Implementation of Math Connects at Bridgeport Elementary

A Special Project

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Dr. Robert P. Kraig, PhD.

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Implementation of Math Connects

at Bridgeport Elementary

A Master's Special Project

by

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ABSTRACT

Title: Implementation of Math Connects at Bridgeport Elementary

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Math WASL scores showed that a significant amount of students had not met standard at Bridgeport Elementary, a Title I school of 398 students with 84.7% receiving free and reduced lunch. The purpose of this study was to determine if the change in math curriculum would raise students' grade-equivalency levels in mathematics for fifth-grade students. Students were taught daily math instruction under Bridges in Mathematics during the first semester and under Math Connects during the second semester of the 2009-2010 academic year. Results indicated that there was no significant difference overall in the amount of growth between students who received daily math instruction under Bridges in Mathematics and students who received daily math instruction under Math Connects.

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CHAPTER 1

Introduction

Background for the Project

The No Child Left Behind Act of 2001 (NCLB) had a capitalizing effect on students' academic performance. Schools were expected to have highly qualified teachers and meet adequate yearly progress (AYP) targets. NCLB sought to ensure student improvement in the following subgroups: students of major ethnic and racial backgrounds, students receiving special education services, students from low-income families, and students with limited-English proficiency.

In response to the numerous requirements of NCLB, Washington state created a series of standardized tests called the Washington Assessment of Student Learning (WASL). It was administered to all students in grades three through eight and grade ten in the subject areas of math, reading, writing, and science from spring 1997 to summer 2009. At the beginning of the 2009-2010 school year, the WASL was replaced with two new state standardized tests. The Measurements of Student Progress (MSP) exam would test students in the same subject areas for students in grades three through eight. The High School Proficiency Exam (HSPE) was given to tenth-grade students to test their basic

skills of reading and writing. Students prior to the class of 2013 would not have to pass the math and science portions of the exam to graduate.

One motivating factor for this study was the math WASL achievement scores for the students that attended Bridgeport Elementary School (BES). The administration and staff noticed a severe decline in test scores within the last one to two school years across grades three, four, and five. Another motivating factor for this study was the math curriculum review made by the Office of the Superintendent of Public Instruction (OSPI) and the Washington State Board of Education (SBE). In order to better align with Washington's state standards in mathematics, an extensive review of a variety of math curricula, including Bridges in Mathematics and Math Connects, was conducted. In conjunction with Strategic Teaching (ST) and SBE, OSPI gave their recommendations for curricula that best aligned with state standards in mathematics. Bridges in Mathematics was not at the top of OSPI's rank orderings, which was the current math curriculum being used at BES.

In light of both of these motivating factors, the administration at BES with the approval of the members of the school board decided to change math curriculum – from Bridges in Mathematics to Math Connects – hoping to solve the problem and boost math WASL scores. After gaining approval from the

school board, the implementation of Math Connects at BES began at the start of the second semester of the 2009-2010 academic year.

Statement of the Problem

Math WASL scores showed that a significant amount of students had not met standard at BES. In the 2006-2007 school year, 50% of third-graders met standard in math, whereas only 37% of fourth-graders and 36.5% of fifth-graders met standard. The number of students meeting standard dropped in the 2007-2008 school year, with only 47.5% of third-graders, 33.3% of fourth-graders, and 44.6% of fifth-graders meeting standard. The outlook was not much better in the 2008-2009 school year. 32.8% of third-graders met standard that year, while only 25.9% of fourth-graders and 34.6% of fifth-graders met standard in mathematics.

The data was disaggregated in order to track the students of the class of 2017, who were fifth-graders in the 2009-2010 school year. Their math WASL scores showed that 47.5% met standard in 2007-2008. However, the following school year, only 25.9% of those same students met standard in mathematics. Administration and staff at BES began to wonder why there was a sudden decrease in the amount of students meeting standard in mathematics when those same students showed an increase in their reading WASL scores. In 2007-2008, 55.9% of students met standard in reading, and 64.8% of students met standard the following year.

Purpose of the Project

The purpose of this research study was to determine if the change in math curriculum – from Bridges in Mathematics to Math Connects – would raise students' grade-equivalency levels in mathematics for the students of the class of 2017. The purpose was also to determine if students would have confidence of their math skills under Math Connects curriculum.

Delimitations

This project took place at Bridgeport Elementary School, a Title I school, located in Bridgeport, Washington. The focus group consisted of 33 fifth-grade students – 17 female and 16 male students – from the class of 2017. Students received daily math instruction in standard classroom settings. Math instruction was given daily in the morning hours for approximately 45-60 minutes, in accordance with the lesson plans written within the curriculum.

Assumptions

Some assumptions were made during this study. First, it was assumed that all students participated and gave full effort during daily math instruction in class, on daily homework assignments, and pre-assessments and post-assessments for each unit or chapter. Secondly, it was assumed that all students gave full effort and attention to the STAR math assessment during the fall, winter, and spring testing periods. Finally, it was assumed that the teachers involved were competent in the

area of mathematics, had completed the necessary training for each of the two curricula examined in this study, and were prepared to teach each lesson in its entirety on a daily basis.

Hypothesis

Students who receive daily math instruction under Math Connects curriculum will show higher grade-level equivalency growth on the STAR math test than students who receive daily math instruction under Bridges in Mathematics curriculum. Students will feel confident of their math skills as a result of receiving math instruction under Math Connects curriculum.

Null Hypothesis

There will be no difference in grade-level equivalencies between students who receive daily math instruction under Math Connects curriculum and students who receive daily math instruction under Bridges in Mathematics curriculum. Students will not feel confident of their math skills under Math Connects curriculum.

Significance of the Project

Strategic Teaching (ST) used a rubric-based scoring system to evaluate four math curricula in order to determine which curriculum was better aligned with Washington state's standards for mathematics. They concluded that Math

Connects was a stronger curriculum than Bridges in Mathematics and better met the state's standards for mathematics.

The significance of this research study was to determine the effectiveness of changing to Math Connects curriculum for students at BES in grades kindergarten through fifth grade, as opposed to continuing daily math instruction under Bridges in Mathematics curriculum. The results would then be presented to the school board members, administration, and staff of BES in order to determine the next steps to fully implementing this change in math curriculum and instruction.

Procedure

The following list of procedures was taken in this research study:

1. Students were instructed on a daily basis under Bridges in Mathematics curriculum during first and second quarters of 2009-2010 academic year.
2. Fall STAR math assessment was given to all fifth-grade students on September 21, 2009.
3. Survey was created by the researcher and submitted to Principal Michael Porter for approval on December 2, 2009. (See Appendix A.)
4. Permission was granted by Principal Michael Porter to administer survey to students in research focus group on December 2, 2009. (See Appendix B.)

5. Permission was granted by Principal Michael Porter to conduct research and use students' test data at Bridgeport Elementary School on December 2, 2009. (See Appendix C.)
6. Review of related literature subsets was conducted through online databases.
7. Scores from fall STAR math assessment were tabulated and analyzed. (See Appendix D.)
8. The researcher observed two fifth-grade classrooms on December 11, 2009, in Kennewick, Washington, where students were being taught under Math Connects curriculum.
9. Winter STAR math assessment was given to all fifth-grade students in January 12, 2010.
10. Scores from winter STAR math assessment were tabulated and analyzed. (See Appendix E.)
11. The researcher received professional development and training for Math Connects curriculum on January 16, 2010.
12. Students were instructed on a daily basis under Math Connects curriculum during third and fourth quarters of 2009-2010 academic year.
13. Spring STAR math assessment was given to all fifth-grade students on May 11, 2010.

14. Scores from spring STAR math assessment were tabulated and analyzed. (See Appendix F.)
15. A survey was given to students to evaluate the confidence level in their math skills under Math Connects curriculum on May 12, 2010. (See Appendix G.)
16. Survey results were tabulated and analyzed. (See Appendix H.)
17. Research study results were evaluated and analyzed using Stat Pak, and conclusions were drawn about the study results. (See Appendix I.)

Definition of Terms

For this study, the following words were defined:

Bridges in Mathematics – a math curriculum published by the Math Learning Center in Salem, Oregon, for grades kindergarten through fifth grade developed with initial support from the National Science Foundation; encourages students to use problem-solving strategies and skill-building activities to test, explore, and justify their mathematical reasoning; written and field-tested by teachers.

Math Connects – a math curriculum published by Macmillan/McGraw-Hill in New York, New York, for grades pre-kindergarten through sixth grade; provides students with effective, research-based mathematics content that integrates their writing and reading skills; provides teachers with opportunities to differentiate instruction to ensure success for all students.

Washington Assessment of Student Learning – a state-level assessment that tests students' knowledge and skills in reading, writing, math, and science based on their understanding of the Essential Academic Learning Requirements (EALRs).

STAR Math Test – a standardized test, administered via computers, which is used to give immediate feedback to teachers on areas of strength and improvement for each individual student; can be used as a Response to Intervention (RTI) progress monitoring tool.

Acronyms

AYP – Annual Yearly Progress

BES – Bridgeport Elementary School

GE – grade-equivalency

EALRs – Essential Academic Learning Requirements

ELL – English Language Learner

HSPE – High School Proficiency Exam

MSP – Measurements of Student Progress

OSPI – Office of Superintendent of Public Instruction

RTI – Response to Intervention

SBE – Washington State Board of Education

ST – Strategic Teaching

WASL – Washington Assessment of Student Learning

CHAPTER 2

Review of Selected Literature

Introduction

This chapter has been organized around the following topics: (a) No Child Left Behind Act of 2001, (b) Adequate Yearly Progress, (c) Mathematics Instruction, (d) Title I, (e) Mathematics Curriculum, and (f) Summary.

No Child Left Behind Act of 2001

In January 2001, President George W. Bush signed the No Child Left Behind Act (NCLB) and was implemented in 2002. It required that all students in grades three through eight be tested in reading and mathematics, along with a final exiting test once in high school. According to Hosin Shirvani (2009), NCLB had four important goals to close the achievement gap between different subgroups of student population in the United States. They were as follows: all students would achieve 100% proficiency in English language and mathematics by the year 2014; the achievement gap would be closed between various subgroups of students, including special education, English language learners (ELL), minority students, and White students; a system called Adequate Yearly Progress (AYP) would be established in which schools must show continuous improvement in all students' test scores from each of the subgroups; and all schools must have made an effort to improve teacher quality for their students.

NCLB had given power to the states in choosing the requirements for highly-qualified teachers, standards in the areas of mathematics and English language, and type of state-standardized test. One problem with this idea had been that some states' standards were lower than other states' standards. Shirvani (2009) stated, "South Carolina and Massachusetts have kept their challenging standards, while other states like Mississippi and Colorado, for example, have set their standards so low, in order to prevent a higher rate of student failure" (p. 51).

Schools inadvertently had ignored certain students in order to raise test scores and make AYP. They focused on the "bubble" students – those students who were close to meeting the states' standards but needed some help getting there. In doing so, schools neglected to focus a good amount of attention on those students who were already meeting standard and those students who were so much below standard that they had a higher probability of failing anyway. According to Shirvani, "there are no incentives for the schools to help these students… The group that received the most attention (is) the bubble kids because with some help these children can pass the tests and raise the passing rates of the school district" (p. 52).

NCLB had other major problems as well. It had not taken into account outside factors that influence a student's ability to learn. These factors include socio-economic status, parent involvement, primary language spoken at home,

and community involvement, among others. Shirvani (2009) also stated that the expenses that schools incurred and the lack of sufficient governmental funding was detrimental to the ideas of NCLB. Schools did not have the money needed to implement their educational support programs for students or their professional development programs for teachers that were necessary to meet AYP.

Even though NCLB had good intentions in closing the achievement gap for students in various subgroups compared to White students, it had come at a price. Andy Hargreaves and Dennis Shirley (2008) concluded, "Although more time has been spent on language arts and math since 2001, this has come at the cost of reducing time for such subjects as science, history, and the arts. … Only 15% (of U.S. teachers) indicate on surveys that the No Child Left Behind Act is improving local education, indicating a loss of faith in the government's ability to galvanize the very people who care the most about educating this nation's children" (p. 136).

Adequate Yearly Progress

Under the No Child Left Behind Act (NCLB) previously discussed, one of the major goals was for schools to make Adequate Yearly Progress (AYP). This meant that the schools needed to prove that students were making consistent improvement on state test scores from year to year. Shirvani (2009) explained

that there were consequences for those schools who failed this requirement of NCLB, and a plan of action was implemented in a several step process.

If a school failed to make AYP, it meant that one or more subgroups who took the state exam failed to meet state standards. A school that did this for two consecutive years had to create a school improvement plan stating what their plan of action was going to be in order to help those students in the failing subgroup improve their test scores. At that time, students were also given the opportunity to transfer to another school in the district that was making AYP and meeting the NCLB requirements. For the third year of failing to make AYP, the school then must have offered other educational resources such as after-school tutoring programs for failing students. If after five years a school was still not making AYP, then the state had the right to change the administrative body of the school.

Hargreaves and Shirley (2008) concluded, "Trust, cooperation, and responsibility create the collegiality and shared, committed professional learning that improve classroom effectiveness and raise standards with students" (p. 142) In other words, teachers needed to work together in a cohesive manner to create common learning targets that would address students' academic needs rather than teachers being pushed to higher levels of expectations under the arbitrary goals of AYP.

Mathematics Instruction

Lorin Anderson (2009) stated, "Learning depends on the active engagement of the learner. It is what the learner does that is learned, not what the teacher does. In contrast, teacher-led, whole-class instruction with an emphasis on memorization is unlikely to promote high levels of active engagement" (p. 416). In classrooms across the United States, teachers were "teaching to the test" because they wanted their students to perform well on state standardized tests in order for their school to meet AYP. This caused teachers to instruct their students in a way that was more teacher-led and based on whole-class instruction. According to Anderson (2009), this did not lead to encouraging students to actively engage in learning mathematics. He identified some important strategies that educators need to keep in mind when attempting to engage their students in mathematics instruction. They were as follows: students were more engaged when they were working on problems that are challenging to them; students were more likely to understand mathematics when they were solving real-life situations in collaboration with their classmates; students learned more when they were engaged in dialogue with their peers during problem solving situations; and students were able to learn mathematics best when they were given more time for lengthy verbal explanations of their strategies for solving real-life problems. Anderson (2009) concluded that, in terms of accountability and AYP, teachers did

not improve their teaching because of accountability, and it did "not prohibit teachers from changing their teaching to reflect what is known about how best to teach elementary school students" (p. 417).

One important part of mathematics instruction was that of teacher planning. According to Alison Castro Superfine (2008), "Planning is an important and often underappreciated aspect of teaching practice, when teachers make decisions that ultimately impact students' opportunities to learn" (p. 11). Superfine (2008) continued to explain that teaching was not just about the physical act, but it was also about the time spent planning and preparing for students' interactions with the lesson being taught. It "involves the development of skeletal frameworks rather than detailed scripts for teaching lessons" (p. 13). She concluded that "teachers' conceptions of curriculum and mathematics teaching and learning can become calcified over time. As a result, teachers may become inattentive to how their planning decisions influence students' opportunities to learn and they may become resistant to external influences such as new curriculum programs or professional development experiences" (p. 19).

Rudd, Lambert, Satterwhite, and Zaier (2008) stated, "In summary, teachers need to understand their students, know the content, and be able to communicate the content in a meaningful way which inspires critical thinking and active engagement in the learning process for children" (p. 76). They also said

that teachers needed to connect students' prior knowledge with new mathematical concepts with the language of math being the focal point, and it should have been done in a fun and engaging way.

Title I

The federally-funded program called Title I was proposed by the Elementary and Secondary Education Act (ESEA) of 1965 and adopted under the administration of President Lyndon Johnson. According to John F. Jennings (2000), the program was intended to provide extra financial support to school districts who enrolled children from economically and educationally disadvantaged families. Shelley Billig (1998) stated, "Typically the amount of funding that a school receives is dependent on the number of students who receive free or reduced price meals. Nearly 95% of the schools throughout the nation receive these funds" (p. 209). Jennings (2000) also said, "Title I was intended to provide extra dollars and services for disadvantaged children that would help to make up for the 'educational deprivations' they carried with them to school" (p. 518).

Billig (1998) conducted a research study in which telephone interviews were used to survey practitioners associated with Title I programs. She found that a variety of schoolwide program designs were adopted. "Collaboration most often took place between pairs of adults, however, and not as a schoolwide

phenomenon" (p. 212). She also concluded that most individuals who responded in the surveys said that Title I services were provided to children in both math and reading when in previous years services had been offered primarily in reading. This change was assumed because of the "pressure to raise math scores because students were not meeting standards" (p. 212).

Mathematics Curriculum

Many school districts across the United States used a variety of mathematics curricula to teach their students basic mathematical skills. Mathematics curriculum was ever-changing to keep up with the states' standards that were constantly being modified as well. Barbara Reys and Glenda Lappan (2007) stated, "Since 2002, 38 states have developed or revised their mathematics curriculum standards, some of which are intended to serve as 'models' for local districts, while others are mandatory and specify the mathematics all students in the state are expected to learn at particular grades" (p. 676). This statement was reflective of the changes in mathematics curriculum that occurred in 2008 in Washington state.

The Office of the Superintendent of Public Instruction (OSPI) was given the task by the state legislature of identifying quality math curriculum that would ensure the best possibilities of students in Washington meeting the state's mathematics standards. OSPI presented its initial recommendations to the

Washington State Board of Education (SBE) who, in conjunction with Strategic Teaching (ST), reviewed OSPI's recommendations and suggestions of math curriculum for grades kindergarten through eighth grade. For elementary schools, OSPI recommended two different math curricula – Bridges in Mathematics and Math Connects (K-5).

The teaching approach for Math Connects (K-5) was that seen in a more traditional classroom. However, Bridges in Mathematics took a more constructivist approach to learning mathematics. Jody Brewer and C.J. Daane (2002) stated, "Constructivists believe that knowledge is not directly transmitted from the teacher to the student, but that teachers can help facilitate knowledge acquisition. Constructivist learning includes an importance on process, the exchange of differing points of view, and an emphasis on problem solving" (p. 417).

Reys and Lappan (2007) said, "As publishers (of mathematics curriculum) create textbooks for use in schools, they pay close attention to the newest generation of state standards. If the textbooks developed are to be marketed and sold within a state, they must align with the state's standards" (pg. 679). Strategic Teaching (2008) stated in the executive summary of their report, "During June of 2008, OSPI reviewed twelve elementary and thirteen middle school mathematics programs in order to determine which best align to Washington's standards" (p.

2). The concluding thought was that in order for students to best meet state standards in mathematics, the curriculum they used should be aligned with state standards as best as possible.

Strategic Teaching (ST) used a rubric-based scoring system to evaluate four math curricula, which were as follows: Math Expressions, Investigations, Bridges in Mathematics, and Math Connects. This study was conducted in order to determine which curriculum was better aligned with the state's standards for mathematics. Three mathematical strands – whole number multiplication, area of triangles, and adding and subtracting fractions – were used to establish a baseline evaluation of each of the four curricula. Based on mathematical soundness for elementary students, ST ranked the curricula in order from strongest to weakest in this order – Math Expressions, Math Connects, Bridges in Mathematics, and Investigations. ST (2008) commented that Math Connects covered the threads of whole number multiplication and adding and subtracting fractions with minor weaknesses and exceptions and that the thread of the area of triangles was "mathematically sound, but incomplete. …In all, with the exception of areas of triangles, students should be prepared for further mathematics when coming from Math Connects" (p. 22).

ST (2008) continued their report to comment on Bridges in Mathematics. They stated that Bridges had the necessary concepts and skills related to the topic

of whole number multiplication. However, "the program does not focus enough on the standard algorithm, but seems to always be looking for alternative methods" (p. 23). As for the other two strands – areas of triangles and adding and subtracting fractions – ST (2008) said that an average student would probably not be able to master the content of these strands or be ready to move on to the next level of mathematics in these areas. "While Bridges provides the necessary foundational skills and concepts for whole-number multiplication it does not do so for fractions or area of a triangle. The materials need more supplementation before ST believes the typical student would meet Washington's standards in these two threads" (p. 23).

ST (2008) concluded that their "findings supported using Math Expressions and Math Connects at the elementary level. ST determined Math Expressions to be a rare find because it includes the conceptual underpinnings and the procedural knowledge, with clear explanations between the two, for each of the core topics examined by the mathematician. Math Connects offers an acceptable choice, because its few shortcomings are easily remedied. ST found problems in the presentation of some of the mathematics in both Bridges and Investigations. While no program can be expected to be a perfect fit for Washington, these programs will need more support and supplementation than the other two programs under consideration" (p. 4).

Summary

The focus of this chapter was to address the available evidence to the following topics: (a) No Child Left Behind Act of 2001, (b) Adequate Yearly Progress, (c) Mathematics Instruction, (d) Title I, and (e) Mathematics Curriculum. NCLB had important goals for teachers to strive for in order to close the achievement gap for all students. However, it came at a price accompanied with many problems. AYP was one of the goals under NCLB, but the standards were arbitrary and not cohesive. Three important parts of mathematics instruction were actively engaging students in the lessons, providing teachers with adequate planning time, and connecting students' background knowledge with new mathematical concepts. Title I was a federally-funded program intended to provide extra financial support to schools in communities where students were from educationally disadvantaged families. These federal funds were mostly used to give extra support in the areas of reading and math. OSPI, SBE, and ST supported elementary schools using Math Connects over Bridges in Mathematics curriculum. The methodology and treatment of the data are reported in Chapter 3.

CHAPTER 3

Methodology and Treatment of the Data

Introduction

This chapter has been organized around the following topics: (a) Methodology, (b) Participants, (c) Instruments, (d) Design, (e) Procedure, (f) Treatment of Data, and (g) Summary.

Bridgeport Elementary School, a Title I school located in Bridgeport, Washington, adopted a new math curriculum called Math Connects at the start of the second semester of the 2009-2010 academic year. During the first semester, students were given daily math instruction under Bridges in Mathematics curriculum, which had been the standard curriculum since the 2002-2003 academic year. At the start of the second semester, teachers school-wide began using Math Connects as their instrument for daily math instruction. The researcher sought to find out if the new curriculum would have a positive impact on student learning.

Methodology

The researcher chose to do an action and quasi-experimental research study. Gay, Mills, and Airasian (2009) said, "Action research in education is any systematic inquiry conducted by teachers…in the teaching-learning environment that involves gathering information about the ways in which their particular

schools operate, the teachers teach, and the students learn. … The purpose of action research is to provide teacher researchers with a method for solving everyday problems in schools so that they may improve both student learning and teacher effectiveness" (p. 486). Gay et al. (2009) also said that "to receive permission to include schoolchildren in a study, a researcher often has to agree to keep existing classrooms intact (and) … entire classrooms, not individual students, are assigned to treatments" (p. 259).

Research was conducted during the 2009-2010 academic year in the general education classroom. Data was collected at three separate times in the year, and a student survey was also given twice during the year. The collected data was tabulated using Stat Pak and Microsoft Excel to determine significance of the study for non-independent test samples. The tabulated results were analyzed, and conclusions were made.

Participants

The researcher was given permission to focus research on the class of 2017, which consisted of average fifth-grade students who required no special education services. There were a total of 33 students – 16 male and 17 female – in the class that completed all parameters of the study. 73% of the students were of Hispanic decent, while the other 27% of the students were of Caucasian decent. All students qualified for free and reduced meals. The participating students

resided in the rural community of Bridgeport and were from lower to middle class families. Some students were also from two-parent households.

Instruments

Two different math curricula were used for the purposes of this research study. Bridges in Mathematics curriculum published by the Math Learning Center was used during the first semester of the 2009-2010 academic year, while Math Connects curriculum published by Macmillan/McGraw Hill was used during the second semester of the same academic year.

Data was gathered using the STAR math assessment online program provided by Renaissance Place. Results from the assessment taken by each fifth-grade student were tabulated using Microsoft Excel and a statistical calculator (StatPak). Both Stat Pak and Microsoft Excel were used to determine the significance of data results.

Design

Two different designs were used by the researcher. A pre-test and post-test was given for the quasi-experimental part of the study. The differences in growth between the pre-test and post-test scores were calculated using Microsoft Excel spreadsheets and Stat Pak. A survey was given for the descriptive part of the study. These two parts worked together to help the researcher determine the

students' perceptions of mathematics in general and whether or not the students' confidence levels for mathematics were effected by the change in math curricula.

Procedure

At the start of the 2009-2010 academic year, students were instructed daily under Bridges in Mathematics curriculum at Bridgeport Elementary School (BES). All units in Bridges in Mathematics had a unit pre-assessment, which was usually given within the first four sessions of the unit based on the instructions in the teacher's guide. Throughout each unit, students had an opportunity to practice the skills taught to them through activities from the Bridges Student Book, Home Connections workbook, and Bridges Blacklines. The final session of each unit had a post-assessment, in which students had the opportunity to show what they had learned in that particular unit.

Instruction under Bridges in Mathematics took place in the morning hours of the school day. The researcher followed the teacher's guide provided with the curriculum in order to guide students through the session. Each session lasted about 35 to 55 minutes, depending on the complexity of the session.

All students at BES grades first through fifth were required to take the STAR math assessment, provided to the school through an online program called Renaissance Place. The STAR math assessment was given three times throughout the 2009-2010 academic year. For the fall testing window, the fifth-grade

students took the STAR math assessment in the school's computer lab, in which student computers were arranged along three of the interior walls with one row of computers in the middle of the room. With instructions given to them by the researcher, students took the STAR math assessment on these computers through the Renaissance Place online program on September 21, 2009. Students had a time limit on each of the 27 questions that tested their broad range of mathematical skills. The testing period lasted approximately 30 minutes, and after the testing period was over, students resumed their regular daily schedule.

The researcher created a survey and submitted it for approval to Principal Michael Porter on December 2, 2009. The survey consisted of ten statements, which were related to the students' opinions about math.

At that same time, a letter was submitted by the researcher asking for permission to administer the survey to all fifth-grade students in the research focus group. The letter also asked for permission to conduct research in the fifth grade classrooms for the 2009-2010 academic year and use the students' STAR math assessment data. Permission was granted by Principal Porter, at which time the research began.

Data was gathered from the fall STAR math assessment. Results were tabulated using Microsoft Excel and a statistical calculator (StatPak). The statistical calculator was used to determine the significance of data results.

The researcher conducted a review of literature subsets related to the area of focus through online databases, including Ebsco and Eric. Articles from scholarly journals were read and reviewed by the researcher in the areas of (1) No Child Left Behind Act of 2001, (2) adequate yearly progress, (3) mathematics instruction, (4) Title I, and (5) mathematics curriculum.

The researcher observed two fifth-grade classrooms on December 11, 2009, in Kennewick, Washington, where students were currently being taught daily math instruction under Math Connects curriculum. The researcher observed classroom number one for 30 minutes, where a daily lesson from the Math Connects curriculum was being taught. Next, classroom two was observed for 30 minutes, where a different teacher was teaching the same Math Connects lesson. Finally, the researcher returned to classroom number one to observe the first teacher facilitating a math intervention group using the same material from the same lesson that was taught earlier with Math Connects.

For the winter testing window, all fifth-grade students took the STAR math assessment on January 12, 2010 in the computer lab under the same environment and testing conditions. Students had the same time limit and same amount of test questions. After the testing period was over, students resumed their regular daily schedule. Data was gathered from the winter STAR math assessment provided by Renaissance Place online program. Results were

tabulated using Microsoft Excel and a statistical calculator (StatPak). Stat Pak was also used to determine the significance of data results.

Before the implementation of the new math curriculum, Math Connects, all teachers at Bridgeport Elementary School (BES) were required to complete a professional development course in which they received training on how to properly teach from the Math Connects curriculum and implement it into their classrooms. The researcher attended this training with other teachers from BES on January 16, 2010. The training lasted five hours and included hands-on training with the software programs that accompany the curriculum.

On February 1, 2010, Math Connects was officially implemented into the two fifth-grade classrooms at BES, and students began receiving daily math instruction under the new math curriculum. Students continued to receive math instruction on a daily basis under Math Connects for the remainder of the 2009-2010 academic year. Instruction took place in the same morning hours of the school day. The researcher followed the teacher's guide provided with the new curriculum in order to guide students through each lesson. Each lesson lasted about 45 to 60 minutes, depending on the complexity of the math concept being taught.

The structure of all the lessons in Math Connects consisted of four parts, which were as follows: introduce, teach, practice, and assess. Each lesson also

had a “Five-minute Check” at the start of the lesson so that students could have a chance to review the material of the previous lesson. Each chapter in the curriculum had many opportunities to formally assess students’ learning. These assessments included a chapter diagnostic test, in which the researcher was able to check to see if students were ready for the upcoming chapter and use them as RTI benchmarks for differentiating instruction. The curriculum also had three short quizzes that occurred periodically throughout each chapter, a mid-chapter test, and a chapter post-test. All of these assessments were opportunities for the researcher to check students’ understanding on the lesson concepts being taught in each chapter and reteach a lesson if the researcher observed that students did not understand the lesson concepts.

For the spring testing window, all fifth-grade students took the STAR math assessment given the same testing parameters on May 11, 2010. Data was gathered from the spring STAR math assessment provided by Renaissance Place online program. Results were tabulated using Microsoft Excel. Stat Pak was also used to determine the significance of data results.

The survey submitted and approved by Principal Porter was given to all fifth-grade students in the focus group on May 12, 2010. It was used to evaluate students’ opinions related to their personal confidence levels of their mathematical skills. Students were asked to circle (1) strongly disagreed, (2)

disagreed, (3) agreed, or (4) strongly agreed. They were given a sufficient amount of time in class to privately complete the surveys and return them to the researcher. Data was gathered from the surveys, and results were tabulated and analyzed using Microsoft Excel.

The researcher gathered all final results from tabulations of STAR math assessment scores and completed surveys. Results were evaluated and analyzed to draw conclusions about the research study.

Treatment of Data

The researcher used Microsoft Excel to tabulate data results from the STAR math assessments and the survey results. Stat Pak was used by the researcher to determine the significance of the STAR math assessment results. The probability values of a t-test were found for the participating group of students, given the t-value and the degrees of freedom. The sum and the mean of the scores were also found using these instruments.

Summary

This chapter was designed to review the methodology and treatment of data related to the change in math curriculum from Bridges in Mathematics to Math Connects during the 2009-2010 academic year. Data was collected, tabulated, and analyzed using Stat Pak and Microsoft Excel. The analysis of the data and findings from this study are reported in Chapter 4.

CHAPTER 4

Analysis of the Data

Introduction

Chapter 4 has been organized around the following topics: (a) Description of the Environment, (b) Hypothesis, (c) Results of the Study, (d) Findings, and (e) Summary.

Description of the Environment

This project took place at Bridgeport Elementary School (BES), a Title I school, located in Bridgeport, Washington, during the 2009-2010 academic year. The focus group consisted of 33 fifth-grade students – 17 female and 16 male students – who completed all the parameters of the study. Students received daily math instruction in standard classroom settings. During the first semester, Bridges in Mathematics was used as the standard curriculum, and during the second semester, Math Connects curriculum was used. Math instruction was given daily in the morning hours for 45-60 minutes, in accordance with the curriculum. Each student took the STAR math assessment in the fall, winter, and spring of that year.

Hypothesis

Students who receive daily math instruction under Math Connects curriculum will show higher grade-level equivalency growth on the STAR math

test than students who receive daily math instruction under Bridges in Mathematics curriculum. Students will feel confident of their math skills as a result of receiving math instruction under Math Connects curriculum.

Null Hypothesis

There will be no difference in grade-level equivalencies between students who receive daily math instruction under Math Connects curriculum and students who receive daily math instruction under Bridges in Mathematics curriculum. Students will not feel confident of their math skills under Math Connects curriculum.

Discussion

In November 2008, OSPI recommended four different math curricula, including Bridges in Mathematics and Math Connects (K-5). In conjunction with OSPI, Strategic Teaching (ST) used a rubric-based scoring system to evaluate these two mathematics curricula. They concluded that their "findings supported using… Math Connects at the elementary level… Math Connects offers and acceptable choice, because its few shortcomings are easily remedied" (p. 4). ST found a few problems with the way that some of the mathematics in Bridges was presented and needed more supplementation and support than Math Connects.

The purpose of this research study was to determine if the change in math curriculum – from Bridges in Mathematics to Math Connects – would raise

students' grade-equivalency levels in mathematics for the students of the class of 2017. The purpose was also to determine if students would have confidence of their math skills under Math Connects curriculum.

Results of the Study

A pre-test was given to students at the start of receiving daily math instruction under Bridges in Mathematics curriculum, and a post-test was given toward the end of receiving daily math instruction under Bridges in Mathematics curriculum. The average grade-equivalency (GE) level from pre-test number one scores was 4.21, which meant students tested as average fourth-graders during the second month of school. The post-test number one scores showed that students had an average GE level of 5.09, which represented a student at the start of fifth grade.

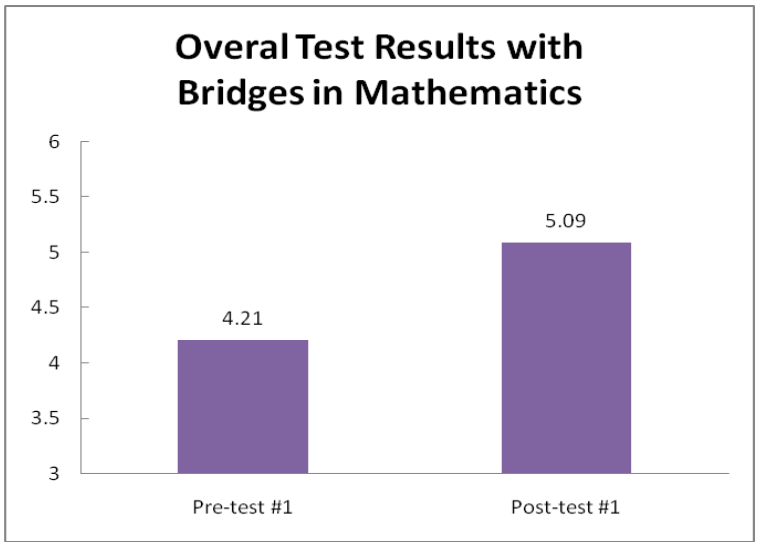

Figure 1

Post-test number one results were used as a benchmark for pre-test number two scores to represent the start of students receiving daily math instruction under Math Connects curriculum. A second post-test was given to the same students toward the end of receiving daily math instruction under Math Connects curriculum. The average grade-equivalency (GE) level from pre-test number two scores was 5.09, which represented a student at the start of fifth grade. The post-test number two scores showed that students had an average GE level of 5.95, which represented a student near the end of fifth grade during the ninth month of the academic year.

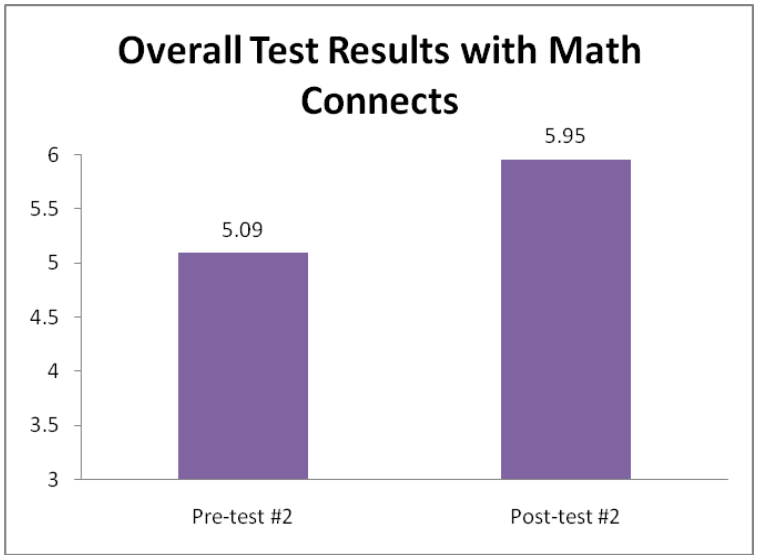

Figure 2

A *t*-test for non-independent samples was conducted using Stat Pak. Test results showed a *t*-value of -0.05 with df = 32. The sum of D's was -0.60, and the

mean of D's was -0.02. For a df = 32 and p = .05 a t-value of 2.042 was needed. Overall, students grew an average of 0.9 year under Bridges in Mathematics curriculum and an average of 0.86 year under Math Connects curriculum. Therefore, test results showed no significant difference overall in the amount of growth between students receiving daily math instruction under Bridges in Mathematics and those receiving instruction under Math Connects.

Data was disaggregated to determine whether the change in curriculum from semester one to semester two made a difference for each specific gender. Male students who received daily math instruction under Bridges in Mathematics, showed the average to be 4.18 GE for pre-test number one scores, and post-test number one scores averaged 4.84 GE. This was only a growth of 0.66 of an academic year.

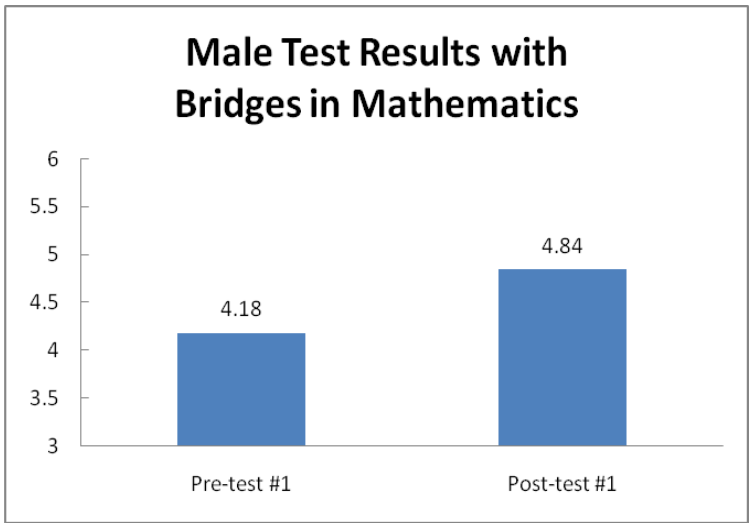

Figure 3

Male students who received daily math instruction under Math Connects showed higher GE level growth according to test results. Pre-test number two showed an average GE level of 4.84, and post-test number two showed an average GE level of 5.99. This was a difference of a GE level of 1.14, which is a little more than a whole grade level of growth.

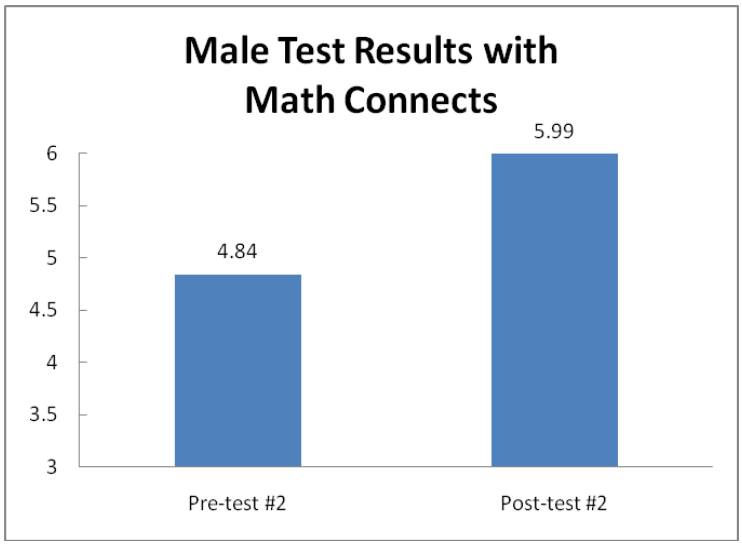

Figure 4

A separate *t*-test for non-independent samples was conducted using Stat Pak for male students' STAR math assessment results. Test results showed a *t*-value of 1.04 with degrees of freedom being 15. The sum of D's was 7.70, and the mean of D's was 0.48. For a df = 15 and p = .05 a t-value of 2.131 was needed. When comparing overall male student growth, they grew an average of 0.66 year under Bridges in Mathematics curriculum and an average of 1.14 year under Math Connects curriculum. This was a difference of 0.48 from the first

semester's growth and the second semester's growth. Therefore, test results showed there was growth between male students who received daily math instruction under Bridges in Mathematics and those who received daily math instruction under Math Connects.

When looking at the female students who received daily math instruction under Bridges in Mathematics, pre-test number one scores showed the average to be 4.24 GE, and post-test number one scores averaged 5.32 GE. This was a growth of 1.08 academic years.

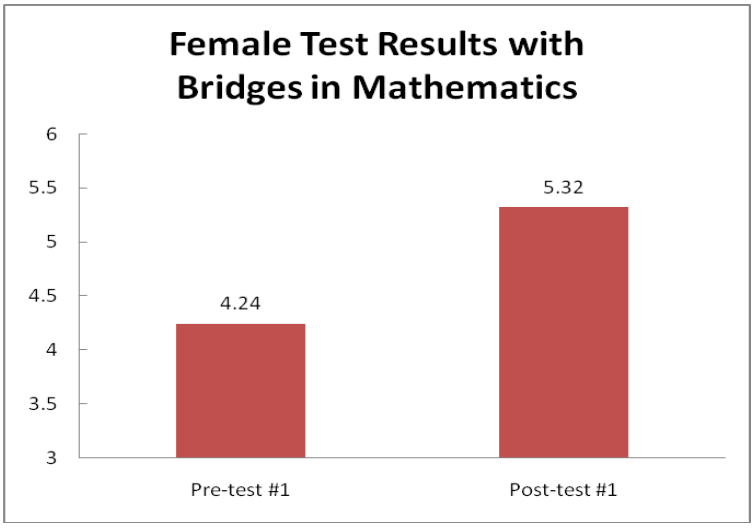

Figure 5

Female students who received daily math instruction under Math Connects showed a lower GE level growth according to test results. Pre-test number two showed an average GE level of 5.32, and post-test number two showed an average

GE level of 5.91. This was only a difference of a GE level of 0.59, which was about half of a grade level of growth.

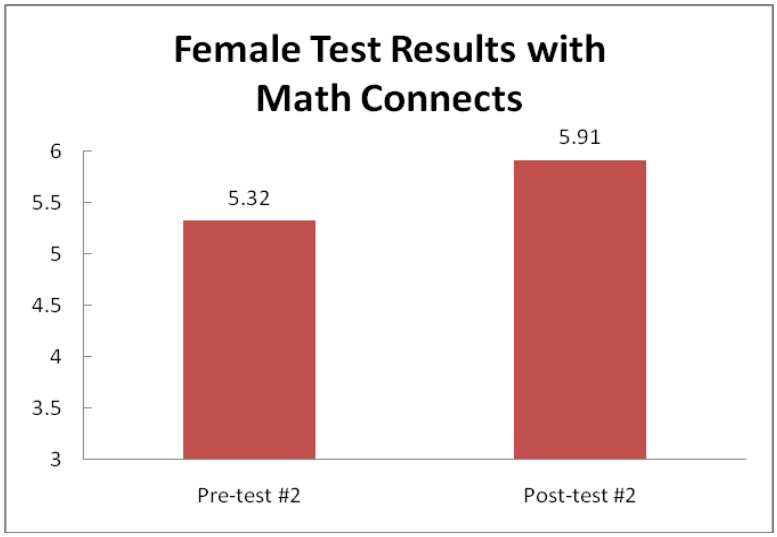

Figure 6

A third *t*-test for non-independent samples was conducted using Stat Pak for female students' STAR math assessment results. Test results showed a *t*-value of -0.91 with degrees of freedom being 16. The sum of D's was -8.30, and the mean of D's was -0.49. For a df = 16 and p = .05 a t-value of 2.120 was needed. When comparing overall female student growth, they grew an average of 1.08 years under Bridges in Mathematics curriculum and an average of 0.59 year under Math Connects curriculum. The difference between the two was actually -0.49. Therefore, test results showed there was not significant growth between female students who received daily math instruction under Bridges in Mathematics and those who received daily math instruction under Math Connects.

A survey submitted to and approved by Principal Michael Porter was given to the focus group on May 12, 2010. It evaluated students' opinions related to their personal confidence levels of their math skills after receiving daily math instruction under Math Connects. Students were asked to circle one of the following as to how they felt about each statement: (1) for strongly disagreed, (2) for disagreed, (3) for agreed, or (4) for strongly agreed. They were given ample time in class to privately complete the survey, and results were tabulated and analyzed using the spreadsheet program Microsoft Excel. Students responded favorably to statement number one, which said, "I enjoy doing math at school." Of the 33 students that completed the survey, 13 students circled (4) for strongly agreed while the other 20 students circled (3) for agreed.

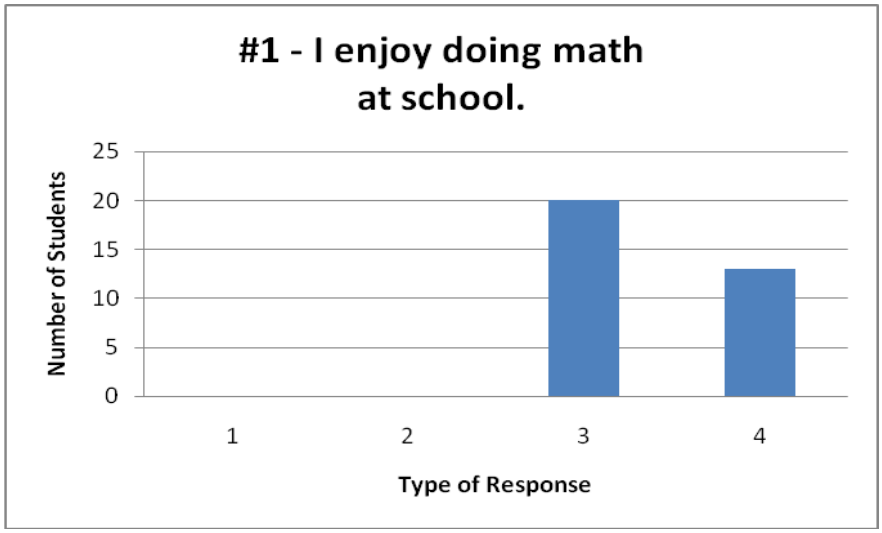

Figure 7

About three-fourths of the participating students surveyed responded favorably to statement number two, which said, “I enjoy doing math at home.” 18 students agreed with the statement, while six students strongly agreed. However, eight students disagreed with the statement, and one student strongly disagreed with it.

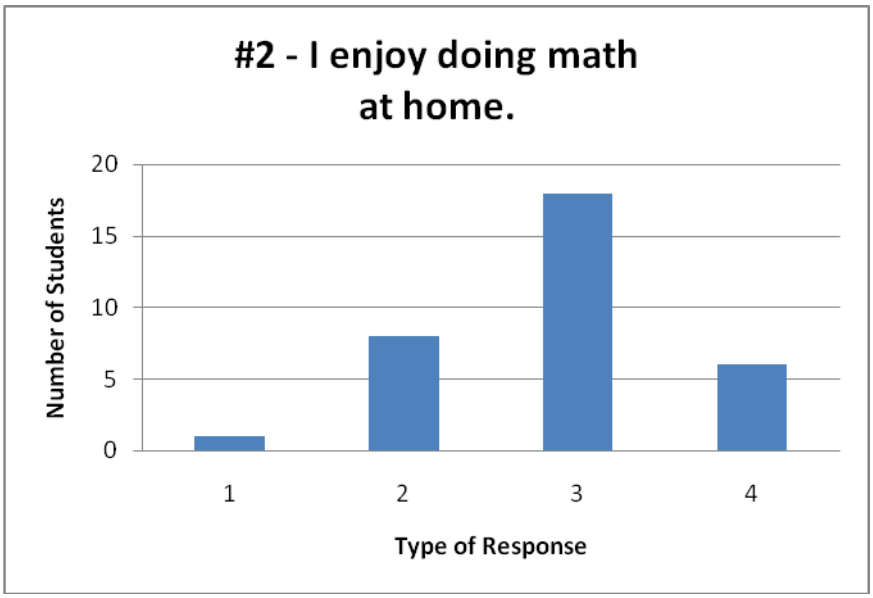

Figure 8

Students responded favorably to statement number three, which said, “I enjoy working on math with others.” Of the students that completed the survey, 17 students said that they strongly agreed with the statement. Another 14 students said that they agreed with the statement, while only two students said that they disagreed with the statement.

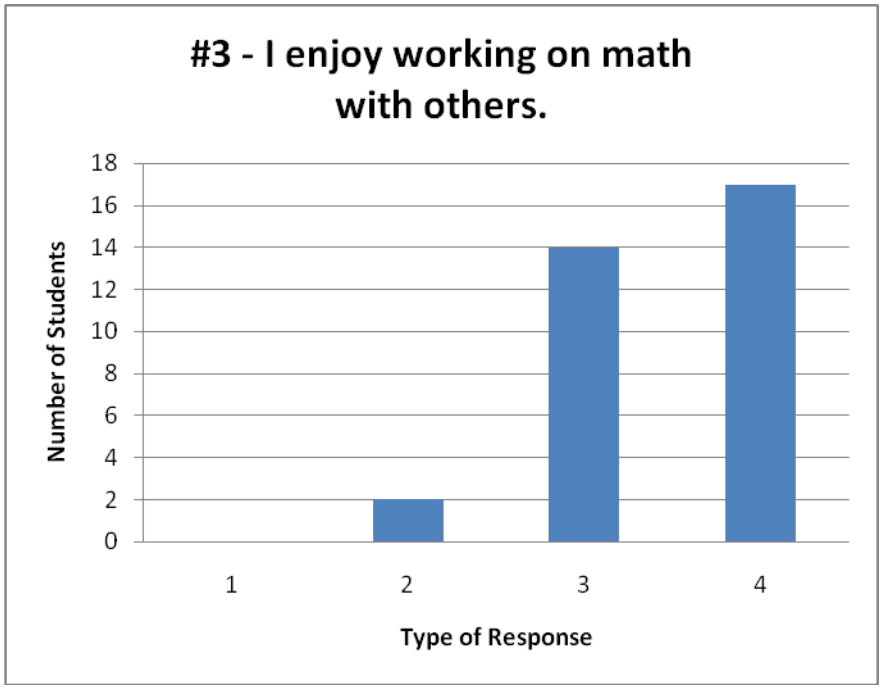

Figure 9

Survey results for statement number four were a little more spread across the board. Of the 33 students surveyed about the statement – "I can picture in my mind what is happening in a story problem as I read it to myself" – seven students disagreed with the statement. 14 of the 33 students agreed with the statement, while 12 strongly agreed with the statement. Identical results were also gather for survey statement number five – "I understand a story problem better if I hear it read aloud to me first."

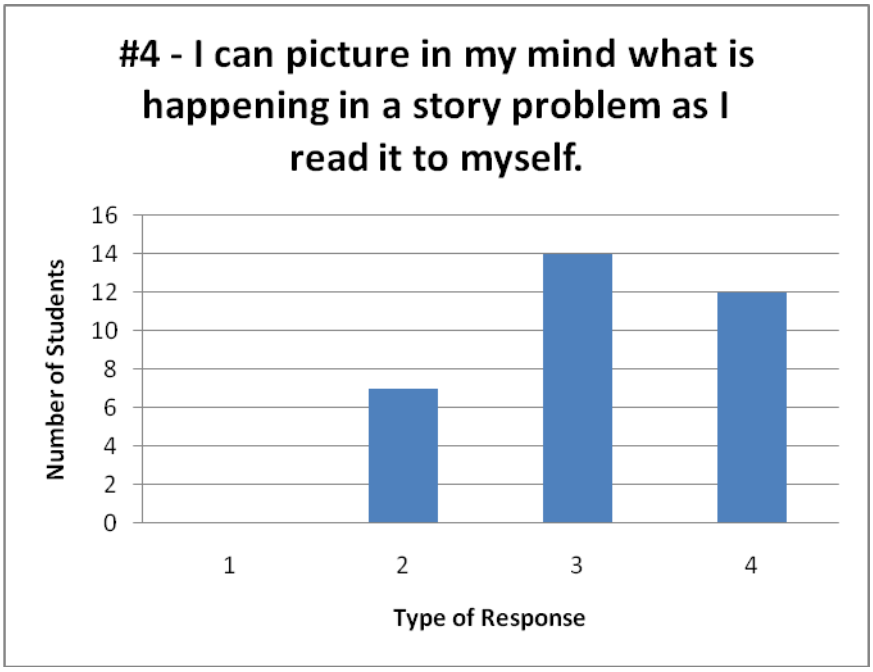

Figure 10

When asked to respond to statement number six, which said, "I am very good at math," most students responded favorably. 24 students agreed with this statement, while only four students strongly agreed with it. Another group of five students, however, disagreed with the statement.

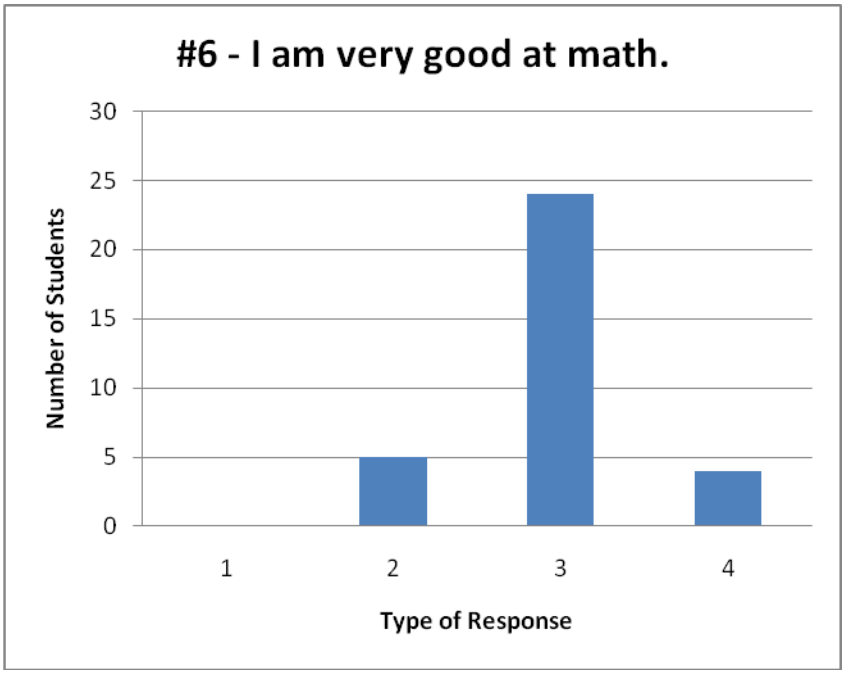

Figure 11

Students responded very favorably to the statement number seven, which said, “I understand my math facts for addition and subtraction.” 25 students strongly agreed with the statement, while another eight students agreed with it as well.

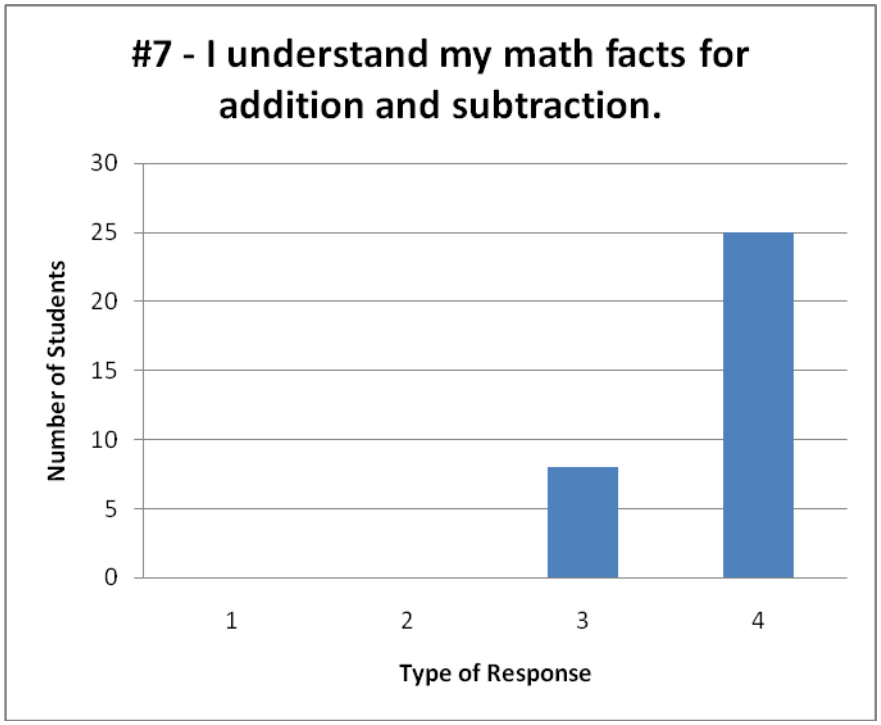

Figure 12

When asked how they felt about statement number eight, which said, "I understand my math facts for multiplication and division," most of the students responded favorably to the statement. 21 students strongly agreed, and ten students agreed with the statement. Only two students disagreed with the statement.

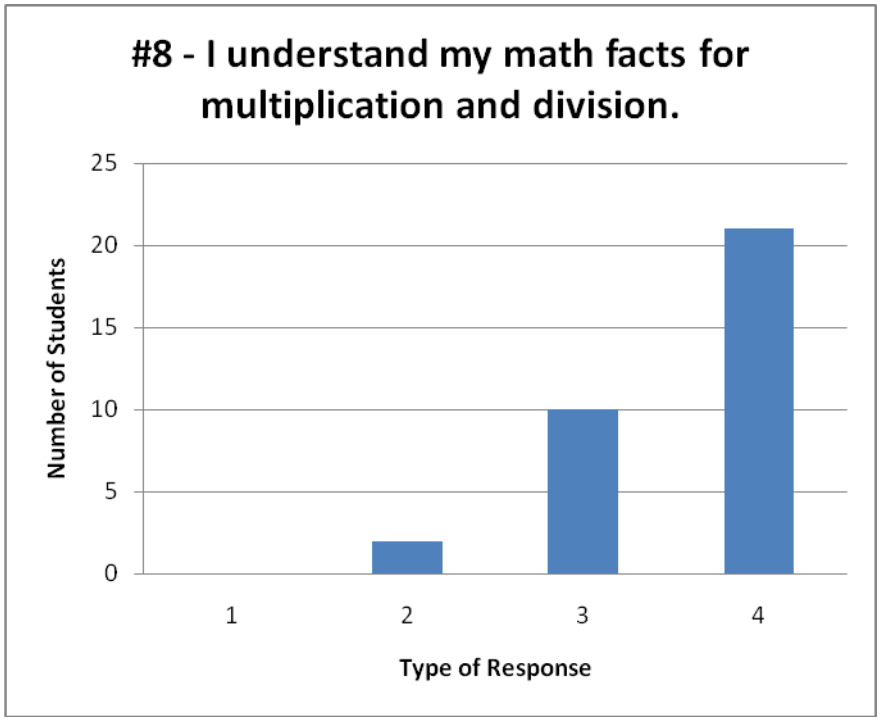

Figure 13

The survey results for statement number nine were more spread out than the other responses received, yet most students still responded favorably to statement number nine. The statement read, "I enjoy being involved in class discussions about math." 14 students strongly agreed, and 15 students agreed with this statement. On the other hand, three students disagreed, while only one student strongly disagreed.

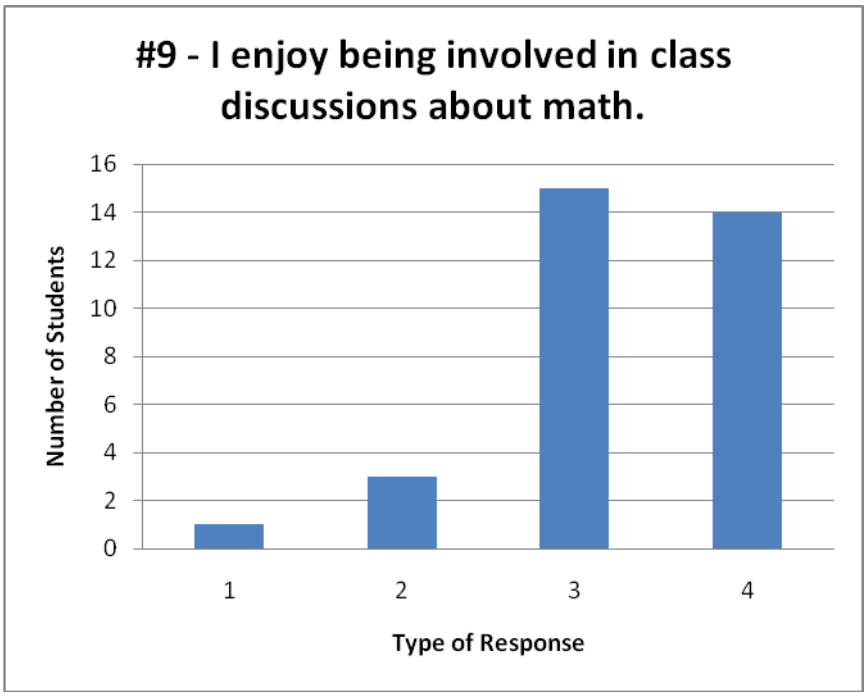

Figure 14

Statement number ten read, "I am happy with my progress/grades in math." The final statement on the survey was responded to very favorably as well by the 33 students that completed the survey. 15 students strongly agreed, and 16 students agreed with the statement. Only two students disagreed with the statement.

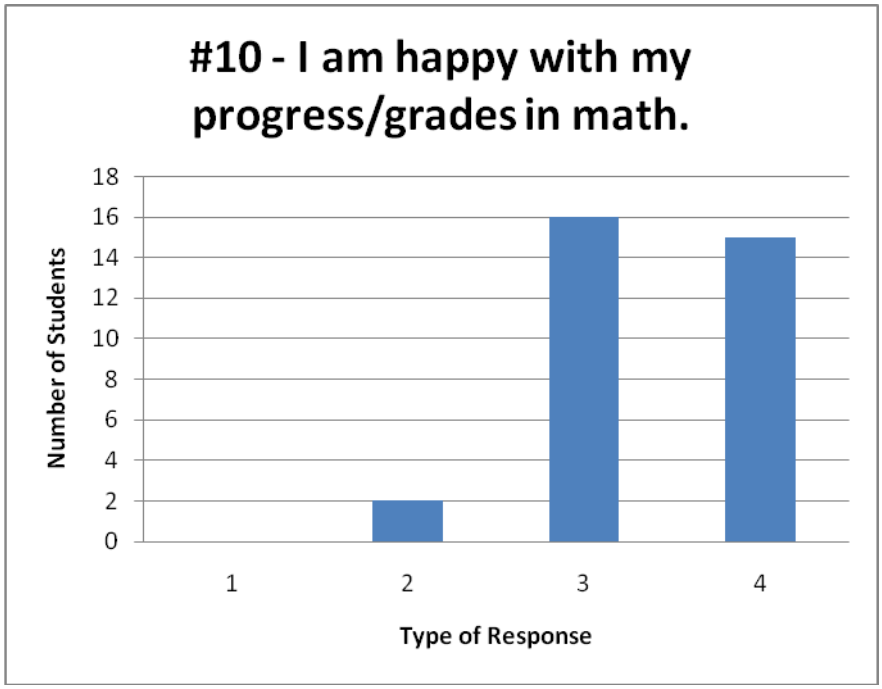

Figure 15

Findings

The first part of the hypothesis stated that students who receive daily math instruction under Math Connects curriculum will show higher grade-level equivalency growth on the STAR math test than students who receive daily math instruction under Bridges in Mathematics curriculum. On the other hand, the first part of the null hypothesis stated that there will be no difference in grade-level equivalencies between students who receive daily math instruction under Math Connects curriculum and students who receive daily math instruction under

Bridges in Mathematics curriculum. Given the analysis of the data and the testing of the hypothesis and null hypothesis, a number of findings became apparent.

While the male students of the focus group showed higher grade-level equivalency growth between the two curricula, the female students did not show higher grade-level equivalency growth. Likewise, overall as a focus group there was no significant difference in the amount of growth between students who received daily math instruction under Bridges in Mathematics and students who received daily math instruction under Math Connects. Therefore, the researcher was unable to reject this part of the null hypothesis and, in turn, was not able to support this part of the hypothesis.

The second part of the hypothesis stated that students will feel confident of their math skills as a result of receiving math instruction under Math Connects curriculum. Based on the analysis of the survey results, the researcher was able to support this statement of the hypothesis. Students overall favorably agreed or strongly agreed to each of the ten statements that were on the student survey for math.

Summary

This chapter was designed to analyze the data of the research study and identify the findings therein. Test results showed that there was no significant difference overall in the amount of growth between students who received daily

math instruction under Bridges in Mathematics and students who received daily math instruction under Math Connects. However, most students favorably agreed to the statements that they were asked to respond to on the survey. From the data, the second statement of the hypothesis was supported. However, the researcher was unable to reject the first statement of the null hypothesis and, in turn, was not able to accept the first statement of the hypothesis. Chapter 5 will summarize the study, draw conclusions, and make recommendations.

CHAPTER 5

Summary, Conclusions and Recommendations

Introduction

This chapter has been organized around the following topics: (a) Introduction, (b) Summary, (c) Conclusions, and (d) Recommendations. The purpose and nature of the research study and concerns therein are paraphrased here.

Summary

A number of students were not meeting benchmark on the Washington Assessment of Student Learning (WASL) exam at Bridgeport Elementary School (BES). Administration and staff began to wonder why there was a sudden decrease in the amount of students meeting standard in mathematics when those same students showed an increase in their reading WASL scores. The purpose of this research study was to determine if the change in math curriculum – from Bridges in Mathematics to Math Connects – would raise students' grade-equivalency levels in mathematics for the students of the class of 2017. The purpose was also to determine if students would have confidence of their math skills under Math Connects curriculum.

Selected literature relating to the problem was reviewed, and an action/quasi-experimental research study was conducted according to the study's purpose. After test results and survey responses were gathered, the researcher

concluded that there was no significant difference overall in the amount of growth between students who received daily math instruction under Bridges in Mathematics and students who received daily math instruction under Math Connects. However, most students favorably agreed to the statements that they were asked to respond to on the survey.

Conclusions

As mentioned in chapter 2, Strategic Teaching (2008) recommended that elementary schools use Math Connects curriculum in grades kindergarten through fifth grade (p. 4). Even so, the researcher concluded that there was no significant difference overall in the amount of growth between fifth-grade students who received daily math instruction under Bridges in Mathematics and fifth-grade students who received daily math instruction under Math Connects. This was accredited to the fact that most of the students in the focus group had been receiving daily math instruction under Bridges in Mathematics since entering school in kindergarten. The amount of time for daily instruction under Math Connects was only one semester. Therefore, the focus group was not familiar enough with the newly presented curriculum.

Superfine (2008) explained that teaching was not just about the physical act, but it was also about the time spent planning and preparing for students' interactions with the lesson being taught. It "involves the development of skeletal

frameworks rather than detailed scripts for teaching lessons" (p. 13). This explains the need for the staff of BES to utilize more time familiarizing themselves with Math Connects curriculum, collaborating within and between grade levels, and planning their daily math lessons.

Jennings (2000) said, "Title I was intended to provide extra dollars and services for disadvantaged children that would help to make up for the 'educational deprivations' they carried with them to school" (p. 518). When students were asked to respond to statement number two – "I enjoy doing math at home" – on the student survey for math, six strongly agreed, 18 students agreed, eight students disagreed, and one student strongly disagreed with the statement. Being a Title I school, students who attend BES come from families of low-economic status. Thus, it explains that students carry with them "educational deprivations" and have trouble receiving help on their math homework at home.

Recommendations

One recommendation of the researcher is to present the findings and conclusions of this study to the school board members, administration, and staff of BES in order to determine the next steps to fully implementing this change in math curriculum and instruction from Bridges in Mathematics to Math Connects. Another recommendation of the researcher is to allow students at BES more time to familiarize themselves with Math Connects curriculum. The researcher also

recommends that the staff of BES be allowed more in-service time to familiarize themselves with Math Connects. This would give them ample opportunity to learn how to better use the curriculum to implement it into their daily math instruction to meet the needs of their students. Additional training on Math Connects may include teachers collaborating with each other within and between grade levels and aligning the curriculum with district, state, and national mathematics standards.

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APPENDICES