Using the Connected Math Project to Improve Seventh Grade Math Scores at Wapato Middle School

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A Special Project

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FACULTY APPROVAL

Using the Connected Math Project to Improve Seventh Grade

Math Scores at Wapato Middle School

Approved for the Faculty

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ABSTRACT

The author of this paper was puzzled for two years about the seeming lack of basic math skills of his incoming students. Even though the school had been proactive in finding a new curriculum before it was demanded of them by the state, it seemed state test scores had risen at first, but had gone flat for two years. Daily math tasks as assigned by the author had not been accomplished in a manner that was appropriate for the grade. The researcher decided to pursue a study that would compare the Orleans-Hanna Algebra Prognosis Test scores of students from 2004 that had been taught from a traditional math curriculum with the scores of students that had been taught using the newer Connected Math Project. After the principal of the school gave permission for the test to be administered, the test scores were then compared.

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CHAPTER 1

Introduction

Background for the Project

Wapato Middle School (WMS) students have been working to improve their Washington Assessment of Student Learning (WASL) mathematics scores. The adopted curriculum for reading and writing has raised scores dramatically in those areas, but mathematics declined during the 2005-2006 school year. These test scores were used to satisfy the federal government's requirements for reporting under the No Child Left Behind Act (NCLB).

As noted by Governor Christine Gregoire (2007), Washington State now operates in a global economy, at the forefront in trade with Pacific Rim nations. Washington needs students of mathematics and engineering that can keep our state on the cutting edge of manufacturing technology for aerospace, computer science, agriculture, and other fields that use engineers and mathematicians. The Governor recommended spending more money on the infrastructure of our human capital, including updating our teacher standards. The Governor was quoted by James Joyce in the Yakima Herald-Republic (2007) as follows: "our students need more math and science even for the military or the work force, let alone college" (p.1).

Washington State Representative Glenn Anderson (2007) asserted in his letter to Governor Gregoire on November 7, 2007, from the Washington Learns

Steering Committee, that “based on generally accepted standards of educational achievement, both nationally and internationally, the children of Washington are on average both less educated than their global peers and their own parents” (p.1).

The researcher (Timothy Fauth) did not believe that the WASL, which was a criterion-referenced test, was a good test for our state to be using. Such tests have frequently used questions that are directly or indirectly linked to the socioeconomic status (SES) of students. As such, they do not always accurately reflect the true learning of our students. (Popham, 2004, p. 46.) Popham also asserted that such state tests often have so many curricular aims that it is virtually impossible to get students ready for the test.

Due to some limitations inherent in high-stakes testing, many school districts in our state have fallen short in their quest for higher mathematics scores. As a result of this shortfall, some districts have looked to curriculum resources as a way to help boost their mathematics performance. In 2005, the Wapato School District adopted the Connected Math Project (CMP) curricular and instructional model for the purpose of improving student’s mathematics scores at WMS.

The concern of the researcher was based on students who, anecdotally at least, continued to come to his room with basic math skills that appeared to be getting worse instead of better.

Statement of the Problem

Anecdotal evidence indicated that seventh graders in the researcher's classroom were continuing to struggle with mathematics. Accordingly, the researcher decided to test this population of students to determine if they were improving at algebra-readiness, and whether the CMP curriculum caused them to lose ground in basic mathematics skills.

Phrased as a question, the problem which represented the focus of the present study may be stated as follows: Did the CMP curricular and instructional intervention enhance mathematics scores of participation students at WMS?

Purpose of the Project

The purpose of this experimental research project was to determine whether the CMP curricular and instructional intervention improved mathematics scores as measured by the Orleans-Hanna Algebra Prognosis Test (OHAPT). To accomplish this purpose, a review of selected literature was conducted, baseline data were obtained and analyzed, and related conclusions and recommendations were formulated.

Delimitations

The population enrolled in the researcher's room at the time the OHAPT was administered (March 2007) included fourth period students with the second-highest mathematics scores in the WMS seventh grade. This group's mathematics

scores were compared with OHAPT mathematics scores from seventh graders from the fourth period in the researcher's room from March, 2004. The OHAPT was administered during one class period of about 50 minutes each year. The investigator (Timothy Fauth) personally graded test results from both groups of students. Students used OHAPT test booklets in English or Spanish and no individual help was provided by the test proctor. No calculators were allowed, but scratch paper was permitted. The answer sheet was a bubble-in form, and it was collected at the end of the examination.

Assumptions

The assumption was made that 2007 student participants received the same mathematics curriculum and instruction as 2004 participants. All participants were taught using CMP. Mathematics teachers at WMS had been provided special CMP training recommended by the publisher and Educational Service District 105(ESD 105) to assure their proficiency when using the CMP materials. All teachers were considered highly qualified to teach the CMP intervention and mathematics curriculum. The further assumption was made that all mathematics teachers at WMS wanted to teach the students and that participating students were eager to learn. The environment at WMS was considered safe and comfortable for the general population of students.

Hypothesis

Mathematics scores of seventh grade students at WMS who received CMP intervention and curriculum instruction will show significant improvement when measured by the OHAPT assessment test.

Null Hypothesis

Mathematics scores of seventh grade students at WMS who received CMP intervention and curriculum instruction will show no significant improvement when measured by the OHAPT assessment test. Significance was determined at p

$\geq$ 0.05, 0.01, and 0.001 levels.

Significance of the Project

Students need basic skills, reading, writing and mathematics, to survive in life. Wapato School District administrators were aware that mathematics scores of students in Wapato were falling behind and, as a result, community support for schools was suffering. The determination was therefore made to adopt CMP intervention and mathematics curriculum to improve student's mathematics scores. Specifically, WMS was currently on a School Improvement Plan (SIP) and under considerable pressure to improve mathematics scores. If unable to improve mathematics scores the district was in jeopardy of losing some control of

local schools and might be limited in making future decisions concerning curriculum and the implementation of various teaching practices. The present study was also undertaken to provide the district with the data needed to address the SIP.

Procedure

Procedures followed in the present study evolved in several stages, including:

1. As early as 2000, WMS administrators became concerned about declining mathematics scores at the middle school level.
2. During the 2004-2005 school year, the CMP intervention and mathematics curriculum model was adopted to improve mathematics scores.
3. In February, 2007, the investigator sought and received permission from Mr. Kelly Garza, Principal at WMS, to undertake the present study.
4. Throughout the 2006-2007 school year, the investigator obtained and analyzed baseline date from the 2003-2004 and 2006-2007 school years to determine any significant improvement in student's mathematics scores.
5. During April and May, 2007, the investigator completed data analysis and formed related conclusions and recommendations.

Definition of Terms

Significant terms used in the context of the present study have been defined as follows:

constructivism. A style of learning that requires students to construct meaning from their learning activities. It takes more time than traditional methods.

direct instruction. A method of teaching that is teacher-oriented, requiring great depth of knowledge and preparation. It is useful for teaching algorithms and lists of terms and ideas.

experimental research. "Research in which at least one independent variable is manipulated, other relevant variables are controlled, and the effect on one or more dependent variables is observed" (Gay & Airasian, 2000, p. 623).

indirect instruction. A method of teaching that is student-centered, requiring good classroom management skills and rapport with the students. It is useful for teaching ideas that require student input and project-based learning. It is also good for inquiry-based learning.

mastery learning. A style of learning that requires a considerable amount of time for students to be able to learn thoroughly all the concepts of a lesson.

Orleans-Hanna Algebra Prognosis Test. The assessment test used to determine whether the CMP curriculum and instructional intervention model will improve mathematics scores.

prognosis. A prognosis test will forecast the abilities of the student to succeed in a given area that can be tested.

school improvement plan. The State of Washington has the ability to help schools that are not making adequate yearly progress as defined by the State's test of basic skills. These schools may then request funding from the state for help in implementing a school improvement plan.

t-test for independent samples. "A parametric test of significance used to determine whether there is a significant difference between the means of two independent samples at a selected probability level" (Gay & Airasian, 2000, p. 629).

Acronyms

CMP. Connected Math Project

ESD 105. Educational Service District 105

GLEs. Grade Level Expectations

NCLB. No Child Left Behind

NCTM. National Council of Teachers of Mathematics

OHAPT. Orleans-Hanna Algebra Prognosis Test

OSPI. Office of the Superintendent of Public Instruction

SES. Socioeconomic Status

SIP. School Improvement Plan

WASL. Washington Assessment of Student Learning

WMS. Wapato Middle School

WSC. Wapato School District

CHAPTER 2

Review of Selected Literature

Introduction

The review of selected literature presented in Chapter 2 has been organized to address the following topics:

1. Mathematics Through Time
2. National, State and WSD Mathematics Standards
3. Today's Mathematics Students
4. Best Practices in Teaching Mathematics
5. Summary

The preponderance of research cited on the following pages was current primarily within the past seven years. Key resources/references included internet, Proquest, a hand-search of selected professional journals, and Wapato School District data bases were consulted.

Mathematics Through Time

According to Millmore (2007), the Egyptians and Greeks first developed higher-level mathematics. The Egyptians have been credited with developing the ten-base mathematics system, using the following ideas to express numbers: A stick represented one; a horseshoe ten; a coil of rope one hundred; a lotus plant one thousand; a finger ten thousand; a frog one hundred thousand; and a god with up-raised arms one million. Using these concepts and symbols, the Egyptians would have been able to exercise their obviously great skill in numbers, evidenced by their great civilization, engineering feats, and advances in medicines.

Williams (2005), contended that much of our knowledge of ancient mathematics has been colored by a euro-centric view. This authority offered as

proof some letters written by Benjamin Banneker to Thomas Jefferson in 1791. In the letters, Mr. Banneker asked Jefferson to understand that Africans in America were in a deplorable condition mentally because of their treatment, not because of their inherent abilities, as earlier surmised by Jefferson.

Mankiewicz (2000), explained how mathematics has evolved through time is rather a misty, and hard to read story. Mankiewicz referenced some of the oldest mathematics records from the Babylonian period, where the base sixty for timekeeping was employed. This authority explained how the positional symbol, or zero, did not come into play until about the sixth century, B.C., and is still in use today.

National, State, and WSD Mathematics Standards

On a national level, the National Council of Teachers of Mathematics (NCTM, 1999), has helped shape mathematics standards, according to an NCTM publication entitled Teaching Children Mathematics. Often cited NCTM mathematics standards included:

1. Number Sense including: Whole Numbers and Fractions, Decimals, Ratio & Proportion, Integers, Order of Operations and Properties.
2. Probability and Statistics including: Representing and Describing Data, Probability, and Investigations.
3. Geometry and Measurement including: Units of Measure, Comparisons, and Coordinate Grid.

4. Algebra including: Variables, Expressions, Relationships, Equations, Exponents, and Functions.

Jehlen (2007), focused recent research on the recent emersions of high-stakes testing in the area of mathematics. In the opinion of this authority, it appeared as though high-stakes testing has brought about nothing more than a better level of mathematics coaching. Jehlen cited a Harvard University testing expert, Daniel Koretz, who described how students in a Kentucky school were scoring about a half-year above average, but the school wanted to show improved mathematics scores. A new test was implemented and the mathematics scores went down. After four years of preparing for the test, scores improved significantly. Jehlen concluded that when students are repeatedly administered the same test, scores will improve.

In the State of Washington, the Office of the Superintendent of Public Instruction (OSPI) has recently adopted mathematics standards for all students. Their requirements can be found on OSPI Grade Level Expectations (GLEs). Included in GLEs are the following standards:

1. Number Sense including: Numbers & Numeration, Computation, Estimation.
2. Measurement including: Attributes & Dimensions, Approximation & Precision, Systems & Tools.

3. Geometric Sense including: Shape & Dimensions, Relationships and Transformations.
4. Probability and Statistics including: Chance, Data Analysis, Prediction & Inference.
5. Algebraic Sense including: Relations & Representations, Operations.

To address the problems presented by declining mathematics scores the WSD adopted the Connected Math Project (CMP), during the 2004-2005 school year. Mathematics standards cited in the CMP included:

1. Number & Operations including: Whole Numbers, Decimals, Fractions, Ratio & Proportion, Percents, Integers, Large & Small Numbers, Irrational Numbers, Real Numbers, Combinations, Order of Operations, Properties.
2. Data Analysis & Probability including: Data Investigation & Representation, Describing Data, and Probability.
3. Measurement including: Angles, Perimeter, Area, Volume, Surface Area, Finding Missing Lengths, Indirect, Temperature and Units of Measure.
4. Geometry including: Lines, Angles, Polygons, Circles, Three-Dimensional Figures and Transformations.
5. Algebra including: Variables, Patterns, Rules, Expressions, Relationships, and Linear, Cubic, Exponential, and Nonlinear Equations; Linear, Quadratic, and Exponential Functions, and Graphing.

According to Pulaski (1980), advocate claimed high stakes testing measures the ability to think constructively and to solve actual-world problems. However, Pulaski concluded it was meaningless to try to measure all students with the same tool, as each student thinks in different ways, and learns at different speeds.

Today's Mathematics Students

A recent initiative, promoted by the National Leadership Council for Liberal Education and American Promise (NLCLEAP), has been working with business and education leaders of our country for about ten years. According to Anne Lewis (2007), there was a concern that college graduates will not have the skills needed in the marketplace to help themselves or their country maintain its preeminence in world trade markets. It was not enough for college graduates to have utilitarian skills, but they should have cross-discipline knowledge of science, global culture, and technology. Creative and innovative reasoning and problem-solving skills will be most helpful in today's and tomorrow's workplace.

The NLCLEAP is calling for more emphasis on community service internships and capstone courses as part of the student's experiences on campus. More has been demanded of a student body that is increasingly coming to the table with less to start with. Student demographics in the United States today is characterized by a population comprised nearly one-half of those from poor families, and the other half from minority families.

In another article, Blanc and Simon (2007), argue that we have been "under-investing in the children of the poor" (p. 503). The researcher agreed that if we did not spend money on the education of our children, then we would spend money on them in the justice system. This will cost the taxpayer either way. If we educate people, at least they have a hope of being productive citizens that will pay into the system for the next generation.

The concept of educating the masses has puzzled the world of education since the beginning of the public school system. Connors (2007), stated that "mediocrity has become the new excellence" in the classroom (p.518). Connors further stated: "the new thinking calls for inclusion on a grand scale. We are supposed to eliminate tracking and educate the entire range of abilities and interests in the same room at the same time" (p. 518).

According to Connors, we are now offering a weakened, diminished product to the American business owner and the public, test-makers are tinkering endlessly to find the single, magic standard in reach of everyone. Colleges are teaching young teachers just emerging from school to be "eager to embrace the notion that they can educate all equally in a one-size-fits-all classroom." These teachers are called "good teachers" while the older teachers who say "give me a break" to the idea of one classroom for all students, are now called "bad teachers" (p. 522).

When quoting the famous educational psychologist Piaget, Pulaski explained how children enter the age of reason at seven, and are able to think in a concrete manner. They are able to associate groups and multiply groups, based on characteristics as shared by groupings. They also understand the logic of relations and are able to group things in ascending and descending order. However, adolescents are capable of inferential or second-order thinking, and "they are able to consider entire experiments, holding all variables the same while changing one at a time (p. 69). This allows for much more complicated thinking, and at this age, the child is ready to begin learning algebra, which requires abstract thinking. The child is then able to reach conclusions based on logic. The problem that continues to frustrate educators, however, is even though the child develops in a predictable and sequential spiral there is nothing that makes them learn at a predictable pace, because each child progresses at different rates.

The Wapato School District today faces the challenges from students of high minority and high poverty levels. According to the Washington State Report Card listed on the OSPI website (2007), of 776 students enrolled at Wapato Middle School, 91% receive free and reduced lunch, 28% are from migrant families and nearly all minorities.

Vygotsky, referenced by Rozycki and Goldfarb (2000), taught that children should be presented with material that is above them at the next level of development. As explained in Vygotsky's Theory of Transmission and the "zone

of proximal development is the difference between a child's capacity to solve problems on his own, and his capacity to solve them with assistance" (p. 3). Teachers should have the time to watch children work and play, and be prepared to present them with the proper items to continue progressing through their education.

Teachers also needed to be cognizant of the concept of multiple intelligences, and how this approach can affect a child's learning. Gardner challenged some of Piaget's ideas, such as believing that a child could only exist in one level of development at a given time. Gardner questioned that intelligence was a single entity, but could mature in different places and at different rates (Gardner, 2007).

Bloom (2007), was another educational psychologist that left a lasting mark on educational thinking. Bloom proposed that learning was arranged in six levels, with knowledge being the base, moving on then through understanding, application, analysis, synthesis, and finally evaluation. These different types of learning can be characterized by the following verbs used during teaching time: Understand, elaborate, organize, list, show, re-tell, use your own words, etc.

Best Practices in Teaching Mathematics

Gilbert & Gilbert (2002), referenced the constructivist approach to teaching. This indirect teaching method required more time for students and, correspondingly, better classroom management skills. Students seemed to enjoy

their class-time more with the constructivist approach, but it was easier for the unmotivated student to waste time, and not only for themselves, but for those around them.

Gilbert & Gilbert (2002), quoted John Dewey as follows:

> "Perhaps the greatest of all pedagogical fallacies is the notion that a person learns only the particular thing he (or she) is studying at the time" (p.522). We have known that many forces from inside and outside the classroom affect how and what the student learns. It is important that students be allowed to study in a safe environment" (p. 523).

Borich (1996), described constructivism as a movement in the educational world that has encouraged teachers to learn to present lessons that will allow students to "use their own experiences to construct meaning" (p. 288).

One of the first methods of instruction by most teachers has been called direct instruction, an efficient way to teach facts, rules, and action sequences. Considered the best way to teach beginners how to find their way through arithmetic algorithms, this approach was also teacher-centered, not student-centered.

With direct instruction, teachers should check often for student understanding. Although many educators do not favor direct instruction, this approach has been shown in research to be highly effective for producing high student achievement. When direct instruction is properly used, the teacher should

have carefully followed these steps: review; structure of new material; guided practice; feedback; independent practice; and weekly or monthly reviews (Borich, 1996).

Borich explained that mastery learning would be accomplished only when students were allowed to spend a considerable amount of class time learning and practicing the material studied. Said Borich: “efficient use of class time and active student practice are important ingredients of mastery learning” (p. 247).

Borich alluded to the ideas of inductive and deductive reasoning. The thinking process known as inductive was used “when a set of data is presented and students are asked to draw a conclusion, make a generalization, or develop a pattern of relationships from the data” (p. 308). Deductive reasoning moves in the other direction, and allows a learner to take general rules and apply them to some specific circumstances that the student wanted to study.

Summary

The review of selected literature presented in Chapter 2 supported the following research themes:

1. The development of higher-level mathematics can be traced back to Babylonians, Egyptians and Greek civilizations.
2. High-stakes tests of mathematics skills have been reflected in national, state, and school district standards.

3. Today's public school demographics reflect increasing numbers of student populations from poor and minority families, and resulting challenges faced by educators to address the mathematics achievement gap.
4. Direct instruction, mastery learning, and constructivist approaches have all proven effective best-practices for teaching mathematics.

CHAPTER 3

Methodology and Treatment of Data

Introduction

The purpose of this experimental research project was to determine whether the CMP curricular and instructional intervention improved mathematics scores as measured by the Orleans-Hanna Algebra Prognosis Test (OHAPT). To accomplish this purpose, a review of selected literature was conducted, baseline data were obtained and analyzed, and related conclusions and recommendations were formulated.

Chapter 3 contains a description of the methodology used in the study. Additionally, the researcher included details concerning participants, instruments, design, procedure, treatment of the data, and summary.

Methodology

The researcher used an experimental research model to gather essential baseline data. At least one independent variable was manipulated, other relevant variables were controlled, and the effect of one or more dependent variables was

observed. A *t*-test for independent samples was utilized for data analysis to determine significance between the experimental and control groups. Each group received a different treatment. Both groups were tested using the OHAPT. The experimental group (Group X) was treated for two years using the Connected Math Project, a curriculum and instructional intervention model. The control group (Group Y) was tested in the 2003-2004 school year, and the experimental group was tested in the 2006-2007 school year. Both groups were tested in the spring, so rate of maturation was not an issue.

Participants

The participants included 29 students from the researcher's physical science class.

Instruments

The Orleans-Hanna Algebra Prognosis Test (OHAPT) was used to assess the performance of seventh grade students at Wapato Middle School who had been instructed for two years using the Connected Math Project, a curriculum and instructional intervention tool. The OHAPT, commonly used to test middle school students, determined how proficient students are at abstract thinking.

Design

This experimental study utilized a posttest to determine whether the group that received the treatment was able to record higher mathematics scores as evidenced by the OHAPT. Only the experimental group received mathematics

instruction using the CMP. For the purpose of this study, participating students were organized into two groups as follows:

Experimental Group X: This group included 29 students that received instruction using the CMP. These students were chosen as the second-highest group of math students in WMS, using the WASL state test scores. This group was tested using the OHAPT at the end of the 2006-2007 school year.

Control Group Y: This group included 27 students that received mathematics instruction using a traditional curriculum and teaching methods at WMS. These students were tested each spring using the OHAPT to determine group placement of the eighth grade.

Procedure

Procedures followed in the present study evolved in several stages, including: As early as 2000, WMS administrators became concerned about declining mathematics scores at the middle school level. During the 2004-2005 school year, the CMP intervention and mathematics curriculum model was adopted to improve mathematics scores. In February, 2007, the investigator sought and received permission from Mr. Kelly Garza, Principal at WMS, to undertake the present study. Throughout the 2006-2007 school year, the investigator obtained and analyzed baseline date from the 2003-2004 and 2006-2007 school years to determine any significant improvement in student's

mathematics scores. During April and May, 2007, the investigator completed data analysis and formulated related conclusions and recommendations.

Treatment of the Data

A *t*-test for independent samples, used in conjunction with Windows STATPAK statistical software program that accompanied Educational Research: Competencies of Analysis and Applications text (Gay and Airasian, 2000), allowed the researcher to compare mathematics scores between the control and experimental groups mathematics scores. Significance was determined for $p \geq$ at 0.05, 0.01, and 0.001 levels.

To test the null hypotheses, which would indicate significance in the two instructional programs, a *t*-test for independent samples was again performed.

Summary

Chapter 3 provided a description of the research methodology employed in the study, participants, instruments used, research design, and procedure utilized. Details concerning treatment of the data obtained and analyzed were also presented.

CHAPTER 4

Analysis of the Data

Introduction

The present study sought to determine whether the Connected Math Project curriculum and instructional intervention model adopted at Wapato Middle School enhanced mathematics scores of participating seventh grade students.

Chapter 4 was organized to include the following: Description of the environment; hypothesis; null hypothesis; results of the study; findings; and summary.

Description of the Environment

The study was conducted in the Wapato School District at Wapato Middle School during the 2003-2004 and 2006-2007 school years. The study involved two groups of seventh grade students that had been taught using different mathematics curricula. The experimental group (X) received the Connected Math Project, curriculum and instruction intervention model for two years. The control

group (Y) received a traditional mathematics curriculum and instruction model. The study sought to determine whether students who received CMP would perform better on the OHAPT than students that were taught using the traditional curriculum.

Hypothesis

Mathematics scores of seventh grade students at WMS who received CMP intervention and curriculum instruction will show significant improvement when measured by the OHAPT assessment test.

Null Hypothesis

Mathematics scores of seventh grade students at WMS who received CMP intervention and curriculum instruction will show no significant improvement when measured by the OHAPT assessment test. Significance was determined for

p at $\geq$ 0.05, 0.01, and 0.001 levels.

Results of the Study

A *t*-test was calculated to determine the level of significance between control and experimental groups. Table 1 disclosed the results of the *t*-test while

Table 2 represented the distribution of *t* with 54 degrees of freedom. Significance was determined for $p \geq$ at 0.05, 0.01, and 0.001 levels.

Table 1

Summary of *t*-Test for Independent Samples

Table 2

Distribution of *t* with 54 Degrees of Freedom

p-values	**0.05**	**0.01**	**0.001**
t-values	9.84	9.84	9.84
df-54	2.0063	2.7172	3.5783

Table A.4 (Gay & Airasian, 2000), was used to complete this chart (p. 615).

Table 1 showed 29 scores for Group X and 27 scores for Group Y. According to the STATPAK statistical software, the mean of Group X was 19.97, and the mean for Group Y was 46.11. The degrees of freedom were 54, and the *t* value was -9.84.

Table 2 showed the distribution of *t* with 54 degrees of freedom at levels of 0.5, 0.01, and 0.001.

Findings

Data obtained were used to compare seventh grade students who received instruction in CMP mathematics curriculum and instructional interventional

model during the 2005-2007 school years with seventh grade students who were taught using a traditional mathematics curriculum. The results did not demonstrate an increased mean when students were taught using the new CMP curriculum. Through statistical analysis, it was determined there was significant differences between control and treatment groups at all levels for $p \geq$ at 0.05 (2.0063), 0.01 (2.7172), and 0.001 (3.5783) levels. The null hypothesis was therefore rejected at all levels for $p \geq$ at 0.05 (2.0063), 0.01 (2.7172), and 0.001 (3.5783) levels.

Summary

Chapter 4 reviewed and detailed the description of the environment, hypothesis, null hypothesis, results of the study, and major findings. Data analyzed indicated:

1. The hypothesis was supported (i.e., Students that were taught using the new CMP curriculum and instructional intervention model were not likely to perform as well as students that were taught using the traditional mathematics curriculum).
2. The null hypothesis was rejected (i.e., There was significant difference in the scores of students who received instruction in the new CMP curriculum and instructional intervention model as compared to students who were taught using the traditional mathematics curriculum).
3. The fundamental research question on which the study focused indicated that students who received instruction in mathematics using the new CMP curriculum and instructional intervention model in seventh grade at WMS, did not receive higher mathematics test scores using the OHAPT to compare baseline data.

CHAPTER 5

Summary, Conclusions and Recommendations

Summary

The present study sought to determine whether the Connected Math Project curriculum and instructional intervention model adopted at Wapato Middle School enhanced mathematics scores of participating seventh grade students. To accomplish this purpose, a review of selected literature was conducted, related baseline data were obtained and analyzed, and conclusions and recommendations were formulated.

Conclusions

From research findings and an analysis of data produced by this experimental study, the following conclusions were reached:

1. The low mathematics scores of WSD students and WMS seventh grade students in particular has generated a need to implement the best teaching practices and mathematics curriculum that can be obtained.
2. Best practices in teaching mathematics have been shown by research to be a combination of direct instruction and inquiry-based teaching methods.
3. The NCLB and the State of Washington's demands that all schools improve education has been announced to the public and supported by the schools. All students can learn, and all schools must teach.
4. The null hypothesis was rejected (i.e., there will be no significant difference in mathematics test scores of seventh grade students that are taught using the CMP curriculum and instruction intervention model

compared to those who were taught using a traditional mathematics curriculum).

5. The hypothesis was supported (i.e., there will be a significant difference in mathematics test scores of seventh grade students that are taught using the CMP curriculum and instruction intervention model compared to those who were taught using a traditional mathematics curriculum).
6. The fundamental research question on which the study focused indicated students who received instruction in mathematics using the new CMP curriculum and instructional intervention model in seventh grade at WMS, did not receive higher mathematics test scores using the OHAPT to compare baseline data.

Recommendations

1. To acquire a deeper understanding of the development of higher-level mathematics, investigating the contributions of Babylonian, Egyptian, and Greek civilizations is recommended.
2. To encourage the acquisition of higher student mathematics skills, education should support the national, state, and school district's high-stakes testing standards.
3. To address the mathematics achievement gap, educators should be apprised of population demographics characteristics of poor and minority families.

4. To provide a balanced and effective mathematics program, educators should make provision for direct instruction, mastery learning, and constructivist approaches.
5. To produce higher mathematics scores of seventh grade students, implementation of the CMP curriculum and instructional intervention model is recommended.
6. Educators seeking information related to the improvement of mathematics skills of middle school students may wish to utilize information presented in this study or, they may wish to conduct further research suited to their unique needs.

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