability group students for mathematics. Students were sent to different classrooms with students having similar ability in mathematics.

Walk-to-Read.   Walk-to-Read has been a way to ability group students for reading. Students were sent to different classrooms with students having similar ability in reading level.

Washington Assessment of Student Learning.   Washington Assessment of Student Learning, had be created as a state test given and taken by students in third, fourth, fifth, sixth, seventh, eight, and tenth grade in the state of Washington, students took the state test every April to meet the state's requirements.

Classroom-Based Assessment.   Classroom-Based Assessments were quick tests students were given to keep track of student's progress in mathematics.

<u>Acronyms</u>

<u>AYP.</u>   Adequate Yearly Progress.

<u>CBA.</u>   Classroom-Based Assessment

<u>CMC.</u>   Connecting Math Concepts

<u>DIBELS.</u> Dynamic Indicators of Basic Early Literacy Skills

<u>DI.</u>   Direct Instruction

<u>MAP.</u>   Measures of Academic Progress.

<u>NWEA.</u>   Northwest Evaluation Association

<u>OSPI.</u>   Office of the Superintendent of Public Instruction.

<u>RTI.</u>   Response to Intervention

<u>SIT.</u>   School Improvement Team

<u>WASL.</u>   Washington Assessment of Student Learning

CHAPTER 2

Review of Selected Literature

Introduction

Student achievement has been very low in all mathematical areas in the rural elementary school.   The Response to Intervention Team had decided to research different mathematical programs to see which mathematical program would best fit the needs of all the students. Connecting Math Concepts was the program 4th grade teachers and the Response to Intervention Team decided to adopt for low mathematical ability students after reviewing Washington Assessment of Student Learning test scores and analyzing low test scores. Connecting Math Concepts has been a direct instruction mathematical program which helped student's mathematic skills. The literature reviewed discussed the importance of direct instruction and grouping for instruction in the mathematical program, Connecting Math Concepts (Crawford & Snider, 1996). Connecting Math Concepts has been beneficial for lower level student's success in mathematics. Connecting Math helped improve basic mathematical skills, basic addition, subtraction, multiplication, division, fractions, and basic mathematical word problems. Connecting Math Concepts has been proven to helped students improve mathematical skills and find solutions to the problems of lower students not meeting state standards in mathematics (Engelmann, 1993).

The Response to Intervention Team along with the fourth grade teachers decided to try Walk-to-Math and Connecting Math Concepts together as part of an intervention program to help the lower students in mathematics. After ability grouping Connecting Math Concepts along with Walk-to-Math was used as an intervention program to help students with low mathematical abilities. There has been no known research on Walk-to-Math, but Connecting Math Concepts worked well in the author's elementary school. The author's elementary school has used the

model Walk-to-Math for the past two years.   Connecting Math Concepts has supported grouping by ability because the program has been designed as a direct instruction program designed for lower level mathematical students.   Walk-to-Math appeared to be the best approach and solutions in helping at risk students learn mathematics in the author's school. The reasoning for the decision behind using the model of Walk-to-Math was because the author's elementary school has used the model Walk-to-Read by ability grouping which has worked very well for the school. The school has been a reading first school for several years and Walk-to-Read was part of the reading First Program.

To avoid any labeling and hurting student's self- esteem the model Walk-to-Read had been used in the author's school for over six years and had worked well and helped make the decision to use the model Walk-to-Math with a mathematics program. Connecting Math Concepts and Walk-to-Math were programs which had gone hand and hand in setting up a well rounded mathematical program which served all students including English limited students in the author's elementary school. The model Walk-to-Math along with the program Connecting Math Concepts was used for the first time in the author's school in the 2008-2009 school year.

Connecting Math Concepts

Connecting Math Concepts Level D was designed as a direct instruction program to help students improve achievement in mathematics for students in fourth grade. The program was designed by McGraw-Hill and introduced students to new mathematic concepts. Connecting Math Concepts was designed for cooperative learning among students and a direct instruction program. Students developed a broad background by learning concepts and skills in several content strands using the Connecting Math Concepts program (Engelmann, 1993).   Students

learned about numbers and numeration which taught students to read write and use whole numbers, fractions, decimals and negative numbers (Engelmann, 1993).

Students had to learn operation's and computation by practicing addition and subtraction to proficiency; developing multiplication and division skills; exploring new methods of addition, subtraction, multiplication and division; inventing individual procedures and algorithms, and experiences with calculators. Students learned to explore metric and U. S. measurements; linear, area, volume, and weight, number lines, coordinates, and times. Connecting Math Concepts was designed for ongoing assessment, gathering information from students' everyday work. All assessments took place at the same time as instruction. The teacher did periodic assessments that had been built into the curriculum such as the end of unit tests (Crawford & Snider, 1996).

Connecting Math Concepts contained independent worksheets as homework for students. The independent worksheets reinforced the lessons taught which gave the students a stronger understanding of the mathematical concepts taught in the lesson (Connecting Math, 1993).

Connecting Math Concepts has conducted over thirty-seven studies; 173 comparisons for quasi-experimental studies over a 25 year span.   In one of the most expensive studies done was performed from 1968-1976 on 1,195 fifth graders which were put into two groups. The experimental group 624 students followed 567 through graduation. The experimental group used CMC direct instruction and the control grouped used a traditional mathematics program (Becker & Gersten, 1982). The results were as followed;

> Approximately 63% of the follow through graduation successfully finished high school, compared to approximately 38% of the controlled group. In addition, 37% of the follow through graduation applied to college (34% were accepted), while 22 % of the control group applied to college (17% were accepted), (Becker &Gersten, 1982, p. 1).

Connecting Math Concepts has proven to be a mathematical program which showed great results. In the mathematics program Connecting Math Concepts pre-tests and posttests have been a big part of the program. The program showed results over time and has been used not only as a main mathematical program but as an intervention program. Students gained and improved on all areas of mathematics skills (Crawford and Snider, 1996).

Connecting Math Concepts has been researched since the early 1990's, over twenty studies have been done on the program from researched-based to controlled and non-controlled studies were performed with the program Connecting Math Concepts (Crawford and Snider, 1996). The program was designed with variations in amount of time needed for learning each concept which easily accommodated by adjusting the number of minutes and the number of days spent teaching the concept.

The authors Crawford and Snider stated,

> Many important curriculum goals are made easier by organizing lessons into strands, such as sequencing of dozens of pre-skills, cumulatively introducing skills, and treating topics in depth. The presentations of key concepts in strands which run through several lessons allow the concepts to be arranged in a logical scope and sequence. Thus pre-skills can be taught prior to being integrated into more complex mathematical concepts (Crawford& Snider, 1996 p.25).

Connecting Math Concepts provided different strategies to help students feel successful in mathematics whether students were in a low level group or not. The program has helped improve mathematical skills.

Classroom-Based Assessments

Classroom –Based Assessments came about in response to the 2004 House Bill 2195. Classroom-Based Assessments were built from Washington state's learning standards (Classroom Based-Assessment, 2009). The Classroom-Based Assessments were given by the classroom teacher, but in the author's school the CBAs were given by the Response to Intervention Team. The RTI team were in charge of collecting all data and seeing if the new program, Connecting Math Concepts were helping students in improving mathematics skills.

Classroom-Based Assessments helped students and teachers better understand state standards and recognize the quality work which defined good performance in each content area. Classroom-Based Assessments helped teachers become more effective in gathering valid evidence of student learning related to the state standards (OSPI, 2009).   After gathering all data, teacher's received data on the improvement of students and from the data the 4th grade teachers along with the RTI team made decisions to see if students needed to be moved up a mathematics group or moved down a group. The data was also used to give students extra support in mathematics by using the program, Corrective Math Concepts, as an extra intervention for thirty minutes a day. Students who were in the programs Connecting Math Concepts were not in the program Corrective Math. Students in the Connecting Math Concepts program were making progress, so students did not need the extra help.

Walk-to-Read

Walk-to-Read meant students left homeroom classrooms and walked to a class where students joined students reading at the same instructional level for 90 minutes each day. Walk-to-Read lessons were tailored specifically to the educational needs of every group of students

(Muir, 2007).   Research had been found to support the model of Walk-to-Read and has worked

in the author's elementary school very well for several years.   The Walk-to-Read program end

result split students into different groups from low to medium, and medium to high trying to

have students move up groups as students increased achievement (Muir,2007).

Walk-to-Math

Walk-to-Math meant students left homeroom classrooms and walked to a class where

students joined similar students for 90 minutes each day. Using the Walk-to-Math model along

with a mathematics program of the school's preference and using mathematics lessons tailored

specifically to the educational needs of every group of students and every student working on the

lessons specified helped students improve mathematics. The model Walk-to-Math was chosen

from the benefits the model of Walk-to- Read had in the author's elementary school. No

research has been done on the model Walk-to-Math.

School Improvement

School Improvement provided a data-driven, researched –based framework for defined

goals and objectives for improving student learning and selecting and implementing strategies to

improve instructional effectiveness of every school. (OSPI, 2008). The mission for school

improvement has been to build and improve student achievement. The program has been

designed for a three year assistance program. Schools that did not meet AYP for three years in a

row then could apply to go into school improvement if the school district chose to. Once in

school improvement, the school set up a School Improvement Team.   The School Improvement

Team consisted of the principal, vice-principal, six teachers from grades kindergarten through

fifth, one special education director, and the school improvement facilitator. The school improvement team created a school improvement plan and implemented throughout the school year.

The author's school improvement plan stated that in the area of mathematics the school would obtain a mathematics coach for grades kindergarten through fifth grade. The plan required Everyday Mathematics for students at grade level and programs like Connecting Math Concepts would be used for students below grade level. The mathematics program Number World was required for grades kindergarten, first, and second. To keep track of the adopted programs and if improvement occurred, the School Improvement team used NWEA scores, curriculum tests, and CBA test scores. The plan started in the school year 2008-2009 and continued for the next three years.

Research on Mathematics

The author researched several articles on mathematics. One of the articles stated in order for students to be encouraged and have effective participation in mathematics the teacher must not get upset if a student did not understand something or made mistakes because students would build the fear of failure (Taplin, 2003). Another article the author found interesting spoke about the importance of cooperative learning techniques in mathematics. Students trained to work effectively in groups have shown wonderful results and have been very productive in a learning environment when working in mathematics (Glosser, 2009). Mathematics was not just researching or using cooperative learning but finding the mathematical program that worked for all students and met student needs. The state standards for the state of Washington had been reviewed and changed because not many students were passing or meeting the state test or

standards. First came Essential Academic Learning Requirements, then from the development of the EALRs came Grade Level Expectations and the state came out with a new way to view state standards and to replace the EALR's and GLE's. The new phase for the state of Washington was called Performance Expectations (OSPI, 2009). The state of Washington felt the need for improvement of state standards because of the low rate of students passing the state test and fewer students meeting the graduation requirements.

The author found several great articles, but the one that grabbed the author's attention was when an article which spoke about not building fear of failure in students. Teachers needed to build a sense of accomplishment in students, and teachers needed to also build a sense of accomplishment in students. Teachers need not fear failure when teaching students mathematics (Tallinn, 2003).

Washington Assessment of Student Learning

The Washington Assessment of Student Learning measured students' learning of skills knowledge important to students' success in school and life. The Education Reform Law passed in 1993 and the WASL was required in public schools. The Office of the Superintendent of Public Instruction created the WASL to measure student learning of the Essential Academic Learning Requirement standards. The WASL consisted of multiple-choice, short answer and extended-response questions. The WASL was used to see if students had met state and federal testing requirements. Students in third through eighth and tenth grade took the WASL each spring in reading and mathematics. Students were tested in writing at grades fourth, seventh, tenth, and grades fifth, eighth and tenth were tested in science. Teachers used the WASL scores to improve teaching methods and try to meet every student's needs (OSPI, 2007).

The Washington Assessment of Student Learning benchmark for each student was between 374 and 400 to meet standard. Student Performance Level Descriptors were broken down by score and grade level, students could earn: Basic (Level 2), Proficient (Level 3) and Advanced (Level 4). There were no descriptors for Below Basic (Level 1). The WASL was set up in four levels for parents to easily understand the scores, Well Below Standard(Level 1), Below standard(Level 2), Met Standard(Level 3), and Exceeds Standards(Level 4) (Office of Superintendent of Public Instruction, 2008). The score for fourth grade reading WASL, 275-374 was a level 1, 375-399 was a level 2, 400-423 was a level 3, and 424-475 was a level 4. In mathematics, 200-374 was a level 1, 375-399 was a level 2, 400-426 was a level 3, and 427-550 was a level 4. In writing the scoring was done differently. A score of 0-6 was a level 1, a score of 7-8 was a level 2, a score of 9-10 was a level 3, and a score of 11-12 was a level 4. In fourth grade students did not take the science WASL (OSPI, 2007).

Essential Academic Learning Requirements

Essential Academic Learning Requirements were mathematical standards built on Washington's commitment to teach mathematics content and mathematical thinking to students. The former Essential Academic Learning Requirements and Grade Level Expectations provided the foundation upon which to build new, challenging, accessible standards based on a few identified priorities at each grade level within a well-balanced mathematics program (OSPI, 2009). The former mathematics EALRs represented the development of mathematical content, reasoning, problem solving, and communication intended to be reflected in the new Washington State K–12 Mathematics Standards (OSPI, 2009).

The state of Washington has gone through several changes since the EALR's were first introduced. First came Essential Academic Learning Requirements then from the development of the EALRs came Grade Level Expectations and now the state had come out with a new way to view state standards and to replace the EALR's and GLE's. The new phase for the state of Washington was called Performance Expectations, (Performance Expectations, 2006).

Measures of Academic Progress

Measures of Academic Progress was a state-aligned program designed by the Northwest Evaluation Association (NWEA, 2009). "Teachers understand the importance of the Northwest Evaluation Association test center for students in Washington State and what they strongly believe in as a company, NWEA partners with educators to offer students assessment, scientifically-based research, and professional development" (NWEA, 2009, p.1). Measures of Academic Progress has been a state-aligned computerized adaptive assessment program which measured student progress. Measures of Academic Progress measured academic growth over time and the assessments were unique assessments adapted to each student's ability and what the student all ready knew and still needed to know.   Independent of grade level or age Measures of Academic Progress could be given up to four times a year to students and the results of the test helped teachers make student-focused data driven decisions which guided instructional planning and school improvement, (OSPI,2009) .

The Northwest Evaluation Association had an approach to test-retest reliability has been a more rigorous test of reliability.   The Northwest Evaluation Association refers to reliability across time and students can take the MAP test two to three times an academic school year. The MAP test students took consisted of the same number and types of items in the same structure

and the questions would be the same level of difficulty, measuring the same content with a domain. The pre-test and posttest consistency refers to performance of the test over time as stated;

The questions being answered with this type of reliability is, to what extent does the test administered to the same students twice yield the same results from one administration to the next? Answers to this question are stated in terms of a Pearson product-moment correlation coefficient (r). The minimum acceptable correlation is considered to be .80; 1.00 is a perfect correlation. NWEA's approach to test-retest reliability poses a more rigorous test of reliability. After a first test is given then in a span of a few months a second test is given comparable to the first, by virtue of its content and structure, differing only in difficulty level of items. It would seem unreasonable to expect reliability to drop below.80. However, as test retest reliability only dipped slightly below .80 twice, both at the grade two level. Most coefficients are in the mid-.80's to the low .90's (NWEA, March, 2004).

NWEA uses r-value to estimate reliability of the tests. The r-values reported range from 0.76 to 0.93 with most of the values being between 0.80 to 0.89. An r-value of 0.92 could easily mean over 25% of the data lies more than 6 points away from true. However, 6 points constitutes a year's normal growth (NWEA, March, 2004).

The validity of the NWEA tests consisted of mapping existing content standards for a state. The better a test measure what the test should measure the better the validity of the test given. The NWEA test came in a form of concurrent validity and expressed in the form of Pearson correlation coefficient. "The greater this correspondence, the greater the correlation

coefficient will be. A strong relationship (strong concurrent validity) is indicated when the correlations are in the mid-.80's."(NEWA, March, 2004).

In addition, MAP tests measured academic growth over time independent of grade level or age. The results provided teachers with timely information and guided instructional planning and school improvement (OSPI, 2008).

The students in the author's school district have taken the MAP test three times in a school year. The scores were used to determine if students made progress in the group students were placed in at the time. The NWEA Company has provided a valid and reliable means of gathering information about student growth and achievement and conducted research to assure validity and reliability on all data gathered. The NWEA Company scored the MAP test in four levels, Well Below Standard, Below Standard, Meets Standard and Above Standard. In order for fourth grade students to be at grade level after taking the MAP math test, students needed to score 195 points in fall and 209 points in spring to meet standard and anything higher was be considered above standard (NWEA, 2009).

Direct Instruction

Mr. Siegfried Engelmann and Dr. Wesley Becker along with other colleagues developed the Direct Instruction Model. The Direct Instruction Model has been around since the early 1960's when Mr. Siegfried and Dr. Wesley Becker developed the model. The DI model was designed because Mr. Engelmann and Dr. Becker believed all students learned if given a chance to succeed. Mr. Engelmann and Dr. Becker researched and studied the DI model first hand and realized the importance of using Direct Instruction. From all the research and data gathered over 20 case studies done by Mr. Engelmann and Dr. Becker, Mr. Engelmann developed Reading

Mastery using the data of the Direct Instruction model.   Reading Mastery has been a rigorously developed reading program based on the Direct Instruction Model (Sibert, 2005).

Direct Instruction method was built as a highly scripted method for teacher to teach students mathematics in a fast-paced. Teachers using the method of DI interacted more with students and the goal of DI has been to accelerate learning by maximizing efficiency in the design and delivery of instruction.   When DI was used to do assessments on student learning teachers were more involved and did progress-monitoring on a daily basis. The implementation of the model has relied on heavy use of screening assessments, progress-monitoring, and the use of the data from the assessments to constantly make changes in instruction. (Silbert, 2005).

Dr. Engelmann used Direct Instruction to help inner-city children learn and excel in reading and mathematics, Dr. Engelmann stated,

This method, rich in structure and drilling and content, is the opposite of the favored methods of today's high-paid education gurus, and contradicts the popular theories that are taught to new teachers in our universities. The method continues to bring remarkable success at low cost when it is implemented (Schug & Traver,2001, p. 1).

Dr. Engelmann and Dr. Becker had performed over twenty-one research studies, everything from controlled to uncontrolled classrooms. One of the studies performed was in the Milwaukee Public School system. The worst school was chosen, the principal and faculty worked together and explored and put into action the Direct Instruction method soon the results were apparent.   Dr. Engelmann and Dr. Becker stated the following findings, "In the case study the percentage of fourth graders who scored proficient or better in reading on the state's standardized tests rose from 22% in 1997-'98 to 57% in 1999-2000. In mathematics, the

proficient or better score rose from 11% to 48% over the same period. In social studies, the

increase was from 13% to 60 %" (Schug, 2001, p.2).

Summary

        The research literature showed the different techniques and styles for teaching

mathematics to all levels of students. The author read several articles and found the importance

of understanding, the information used must contain data to support what was stated. The author

found importance of understanding the state requirements and standards and building a well

rounded mathematical program which meets all need of students.   The author also learned the

difference between Direct Instruction compared to traditional methods used in mathematics.

One important thing was teachers would not fear failure if not successful in mathematics, but yet

feel the need to try new and positive methods which have been proven and researched in order to

meet all student needs, no matter from what economic level students come from.

CHAPTER 3

Methodology and Treatment of Data

Introduction

Walk-to-Math along with Connecting Math has been put in place to help at risk students in fourth grade.   The project studied consisted of an academic school year implementation of mathematics intervention. After fourth grade teachers reviewed the students' Washington Assessment of Student Learning test scores in fourth grade and noticing students in fourth grade were not making gains in mathematics, the fourth grade teachers decided to try Walk-to-Math. The fourth grade team consisted of five teachers. The fourth grade teachers along with the Response to Intervention Team decided to try Connecting Math help meet the needs of students found to be very low academically in the mathematical area.

Methodology

The research was a quasi-experimental form. The mathematical class was made up of seventeen students, two Anglo and fifteen Hispanics. A new researched based mathematical program ,Connecting Math, was used. The purpose of the program was to improve student's mathematics skills in addition, subtraction, multiplication, division, and fractions. The purpose of the program, Connecting Math, was also to see if growth occurred from fall to winter and fall to spring in mathematics. All fourth grade students in the Connecting Math program were given a pre/posttest using MAP as the measuring tool.   The scores were taken and a statistical test using a non-independent t-test was completed.

<u>Participants</u>

   The 17 fourth grade students in the research based program Connecting Math came from 5

different fourth grade classrooms in the rural elementary school in the state of Washington. The

ethnic basis of the majority of the seventeen students came from low-income families and

received free or reduced lunch.   The classroom had two Anglo students and fifteen Hispanic

students at the same mathematical level or very, very close to the same level.

      The demographics of the Connecting Math classroom consisted of five girls and twelve

boys. Two of the students were white and the other fifteen Hispanic. The classroom had one

highly qualified teacher and a high school student helper. The high school student helped in the

classroom for thirty minutes a day and assisted students as needed. The ability of all seventeen

students in the classroom appeared to be at the same level with the exception of one monolingual

student and one limited English student.

      The environment in the classroom had been one of learning and respect. The behavior in

the classroom had been a safe and comfortable environment with the exception of one student

diagnosed as having behavioral and anger management problems. The student sometimes

disrupted the classroom and interfered with student learning. The students in the Connecting

Math class had been placed by the five 4th grade teachers and the Response to Intervention Team

after analyzing the students' Measures of Academic Progress test scores. From looking at the

scores students were placed in ability groups and started Walk-to-Math at the beginning of the

2008-2009 school years using the Connecting Math program. The students in the Connecting

Math classroom were expected to earn 78% or better on seatwork, homework, and chapter tests.

In addition, all students which started at the beginning of the school year in the Connecting Math program, finished to the end of the school year. No one was added to the program or moved out of the program.

Instruments

The MAP assessment program was the assessment used in the study by the author. The MAP measured accurately what the students knew and what students needed to learn. The assessment has been adapted to each student's ability level and provided accurate results. The assessment MAP measured student growth over time and the NWEA site gathered the data and posted the results on the NWEA website (NWEA, 2009).

After fourth grade teachers reviewed the students' Washington Assessment of Student Learning test scores in fourth grade and noticing students in fourth grade were not making gains in mathematics, the fourth grade teachers decided to try Walk-to-Math. The fourth grade team consisted of five teachers. The fourth grade teachers along with the Response to Intervention Team decided to try Connecting Math the mathematical program to help meet the needs of students found to be very low academically in the mathematics area.

Design

The quasi-experimental form was not scientific because the Connecting Math classroom did not have a control group. The Connecting Math classroom used MAP scores from fall to winter and from fall to spring to see if growth happened over time. The students went to the computer lab and took the MAP in the fall, winter, and spring.

<u>Procedure</u>

  The Connecting Math class started every day by taking a three minute thirty second multiplication timed test. Students worked on a lesson in the hardback book and student workbook during the last thirty minutes of the mathematical period. After ten lessons students took mathematics test and, depending on the scores, students were moved to another group if necessary. The author of the paper has been teaching Connecting Math since the beginning of the school year. The fourth grade teachers and the Response to Intervention Team met twice a month to decide which, if any ,students should be moved up or down into another mathematical group.

  At the beginning of the school year, all fourth grade students were given a Measures of Academic Progress pre- test to show the academic level of every student. After all fourth grade students completed the Measures of Academic Progress pre-tests the Response to Intervention Team sorted students by ability and placed students in appropriate mathematics groups. Fourth grade students participated in Walk-to-Math for ninety minutes every day using Connecting Math for intensive students.

  At the end of the academic school year the scores of students who took the Measures of Academic Progress pre-test were compared to winter and spring posttest to determine if significant academic growth was made in mathematics. One of the 5 fourth grade teachers had used Connecting Math Concepts and the other 4 fourth grade teacher had been using Everyday Mathematics.

Treatment of the Data

The collection of data comprised of the NWEA fall to winter MAP mathematics assessment test scores and the fall to spring MAP mathematics assessment test scores. The Connecting Math classroom took the MAP mathematics assessment test three times during the school year, to determine if growth occurred.

After gathering and collecting all the data the author ran t-tests. The author used a Stak-Pak for computation of the data gathered. The first, t-test used the NWEA mathematics MAP assessment test scores from fall to winter as shown. The next, t-test used the NWEA mathematics MAP assessment test scores from the fall to spring. Again, the author used and completed a Stak-Pak for computation of the data gathered from fall to spring.

Summary

After gathering and collecting all data the author used a Stak-Pak for computation of the information. The author also completed t-tests using the NWEA mathematics MAP assessment test scores for fall to winter and fall to spring.

CHAPTER 4

Analysis of the Data

<u>Introduction</u>

Students in 4th grade at the rural elementary school made few gains in mathematical test scores as measured by the Washington Assessment of Student Learning. The placement of students in the Walk-to-Math program and Connecting Math Concepts were based on the Washington Assessment of Student Learning test students took in third grade.   The comparison of fall to winter showed growth, but the comparison from fall to spring showed significant growth over the school year.

<u>Description of the Environment</u>

The town was a farming and agricultural community in the state of Washington. The author's elementary schools population was 717 students. Over all 52.2% were males and 47.8% were females in the elementary school in the rural town. The ethnicity of the school was 0.3% Asian, 0.1% Black, 81.5% Hispanic, and 18.0% White. The school's special programs were 84.0% free and reduced meals, 12.7% special education, 55.7% transitional bilingual, and 25.1% migrant. The forty-one teachers of the school have been highly qualified as documented on statistics included in the Washington State Report Card (Office of the Superintendent of Public Instruction, 2007).

The demographics of the author's classroom were seventeen students, five girls and twelve boys. Two of the students were white and the other fifteen Hispanic. The classroom has had one highly qualified teacher and a high school student helper. A high school student helped in the classroom for thirty minutes a day and assisted students as needed. The ability of all

seventeen students in the classroom appeared to be at the same level with the exception of one monolingual student and one limited English student.

The environment in the classroom had been one of learning and respect. The behavior in the classroom had been a safe and comfortable environment with the exception of one student diagnosed as having behavioral and anger management problems. The student sometimes disrupted the classroom and interfered with student learning. The students in the author's class have been placed by the five 4th grade teachers and the Response to Intervention Team after analyzing the students' Measures of Academic Progress test scores. From looking at the scores students were placed in ability groups and started Walk-to-Math at the beginning of the 2008-2009 school years.

Hypothesis/Research Question

Low performing fourth grade students using Connecting Math and the Walk-to-Math model will make greater than expected growth in mathematics as measured by a pre-test/ posttest from fall to winter by the use of a t-test to measure growth.

Low performing fourth grade students using Connecting Math and the Walk-to-Math model will make greater than expected growth in mathematics as measured by a pre-test/ posttest from fall to spring by the use of a t-test to measure growth.

<u>Null Hypothesis</u>

Low performing fourth grade students using Connecting Math and the walk-to-math model will not make greater than expected growth in mathematics as measured by a pre-test/ posttest from fall to winter by the use of a *t*-test to measure growth at the .05 level of significance.

Low performing fourth grade students using Connecting Math and the walk-to-math model will not make greater than expected growth in mathematics as measured by a pre-test/ posttest from fall to spring by the use of a *t*-test to measure growth at the .05 level of significance.

<u>Results of the Study</u>

Figure 1.

<u>*t*-test of Fall Pre –Test and Winter Posttest Results for NWEA Math Scores</u>

Test	N	Mean	Standard Deviation
Pre	17	187.0	9.08
Post	17	191.82	8.83

df= 16	t= 2.85	p<.001

The results showed students in Connecting Math showed significant achievement as shown in Figure 1.   The null hypothesis was rejected. Students made greater than expected growth.

Figure 2.

<u>t-test</u> of Fall Pre-Test and Spring Posttest Results for NWEA Math Score

Test	N	Mean	Standard deviation
Pre	17	187.00	9.08
Post	17	196.24	10.21

df= 16		t= 5.26	p< .001

The scores showed students in Connecting Math showed significant achievement as shown in Figure 2. The null hypothesis was rejected. Students made greater than expected growth in one year.

<u>Findings</u>

The data gathered indicated the improvement in student learning in the mathematics program, Connecting Math Concepts, using Walk-to-Math, as measured by the pre-test and the posttest. Students in Connecting Math Concepts made significant progress in mathematics from fall to winter as indicated on the NWEA scores. Therefore the first hypothesis was supported by the data gathered between fall and winter. The null hypothesis was than rejected.

The second null hypothesis was rejected by the data and information gathered. Students in the intervention mathematics program ,Connecting Math Concepts, using Walk-to-Math made greater than expected gains from fall to spring as indicated by the NWEA scores. After reviewing all data gathered from the Stak-Pak and the t-tests performed, the results showed students in the Connecting Math Concepts classroom made great gains.

The results of the success of the program are shown in the NWEA mathematical test scores taken by the students in the Connecting Math Concepts classroom. The students in the Connecting Math Concepts classroom were given the mathematical MAP pre-test in the fall.

The students in the class averaged 187 points and, in order to be at grade level in the fall students had to score 202 meaning students were about 15 points below grade level. The students in the Connecting Math Concepts class took the posttest in the spring again and averaged a score of 196 points, to be at grade level by spring students needed to score 209 points on the mathematical MAP test. By looking at the scores students were not at grade level, but did make significant growth in the low academic mathematical class (NWEA, 2009).

Discussion

After review of student WASL mathematics scores and NWEA mathematics scores, the RTI team and the fourth grade teachers decided to use the Connecting Math program and using Walk-to-Math for the lower level students. The program was designed as a direct instruction program to help improve student mathematics scores. The fourth grade students were ability grouped by mathematics WASL and NWEA mathematics scores. Then students were placed in groups by ability and students used the model Walk-to-Math. The Walk-to-Math model was used in the elementary school for the first year. By using together the program Connecting Math Concepts and the model Walk-to-Math all students in the Connecting Math Concpets, program were very successful.

Summary

The author of the paper reviewed all the data gathered and found significant growth. The two null hypotheses were rejected after the author reviewed all data gathered from fall to winter NWEA mathematics scores and from fall to spring NWEA mathematics scores. Students made greater than expected growth in using Connecting Math Concepts program and using Walk-to-Math after review of all the data gathered.

CHAPTER 5

Summary, Conclusions and Recommendations

<u>Introduction</u>

After fourth grade teachers reviewed the students' Washington Assessment of Student Learning test scores in fourth grade and noticing students in fourth grade were not making gains in mathematics, the fourth grade teachers decided to try the Walk-to-Math model along with Connecting Math Concepts, a mathematical program designed to help meet the needs of students found to be very low academically in the mathematical area.

<u>Summary</u>

In order to help improve test scores in mathematics, fourth grade teachers decided to try Walk-to-Math using Connecting Math as one of the mathematics programs. At the beginning of the school year, fourth grade students were given the Measures of Academic Progress pre-test and at the end of the school year students were given the Measures of Academic Progress posttest to determine if students made adequate growth using Connecting Math Concepts and Walk-to-Math.

The program Connecting Math Concepts was designed with variations in amount of time needed for learning each concept and could easily be accommodated by adjusting the number of minutes and the number of days spent teaching the concept of each lesson. The authors Crawford and Snider stated,

Many important curriculum goals are made easier by organizing lessons into strands, such as sequencing of dozens of pre-skills, cumulatively introducing skills, and treating topics in depth. The presentations of key concepts in strands which run through several

lessons allow the concepts to be arranged in a logical scope and sequence. Thus pre-

skills can be taught prior to being integrated into more complex mathematical concepts

(Crawford& Snider, 1996, p. 130).

Conclusions

In conclusion, Connecting Math Concepts and the model ,Walk-to-Math ,were beneficial

in the improvement of lower level mathematics students. Significant growth was made by the

students placed in the Connecting Math concept program. By using the model, Walk-to-Math,

and placing students in the appropriate levels in mathematics, the students' scores rose

significantly. The RTI Team along with the 4th grade team were delighted in the student's

growth by using Connecting Math Concepts and the Walk-to-Math model.

After gathering the data of the MAP test scores from fall to winter and fall to spring and

running the statistical test on each of the two sets of scores, the findings were greater than

expected. The findings showed significant growth in both statistical tests completed from fall to

winter and fall to spring.

Recommendations

Further studies of other grade levels would be an appropriate next step to determine if the

model ,Walk-to-Math ,along with the program ,Connecting Math Concepts ,would be beneficial

in improving student mathematics skills. The author would like to see the mathematics program,

Connecting Math Concepts ,and the model, Walk-to-Math, used in lower and upper grades and

keep track of students' progress by using Classroom-Based Assessments, Measures of Academic

Progress, and curriculum tests or assessments. The mathematics program and the Walk-to-Math

with all assessments would be good to use and keep track for more than one year to see if

progress continues over a longer period of time.

The mathematics program, Connecting Math Concepts , has been a direct instruction program, but the author would like to try a different mathematics program, which is not a direct instruction program along with the model ,Walk-to-Math ,to see if indeed progress is seen with students using a different program, for example Everyday Mathematics.

The No Child Left Behind Act helped set the framework to close the achievement gap by trying different programs to help students succeed in mathematics and all subjects. Mathematics has important skills for students to learn in order for students to apply to everyday life. Learning mathematics would help students in shopping, earning a salary, and contributing to society. Students must learn mathematics in order to meet graduation requirements in schools and later on to meet graduation requirements for the state. Mathematics has been one of the most important concepts for which students must be learned in order to be successful in school and in everyday routines.

The research conducted in this study concluded Connecting Math Concepts along with Walk-to-Math had positive results with 4th grade students in a rural elementary school in the state of Washington. The students showed significant growth when given a pre-test and a posttest using the Measures of Academic Progress and comparing the data. The results were favorable and the program appeared to be a success.

The authors recommendations would be improvement is needed to make Connecting Math Concepts and the Walk-to-Math model more successful. One thing would be to have one low group, one mid-high, and two high groups, instead of just having one low group and the other four groups at the same level. The Walk-to-Math model would still be used along with the chosen mathematics curriculum. The author feels this would be a better way of Walking-to-Math and having students feel successful in mathematics.

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APPENDIX

Table 1.

NWEA Data Pre-Test and Posttest for Students Fall and Winter scores

STUDENTS	Fall NWEA Data Pre-Test	Winter NWEA Data Posttest
A	206	200
B	189	195
C	187	201
D	198	200
E	175	179
F	192	189
G	195	204
H	190	183
I	174	180
J	185	196
K	170	174
L	193	198
M	178	200
N	188	193
O	185	186
P	189	193
Q	185	190

Table 2.

NWEA data Pre-Test and Posttest for Students Fall and Spring

STUDENTS	Fall NWEA Data Pre-Test	Spring NWEA Data Posttest
A	206	200
B	189	205
C	187	210
D	198	203
E	175	185
F	192	196
G	195	210
H	190	192
I	174	173
J	185	197
K	170	179
L	193	202
M	178	189
N	188	199
O	185	205
P	189	196
Q	185	195