Increased Instructional Time and Its Impact on Student Learning as Measured by the Measure of Academic Progress

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Increased Instructional Time and Its

Impact on Student Learning as

Measured by the Measure of Academic Progress

Approved for the Faculty

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ABSTRACT

The purpose of this study was to test the hypothesis that increased instructional time will improve student learning as measured by the Measure of Academic Progress (MAP). The researcher conducted the study by identifying at-risk learners in mathematics and offering after school tutoring to these individuals. The at-risk learners were sorted into the treatment and control groups, and the MAP scores for these at-risk learners were compared. The determination was made that the increased instructional time did not show a significant impact on student learning as measured by the MAP mathematics test. The researcher infers that small sample size, short time to administer the treatment, and lack of alignment with MAP test are possible reasons for the results.

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CHAPTER 1
Introduction

Background for the Project

In 2001, the federal government enacted legislation referred to as *No Child Left Behind* (NCLB) that mandated schools create learning environments that ensured success for all learners, and success was measured by high-stakes tests. This push to leave no child behind created a scramble to move all students to levels of proficiency as measured by these state tests.

With the high-stakes testing measuring the gains or lack thereof for each student in Washington State, educators were held accountable for remediation of students who were not progressing towards the desired learning targets in an adequate time frame. With this teacher accountability, came the search for interventions that were most effective in helping those at-risk learners achieve. Choosing interventions and remediation that showed the most gains became paramount in the high-stakes game of NCLB.

Schools changed schedules and eliminated fine arts studies to allow students more time in the core content areas; such as reading, writing, math, and science. No accident that these were the very same areas measured by the Washington Assessment of Student Learning (WASL). The idea being that increased instructional time spent in those content areas will net higher WASL scores for the students and consequently for the school district.

Statement of the Problem

Students who did not demonstrate desired achievement levels needed targeted and explicit interventions to increase their learning. Without thoughtful and well-implemented interventions, these at-risk students would continue to not meet standards. Toppenish Middle School had at-risk learners who did not participate in intervention or remediation programs in the school designed to increase student achievement. Over sixty percent of Toppenish Middle School student's scored below standards in math as measured by the WASL in 2007. Consequently, Toppenish Middle School was in the sixth unofficial step of school improvement and the school faced restructuring in order to improve student math achievement.

Purpose of the Study

The purpose of this study was to test whether classroom interventions were effective at improving student achievement. By classroom interventions, the researcher meant increased instructional time in mathematics in the form of an after school study session. By improved student achievement, the researchers meant as measured by the Measure of Academic Progress (MAP) mathematics test.

Delimitations

This project included two regular seventh-grade math classes at Toppenish Middle School in Toppenish, Washington. The first class size was approximately 22 students, 16 of them males and six females. Twenty-one of the students were Hispanic and one was Native American. Three of these twenty-two had passed the math portion of the 2006-2007 WASL. The second class was composed of twenty-five students, 14 females and 11 males. Twenty-four of these students were Hispanic and one was Native American. Only one student had passed the 2006-2007 mathematics WASL in this group.

Assumptions

The assumptions that formed the foundation of this study were that the classroom teacher involved in the study was knowledgeable and skilled as an educator with the proper certification and requirements as mandated by Washington State. In addition, the teaching materials and the skills asked of the students were developmentally appropriate and at grade level as determined by Washington State grade level expectations. Another assumption was that the goal of the study, to test the usefulness of a classroom intervention program, fitted within the Toppenish Middle School improvement plan.

Hypothesis

Students needed improved mathematics scores to pass state assessments. At-risk students who received increased instructional time as a remediation in mathematics showed increased student achievement, as measured by MAP scores, over at-risk students who did not receive increased instructional time. At-risk students were defined as students receiving classroom grades below a 70%.

Null Hypothesis

In this study, increased instructional time in mathematics had no significant impact on student achievement as measured by MAP scores. Significance was determined for $p \geq 0.05$, 0.01, and 0.001.

Significance of the Project

The purpose of this project was to provide a factual base of information regarding effective intervention strategies that improved student achievement and learning. With Toppenish Middle School students' low achievement in mathematics, the need to analyze the effectiveness of classroom interventions was paramount to making educational decisions that would improve achievement to the greatest extent.

Procedure

The researcher began this study by obtaining permission from the principal to conduct the action research in regards to increased instructional times effect on student achievement using the above stated participants (Appendix A). Then fall 2007 mathematics MAP scores (Appendix B) for the at-risk students in

the two selected classes were gathered and all students and parents were asked to sign a contract. Normal teaching progressed in these two classes and student grades were monitored for skill deficiency biweekly. When a student's grade dropped below a 70%, they were asked to stay for after school study session the following week to bring up their grade and remediate their skill deficiency. Attendance in after school study session was recorded (Appendix C) and the students below 70% were sorted into two groups, those who attended and those who did not. Those who attended became the treatment group and those who did not were then the control. After three months of this activity, the researcher then gathered the winter mathematics MAP scores and compared the score differences between the two groups of at-risk learners.

Definition of Terms

For the purpose of this study, the following words were defined:

at-risk. At-risk students were defined as students not meeting standards on achievement tests and not demonstrating adequate progress toward desired learning targets and consequently received a grade less than 70% in mathematics.

intervention. An intervention was defined as a strategy designed to modify or improve student learning.

remediation. Remediation was defined as an act or process of remedying the lack of student learning.

Acronym

ESEA. Elementary and Secondary Education Act

NCLB. No Child Left Behind

NWEA. Northwest Evaluation Association

MAP. Measure of Academic Progress

WASL. Washington Assessment of Student Learning

CHAPTER 2

Review of Selected Literature

Introduction

With the sweeping educational reform act of 2001, *No Child Left Behind*, came many new dimensions to the educational landscape in the United States. A move toward testing and monitoring individual student performance in all states in the nation created a new standard of teacher accountability for learning. With this new accountability came a need for strategic interventions that improved individual student performance. Interventions needed to be grounded in a firm understanding of the theories of learning to reach learner's true potential in the classroom. The understanding of these theories of learning became central to the development and utilization of strategies for intervening when learners fail. If thoughtful plans were made to address the deficiencies, then progress toward achievement could be made. This chapter has been organized around the following topics: (a) *No Child Left Behind Act*, (b) Washington Assessment of Student Learning, (c) at-risk learners and interventions, (d) theories of learning, and (e) summary.

No Child Left Behind

In 2001, George W. Bush' educational reform measure *No Child Left Behind* (NCLB) was enacted to improve student achievement and alter the culture of the schools of the United States. President Bush felt that the existing school system ignored the neediest of learners and focused on the high functioning. This focus caused a large group of failing students to remain stagnant in their growth. By changing the culture of American schools it was hoped that all students could

learn at a proficient level instead of only select few. Also included in NCLB was the reauthorization of the *Elementary and Secondary Education Act* (ESEA).

> The ESEA was the principal law affecting education from kindergarten through high school. In amending ESEA, the new law represents a sweeping overhaul of federal efforts to support elementary and secondary education in the United States. It is built on four common-sense pillars: accountability for results, an emphasis on doing what works based on scientific research; expanded parental options; and expanded local control and flexibility. (ED.gov, 2005)

The *No Child Left Behind* aimed to prevent learning difficulties in young children by providing support in the early years so that children entered school with the needed skills to succeed. By focusing on early literacy, NCLB hoped to prepare pre-school children for kindergarten; the idea being that if students started in the school system well-prepared there was less likelihood that they would fall behind.

Another goal of NCLB was to provide feedback to parents in regards to their child's learning. By sharing testing data with all parents, the objective was to let a parent know where their child stood academically in relation to other students in the same state. By measuring reading and math scores grades three through tenth grade, the goal was to provide yearly feedback to all students and

their families. This feedback would then be used to intervene in a timely fashion for the students who began to struggle.

Another focus of NCLB was to notify parents of performance data for their child's school. By publishing test scores for each school in the country, NCLB strived to keep parents informed and allowed them choices in the school that their child attended. If the school was performing poorly, then the parents had an option to send their child to another school. Since schools received funds for each child that attended their school, the desire to keep students in the school was strong. With low tests scores, a school risked losing students to higher-performing schools in their area and this meant less funding. The threat of lack of funds and the risk of a negative reputation were thought to motivate a district and its teachers to make positive changes to their failing school.

The *No Child Left Behind* also aimed to inform teachers and principals in order to improve teaching and learning. By providing test information to teachers and principals, the thought was that the instruction would change in response to the data. Instruction would become more focused and intentional and learning would improve.

The NCLB act targeted teacher quality as well. The act defined the qualifications needed by educators who instruct students and required each state to develop plans for getting all educators to the level of proficiency set by the act.

All teachers were to be considered highly qualified to teach in core academic subject in which they taught.

With the changes brought about by NCLB also came funding, more than "$7,000 on average is spent per pupil by local, state, and federal taxpayers. State and local school districts are now receiving more federal funding than ever before for all programs under *No Child Left Behind."(*ED.gov, 2005*)* In return for the high accountability, came the increased flexibility in how schools could spend these federal funds, innovation and creativity was encouraged in order to improve student performance in the schools.

A special emphasis was placed on choosing instructional materials and programs that had proven to be effective based on research. The *No Child Left Behind* act provided federal funds to support programs that had proved to increase student achievement; for example, the Reading First program.

Measuring "student learning was a central focus of the *No Child Left Behind* act" and states strictly followed the law's requirements for testing students in grades three through eight. Since the acts inception in 2001, many changes were made to the original provision set forth by the law. Many states were exploring different ways to assess their students learning and many growth models were suggested in finding more accurate methods of measuring improvements in students. (Guilfoyle, 2005)

Washington Assessment of Student Learning

The focus of the Washington Assessment of Student Learning (WASL) was to regularly test students in the state on the important skills in areas such as reading, writing, mathematics, and science. The process of regular testing was part of the *No Child Left Behind* legislation of 2001. The intent was to monitor and track student learning in the state and to target schools that did not make adequate yearly progress toward a learning goal. By targeting and tracking these schools, that state offered assistance and funds to schools not providing a "quality education" regardless of location and demographics. (Office of Superintendent of Public Instruction [OSPI], 2002)

The WASL test contained both basic skills and more advanced skills such as comparing and contrasting reading selections. The Office of Superintendent of Public Instruction (OSPI) created and developed all the state assessments and monitored their administration in the schools in Washington State. The Office of Superintendent of Public Instruction scored the tests and reported the achievement data for each student, school, district, and overall score for the state. This data was posted on the OSPI website and the information was intended to help the school districts focus the curriculum and improve instructional practices as well as provide feedback for parents about how their child was doing.

The Washington Assessment of Student Learning measured a student's learning of the academic standards determined by the state of Washington. Each child was tested in the spring in grades three through tenth grade in reading and

math; tested in writing in grades four, seven, and ten; and in science in grades five, eight, and ten.

At-risk Learners and Interventions

With the identification of struggling students came the need to implement strategic interventions to improve their learning. School districts across the nation struggled with how to best use their resources to improve student achievement in the classroom and many interventions for at-risk learners were attempted, some successfully and others not so successfully. A plethora of interventions had been investigated and researched in order to find the most effective means for addressing the lack of student learning. The most common method for intervention involved more learning time in the area of deficiency; the increased time was created by grouping students based on needs, taking more time from other subjects, and increasing the contact time between individual students and a skilled professional.

In the Fresno Unified School District, Holland Elementary School had poor achievement results as measured by state assessments. The school, under the leadership of a new principal, decided to reorganize the school system to support differentiated instruction as an intervention to low test scores.

The differentiated instruction meant that Holland Elementary School regrouped students to provide "explicit, direct instruction based on proficiency for access to grade level, core instruction and focused standards." (Cusumano &

Mueller, 2007) After the targeted instruction, students who were still low-performing as determined by first trimester growth assessments were placed in an "extended day early intervention program." (Cusumano & Mueller, 2007) The extended day program included one-on-one tutoring and small group interventions based on needs.

Coupling this differentiated and targeted learning intervention with authentic professional learning communities, which held each teacher responsible for their student's individual learning, caused huge growth as measured by California's state assessment. The Holland Elementary School moved from one of the lowest ranking elementary schools in the state to near the highest ranking and the annual yearly progress targets had been met for the last three consecutive years in both language arts and mathematics. Considering the school had a 90% poverty rate and 25% English language learners, this growth was quite significant. (Cusumano & Mueller, 2007)

In the Montgomery County public schools, school officials were seeking to eliminate remedial math courses and design an intervention system that sorted students into groups of learners needing varying degrees of remediation. The remediation was addressed in increased learning and instructional time targeted toward specific skill deficiencies. The thinking behind this decision being that with increased learning time, students would be able to make gains in achievement.

The Montgomery County public schools found that by moving low-performing students to remedial classes, they in essence, created a group of slow learners that never caught up to the other students. By keeping the low-performers in the same classes as their peers and then adding increased math time to their day, the school district hoped the intervention would bring the slow learners up to speed with the majority. The elimination of the previous tracking system and then increasing the instructional time seemed like a good plan for intervention.

The concept of increased instructional time as an intervention was not an isolated idea. Many school districts across the country called on the idea to remediate low performers in their districts. The increased instructional time was harvested in many ways in the school day and year. Some schools such as three of the four elementary schools in Toppenish School District, eliminated or drastically cut-back recess time. By shaving off the recess and lunch time in a school day, a school could add thirty minutes or more of academic time to the regular day. These extra minutes in the day could be then used as targeted intervention time for low-performers. (Yakima Herald Republic, 2008)

Most of the increased learning time came from the elimination of liberal arts and elective classes. Physical education time was reduced to the minimum required by some states and after school tutoring programs were started to add more hours to the academic school day. With this focus on increased instructional

time as an intervention, came some unexpected consequences. Students spent less time in physical education classes, less time at recess playing, and less time after school in sports or play at home. This decrease in physical activity caused a serious obesity epidemic in the children of United States in addition to a decline in exposure to liberal arts education for all students. The ramifications of the *No Child Left Behind* act and the interventions that followed would be felt long into the future in the United States.

Theories of Learning

A couple of significant theories in learning came into play in the idea of increased learning time as an intervention. With increased instructional time and more one-on-one time spent with the learner, the use of immediate feedback and reinforcement became more powerful for those learners who fade into the background and thus performed lower than their peers.

Feedback and reinforcement were two of the most pivotal concepts in learning. Feedback involved providing learners with information about their responses,

> whereas reinforcement affects the tendency to make a specific response again. Feedback can be positive, negative, or neutral; reinforcement is either positive (increases the response) or negative (decrease the response). Feedback is almost always considered external while

reinforcement can be external or intrinsic (i.e. generated by the individual). (Deterline, 2005)

When a teacher has more time with a low performing or at-risk learner, they provided increased positive feedback and reinforcement on a more frequent basis. This resulted in a marked improvement in achievement.

Information processing theories focused on the importance of "feedback to learning since knowledge of results is necessary to correct mistakes and develop new concepts". (Deterline, 2005) Other theorists "focus on the role of reinforcement in motivating the individual to behave in certain ways." (Deterline, 2005) A key component in both theories was the length of time between the response and the feedback or reinforcement. The quicker the response came, the more learning was facilitated. Conversely, the longer period of time it took for feedback to occur the more likely the learner would continue with misconceptions and the amount of learning would drastically decrease. Feedback was a very powerful component in the educational arena.

By working longer periods of time with at-risk students, a teacher can give more immediate feedback or reinforcement, thus increasing the learning demonstrated in the at-risk learner. Therefore, increased instructional time became necessary for feedback and reinforcement. Without the time to provide feedback in a thoughtful manner, this tool became useless.

Another theory of learning that involved increased learning time as an intervention was the concept of mastery learning. A shift in thinking in the educational world occurred in 1963 when John B. Carroll introduced the idea of mastery learning. The premise of mastery learning was that the focus should be on different students learning the same material at different time requirements. This was in stark contrast from the original thinking based on theories of intelligence that the learners were given the same amount of time to learn, and the focus then was on differences in ability between these learners.

The idea of mastery learning amounted to a radical shift in responsibility for teachers; the blame for a student's failure rested with the instruction not lack of ability on the part of the student. In a mastery learning environment, the challenge became providing enough time and employing instructional strategies so that all students achieved at the same level of learning. (Levine, 1985)

Mastery learning involved four key components: (1) clearly specifying what was to be learned and how it was evaluated, (2) allowed students to learn at their own pace, (3) assessed student progress and provided appropriate feedback and remediation, and (4) tested that final learning criterion had been achieved. (Block, 2005)

Mastery learning was based on increased learning time as a remediation for lack of skills. Students who did not achieve mastery during a lesson received remediation through tutoring, peer monitoring, small group discussions, or

additional homework. Additional time for learning was prescribed for those requiring extra help. It was suggested that mastery learning concepts were likely to enhance learning outcomes in most all subject areas. However, studies suggested that effects would be largest in mathematics and science since learning in these subject areas were generally more highly ordered and sequential (Guskey & Gates, 1986).

The mastery learning model operated under the premise that all children will learn, but in a learning environment that was optimal for their own personal growth. The learning environment most often required more time to master the given concepts and with more tailored instructional practices. The key ingredient to the equation was more time.

> In a mastery learning setting, students are given specific feedback about their learning progress at regular intervals throughout the instructional period. This feedback helps students identify what they have learned well and what they have not learned well. Areas that were not learned well are allotted more time to achieve mastery. Only grades of "A" and "B" are permitted because these are the accepted standards of mastery. Traditional instruction holds time constant and allows mastery to vary while mastery learning or systematic instruction holds mastery constant and allows time to vary (Robinson, 1992).

Increased instructional time as an intervention allowed at-risk learners to learn at their own pace and a teacher or tutor to provide the appropriate feedback and remediation needed to move that learner toward higher performance targets. The researchers did note that mastery learning programs tended to require considerable increases in time and effort to implement and that many teachers and school districts were not prepared to meet this demand within their current school systems. The requirement of mastery learning by the NCLB act created a need for restructuring the educational system in the United States. If all students were to learn all the concepts denoted by that states educational system as important, then instructional time had to be increased to allow for this mastery learning taking place. Increased instructional time was the foundation for mastery learning and remediation of at-risk learners.

Summary

With the enactment of *No Child Left Behind* act and implementation of the Washington Assessment of Student Learning, came a radical shift in the educational landscape in Washington State. The mastery learning model, which formed the basis for the thinking behind *No Child Left Behind* act, created a need for increased instructional time to be used as an intervention in the current school systems across the state and the nation. By raising the standard for all learners, a school system became accountable for the large deficit in learning that was a byproduct of a school system that formerly held the students and their families

accountable for their own learning. The schools of the past operated under the basic assumption that a learner held the primary responsibility for the learning outcome in a school system. This shift in culture of American schools created a teacher accountability system that had never been seen in public education. With this accountability came a scramble for interventions and remediation's that worked. The need to help at-risk learners and ensure the success of all students in the public school system caused teachers and school districts to need to change their practices. The change most often sought was more time with the struggling learner. The use of increased instructional time in the school system was one of the most common intervention tools found in many forms across the country to address the issue of low student performance. By spending more focused time with at-risk learners, positive change was hoped for in the achievement of all. The key theories in learning support the choice of increased instructional time as a proper remediation. Mastery learning and feedback/reinforcement models required more time to provide interventions for at-risk learners. Without time to properly provide feedback and reinforce learning, teachers failed to provide support for all learners in a classroom setting and mastery learning were not achieved if students do not have time to learn skills and concepts at their own pace.

CHAPTER 3

Methodology and Treatment of the Data

Introduction

The researcher's intent with this study was to determine if increased instructional time in mathematics improved student achievement as measured by the MAP test. By reviewing literature regarding the WASL, NCLB, theories of learning, and research on at-risk learners and interventions, the researchers was able to define parameters of study to conduct the research described below on a small group of high-poverty, low-achieving learners. The hypothesis, at-risk students who received increased instructional time as a remediation in mathematics showed increased student achievement, as measured by MAP scores, over at-risk students who did not receive increased instructional time, was tested. At-risk students were defined as students receiving classroom grades below a

70%, was tested. This chapter has been organized around the following topics: (a) methodology of study, (b) participants and how they were chosen, (c) instruments used to measure outcome, (d) design of the experiment, (e) procedures followed, (f) treatment of data, and (g)summary.

Methodology

The researcher conducted quantitative research with experimental design and independent samples. The students who attended the program were the treatment group. Those students who did not attend the program were the control group.

Participants

A criterion sampling technique was used. The samples for the study were chosen based on the criteria of receiving a grade below 70% at a grading interval. There were fifteen students who received a grade below a 70% during the research window. From this group, all fifteen participants were invited to participate in increased mathematics instruction. Those who attended at least two sessions of after school tutoring to improve the math grade were considered the treatment group for this study. A total of seven students, six males and one female were considered the treatment group. Those who attended one or less sessions were considered the control group. The control group contained eight participants, five males and three females.

Instruments

The data gathering device used to compare the treatment and control groups was the MAP mathematics achievement test. Research conducted by the Northwest Evaluation Association (NWEA) concluded that data provided by the MAP tests was accurate, reliable, and valid.

> Grade-independent - Because the tests are adaptive and the test items displayed are based on student performance, not age or grade, identical scores across grades mean the same thing. For example, a third grader who received a score of 210 and a fourth grader who received a score of 210 are learning at the same level. This allows growth to be measured independent of grade.
>
> Equal-interval - The RIT scale is infinite, but most student scores fall between the values of 140 and 300. Like meters or pounds, the scale is equal-interval, meaning that the distance between 170 and 182 is the same as the distance between 240 and 252. This allows educators to apply simple mathematical equations to the scores to determine information such as the mean and median scores in a class or grade.
>
> Stability - More than twenty years after it was first implemented, scores along the RIT scale mean the same thing. As a result, educators can confidently measure growth over many years. (NWEA, 2009)

The NWEA reported that they conducted ongoing research to ensure that the information their testing materials provided was reliable and dependable.

Design

The researcher used the non-equivalent group design. The drawbacks to this design were that because the researcher could not assign participants randomly, added validity issues such as "regression and interactions between selection, maturation, history, and testing" were compounded. (Airasian, Gay, & Mills, 2006) A positive effect of this design included that due to the fact that the participants were selected based on a criteria as they were "possible effects from reactive arrangements were minimized."(Airasian, Gay, & Mills, 2006) In this experimental study the researcher compared the difference in fall MAP mathematics scores to winter MAP mathematics scores for all participants.

Procedure

The study spanned several months. During the course of the study, the following steps were taken:

1. Obtained principal permission for study. (Appendix A)
2. Obtained 2007 Fall MAP scores for each student. (Appendix B)
3. Student Contracts for math – signed by student/parent.
4. Monitored student grades for skill deficiency biweekly.

5. Scheduled after school study sessions for students receiving grade below 70%.
6. Recorded students attending after school study sessions and students not attending (assuming all invited-grades below 70%). (Appendix C)
7. Organized data- fall MAP scores for control group and experimental group (Appendix B).
8. Continued holding after school study sessions and record attendance.
9. Organized data- winter MAP scores for control group and experimental group (Appendix B).
10. Analyzed data for whole study-compare pre-test Fall MAP scores and post-test Winter MAP scores. (Findings.)

Treatment of Data

The researcher used a t-test to determine whether the two means of the score differences were significantly different to a selected degree of probability. The t-test formula was provided in the book *Educational Research: Competencies for Analysis and Applications.*

Summary

This chapter was designed to review the methodology and treatment of data related to increased instructional times impact on student achievement as measured by MAP scores in students considered at-risk based on classroom grades and skill deficiency.

CHAPTER 4

Analysis of the Data

Introduction

Once the research was conducted in regards to the effects of increased instructional time on mathematics learning, the researcher analyzed the data to determine the impact of the study. The analysis was organized around the following topics: (a) description of environment, (b) hypothesis, (c) results of the study, (d) findings, and (e) summary.

Description of the Environment

The researcher collected data from two regular seventh-grade math classes at Toppenish Middle School in Toppenish, Washington. The first class size was approximately 22 students, 16 of them males and six females. Twenty-one of the students were Hispanic and one was Native American. Three of these twenty-two had passed the math portion of the 2006-2007 WASL. The second class was

composed of twenty-five students, 14 females and 11 males. Twenty-four of these students were Hispanic and one was Native American. Only one student had passed the 2006-2007 mathematics WASL in this group. Students from these two classes performing below a 70% at biweekly grading periods were invited to participate in after school tutoring, increasing instructional time. These at-risk students were further organized into the control group, those who were invited but did not attend two or more sessions, and the treatment, those invited who attended two or more sessions. The difference between the fall MAP scores and the winter MAP scores were compared using a t-test for independent samples.

Hypothesis

At-risk students who receive increased instructional time as a remediation in mathematics showed increased student achievement, as measured by MAP scores, over at-risk students who do not receive increased instructional time. At-risk students were defined as students receiving classroom grades below a 70%.

Null Hypothesis

In this study, increased instructional time in mathematics had no significant impact on student achievement as measured by MAP scores. Significance was determined for $p \geq 0.05$, 0.01, and 0.001.

Results of the Study

The researcher found the means of the differences in the fall MAP scores and the winter MAP scores to be 1.00 for the control group and 5.00 for the

treatment group. These means were computed by combining the differences in the MAP scores for fall and winter in the control group or treatment and then dividing by the number of students in the control or treatment. The total difference for the control was eight and the number of students in the control group was eight also, which gave a mean difference of 1 for the control group. The total difference for the treatment group was thirty-five and the number of students in the treatment was seven. Thirty-five divided by seven gave us a mean difference of five for the treatment group. Table 1

Table 1

Fall and Winter MAP Scores for Control and Treatment Group

Control Student Number	Fall MAP	Winter MAP	Difference
S1	201	200	-1
S2	198	201	3
S3	187	188	1
S4	207	209	2
S5	205	201	-4
S6	197	198	1
S7	211	213	2
S8	197	201	4
Treatment			
S9	209	212	3
S10	207	201	-6
S11	213	219	6
S12	217	220	3
S13	199	203	4
S14	187	197	10
S15	195	210	15

Note $X_1 = 5$ (treatment), $X_2=1$ (control).

The researcher then used the formula in Table 2 to perform the t-test for independent samples from Table 1. The t-value was calculated using the steps shown below. The degrees for freedom where found by using the formula ($n_1 + n_2 - 2$), n_1 the number of students in treatment group, seven, and n_2 being the number of students in the control, eight. The degrees of freedom were found to be thirteen. The statistics rendered from the *t*-test are shown in Table 2.

Table 2

t-test calculation for data

X_1= 5 (treatment)
X_2= 1 (control)
SS_1= 256
SS_2= 44
df = 13
t = 1.61 *

t =

t =

t = 1.61

Note: *p≤.05 (Airasian, Gay, & Mills, 2006. p 571), not significant.

The researcher then used the *t*-value to determine distribution of *t* to the p≥ 0.05, 0.01, and 0.001 levels of significance in Table 3. To conclude that there was a significant difference between fall and winter MAP scores, the *t* value needed to be above 2.160 at the .05 level, above 3.012 at the .01 level, or above 4.221 at the .001 level of significance.

Table 3

Distribution of t

	p		
df	.05	.01	.001
13	2.160	3.012	4.221

(Airasian, Gay, & Mills, 2006)

The researcher determined that a *t*-value of 1.6089 was not considered statistically significant when compared to the distribution of *t* probability intervals p≥ .05, .01, and .001. The null hypothesis was accepted at all levels of significance and consequently there was no support for the hypothesis that extra instructional time in mathematics would increase MAP scores.

Findings

Given the analysis of the data and the testing of the hypothesis, the researcher determined that there was no significant difference between the control and treatment groups in the study. Increased instructional time did not significantly improve student performance on the mathematics MAP test as shown at all *t* probability intervals p≥ .05, .01, and .001.

Discussion

The researcher expected that the increased instructional time in mathematics would show significant increases in the MAP mathematics scores. Research on mastery learning and feedback models showed that increased time with a learner improved achievement. The students in the treatment group did show an increase in achievement based on the classroom grading system, but did not show significant achievement on the MAP mathematics assessment.

Summary

This chapter was designed to analyze the data and identify the findings. The description of the environment framed the research conditions, the hypothesis and null hypothesis were stated, and the results of the study were evidenced in the tables that followed. The null hypothesis was accepted. The researcher found that the hypothesis was not supported at any level of significance. Significance was determined for $p \geq .05$, .01, and .001. The researcher found that no significant relationship existed between MAP scores of students who received increased instructional time in mathematics in comparison to the MAP scores of those who did not receive increased instructional time. Significance was determined for $p \geq .05$, .01, and .001.

CHAPTER 5

Summary, Conclusions and Recommendations

Introduction

The impact of increased instructional time on student achievement in mathematics was explored in this research. The researcher discussed the findings and makes conjectures in regards to the limitation of the study. This chapter expands on these conjectures and has been organized around the main topics of conclusions, and recommendations.

Summary

The researcher began this study by exploring the historical background of the NCLB act, the WASL test used to measure student progress, strategies and research about and for at-risk learners, and theories of learning. The hypothesis was formalized and the research parameters were defined. Action research was then conducted on a group of 7th grade at-risk students at Toppenish Middle School around the topic of increased instructional times' impact on student learning as measured by the MAP mathematics test. The findings suggested that increased instructional time did not have a significant impact on student learning and the researcher speculated as to why this intervention did not prove to be effective in this study and this was further discussed in the reminder of this chapter.

Conclusions

Conclusions were drawn from a synthesis of the findings. The researcher found that the null hypothesis was accepted and the hypothesis in this study was not supported. The researcher found that the increased instructional time in mathematics did not increase student learning as measured by the MAP mathematics test. The results were limited to the constraints of a very small sample size to test due to the criterion sampling used, a small window of time when the treatment group received the increased instructional time (three months or at least two sessions), and the limits of the MAP mathematics test measuring skills that may not have been closely linked to the skill deficiencies remediated in the after school tutoring sessions.

Recommendations

Based on the conclusions, the researcher recommends increasing the sample size of the treatment and control groups; perhaps open the study to the entire middle school instead of only two class periods. The researcher also recommends that the increased instructional time be increased from three months to nine months and from at least two sessions to at least ten sessions, and that perhaps the test used to measure increased learning was calibrated to test only the skills that were being remediated, a classroom based assessment instead. These recommendations would then need to be further studied to test for their impact on student learning and increased instructional time.

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Appendix B
Study Participants and MAP Data

Control Group (D/F Students who attended 1 or less)

Student Name:	Fall MAP Score	Winter MAP Score	Score Difference
S1	201	200	-1
S2	198	201	+3
S3	187	188	+1
S4	207	209	+2
S5	205	201	-4
S6	197	198	+1
S7	211	213	+2
S8	197	201	+4

Treatment Group (D/F Students who attended 2 or more times)

Student Name:	Fall MAP Score	Winter MAP Score	Score Difference
S9	209	212	+3
S10	207	201	-6
S11	213	219	+6
S12	217	220	+3
S13	199	203	+4
S14	187	197	+10
S15	195	210	+15

Appendix C
After School Tutoring Session Attendance

Student Names:	Dates Invited:	Dates Attended:
S9	9/18, 10/2, 10/16, 10/30, 11/13, 11/27	9/18, 10/2, 10/16, 10/30, 11/13, 11/17
S1	9/18, 9/25, 10/2, 10/16, 10/23, 10/30, 11/6, 11/13, 11/27	11/6
S13	9/18, 10/2, 10/16, 10/23, 11/6, 11/27	9/18, 10/16, 10/23, 11/27
S15	9/25, 10/16, 11/13	9/25, 10/16, 11/13
S4	9/25, 10/16, 11/6, 11/13, 11/27	
S5	9/18, 9/25, 10/2, 10/16, 10/23, 10/30, 11/6, 11/13	
S6	9/18, 9/25, 10/2, 10/16, 10/23, 10/30, 11/13, 11/27	11/13
S7	9/25	9/25
S8	9/18, 9/25, 10/2, 10/16, 10/23, 10/30	10/30
S10	9/18, 9/25, 10/2, 10/16, 10/23, 10/30	9/18, 9/25, 10/2, 10/16, 10/23, 10/30
S11	9/18, 9/25, 11/13	9/18, 9/25, 11/13
S12	11/6, 11/27	11/6, 11/27
S2	11/13, 10/16, 11/27	10/16
S14	9/18, 9/25, 10/16, 11/13, 11/27	9/25, 10/16, 11/13, 11/27
S3	9/18, 9/25, 10/2, 10/16, 10/23, 10/30, 11/13, 11/27	10/2