A Correlation Between

Science WASL and Science MAP

A Special Project

Presented to

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Heritage University

In Partial Fulfillment

of the Requirement for the Degree of

Master of Education

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2009

FACULTY APPROVAL

A Correlation Between

Science WASL and Science MAP

Approved for the Faculty

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April 26, 2009, Date

ABSTRACT

The purpose of the project was to determine if a correlation existed between students who passed the fall Science Measure of Academic Progress with a Rasch Unit score of 216 or higher would pass the Spring Science Washington Assessment of Student Learning. Through the course of the year students were taught from two inquiry based science kits, Science and Technology Concepts for Middle School: *Properties of Matter*, and Science Education for Public Understanding Program: *Issues and Physical Science: Energy.* A correlation was found between the Science Measure of Academic Progress and the Science Washington Assessment of Student Leaning at the .001 level.

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Introduction

Background for the Project

In 1996, the Science Essential Academic Learning Requirements were established by the Science Subject Area Committee for the Commission on Student Learning. In the summer of 1998, a group was brought together to develop the first Science Washington Assessment of Student Learning with the recommendations that the Science Washington Assessment of Student Learning focus 40% of the points to science concepts and processes, 30% on inquiry and problem solving, and 30% percent to the nature of science and science, technology and society issues. The first pilots to the Science Washington Assessment of Student Learning were not successful and in November 2000 two advisory groups came together to re-consider the science assessment for the State of Washington. Based on the recommendations of the 2000 advisory committee a scenario-based Science Washington Assessment of Student Learning was successfully piloted in the spring of 2001.

In the summer of 2001 the Office of Superintendent for Public Instruction established a position where one person, Roy Beven, was to develop the Science Washington Assessment of Student Learning. In January of the following year, 60 science teachers formed the Science Assessment Leadership Team. Roy Beven, along with the Science Assessment Leadership Team, developed the Science Assessment Leadership Team's assessment literacy by participating in professional development, content review, range finding, scoring, and data reviews. Based on the work done by Roy Beven and Science Assessment Leadership Team, a new Science Washington

Assessment of Student Learning was piloted in eighth and tenth grades in the spring of 2002. The Science Washington Assessment of Student Learning pilot of 2002 provided test items and scenarios for the first Science Washington Assessment of Student Learning in April of 2003. In 2005, the Science Washington Assessment of Student Learning became a requirement for all fifth, eighth, and tenth grade students.

Since the time of the first Science Washington Assessment of Student Learning teachers and others in the education system had wondered how the students would perform on the Science Washington Assessment of Student Learning prior to the students' actually taking the test. If educators had a way to predict how students would perform on the Science Washington Assessment of Student Learning, educators could focus attention to the students that were considered to be "at-risk" for passing the Science Washington Assessment of Student Learning. Finding an assessment that would predict how students would perform on the Science Washington Assessment of Student Learning would be invaluable to educators as educators prepared the students for the all-important Science Washington Assessment of Student Learning.

Statement of the Problem

The science portion of the Washington Assessment of Student Learning tested students on the students' ability to describe scientific phenomena. The students took the Science Washington Assessment of Student Learning in fifth, eighth, and tenth grades. Due to the fact the Washington Assessment of Student Learning test changed from year to year, and the fifth grade, eighth grade, and tenth grade test did not test for the same information, students and teachers had no predictor of how students would perform on the Science Washington Assessment of Student Learning

Purpose of the Project

The project was created to determine if the Northwest Evaluation Association Measure of Academic Progress test would predict the outcome of the Washington Assessment of Student Learning in science. The second purpose of the project was to determine what test score was needed on the Northwest Evaluation Association Measure of Academic Progress to ensure that the student could pass the Science Washington Assessment of Student Learning.

Delimitations

In the 2007-2008 school year, the middle school where this study took place was made up of 828 students (50% male and 50% female). The ethnic make-up of the school was 82.5% White, 8.2% Hispanic, 5.2% Asian, 2.7% Black, and 1.3% American Indian. The school had 31.1% of students who received a free or reduced lunch. The population of the school had 9.3% of students receiving special education services. The school's staff was made up of 45 teachers with an average of 13.7 years experience, and 66.7% of the teachers had masters' degrees (Report Card, 2007-2008).

The community surrounding the school was mostly middle and upper middle class with approximately 31% in a lower social-economic class. Many of the parents that had students at the school had a background in science due to the fact that companies such as Pacific Northwest National Laboratories, Bechtel, Flour, and others were located in the community where the school was built.

The students that were a part of the research project were all eighth grade students at a middle school in the Columbia Basin. The students had six 55-minute periods each day. Two of these periods were the student's choice (Technology, Art, Choir, etc.) and four were mandatory core classes (Language Arts, Social Studies, Mathematics, and Science). All students had the ability to learn and move to high school after the students' eighth grade year. All students were required to take the Science Washington Assessment of Student Learning during the students' eighth grade year. All students performed activities from the Science and Technology Concepts for Middle School kit, Properties of Matter and the Science Education for Public Understanding Program kit, Issues and Physical Science: Energy.

Assumptions

The teacher was concerned about the students' ability to pass the Science Washington Assessment of Student Learning. The teacher was a qualified teacher with the students' best interest in mind. Students were willing to learn and were concerned with passing the Washington Assessment of Student Learning. The material that was used by the teacher was approved by the district and was reliable.

Hypothesis

Test scores received by eight grade students who received an average Rasch Unit score of 216 or higher on the fall Measurement of Academic Progress test would pass the spring Science Washington Assessment of Student Learning in greater numbers than student who did not pass the fall Science Measurement of Academic Progress with a Rasch Unit score of 216 or higher.

Null Hypothesis

Test scores received by eight grade students who received an average Rasch Unit score of 216 or higher on the fall Measurement of Academic Progress test would not pass the spring Science Washington Assessment of Student Learning in greater numbers than student who did not pass the fall Science Measurement of Academic Progress with a Rasch Unit score of 216 or higher.

Significance of the Project

The Science Washington Assessment of Student Learning was a requirement for students graduating high school in the year 2013. The Science Washington Assessment of Student Learning had been difficult for student to pass. Only about 35% of middle school students who took the Science Washington Assessment of Student Learning passed the test in the 2007-2008 school year.

Educators needed a test to predict student performance on the Science Washington Assessment of Student Learning. If educators had a way to predict how students would perform on the Science Washington Assessment of Student Learning, educators could then focus attention on students that were in danger of not passing the Science Washington Assessment of Student Learning. The Measure of Academic Progress test would give educators immediate feedback on student performance prior to the Science Washington Assessment of Student Learning test and give educators information on how the students would perform on the Science Washington Assessment of Student Learning.

Procedure

The Measurement of Academic Progress science test was taken in the fall of the 2007 school year. The test was taken in October of the 2007-2008 school year. Approximately 150 students took the two part test in a 55 minute testing window. Each of the students took two parts of the Science Measurement of Academic Progress test. One part of the test dealt with General Science while the second part of the test dealt with

Concepts and Processes. The data from the test was evaluated by the Northwest Evaluation Association and was translated into a score called a Rasch Unit. A Rasch Unit score of 213 for each test was considered to be on grade level for 8^{th} grade students.

The Science Washington Assessment of Student Learning was taken by eighth grade students in April of the 2007-2008 school year. Students took the test during their first period class between the hours of 8:00 and 11:00 a.m. The Science Washington Assessment of Student Learning did not have a time limit, so if students needed more time for the Science Washington Assessment of Student Learning, the students were relocated to another location to finish the test. Teachers followed strict guidelines during the administration of the tests and were responsible for picking up the tests for the students and returning them to a secure location at the end of the day. Administrations, along with teachers, were responsible for the security of the tests to ensure that no tests went missing. Students who scored 400 or above on the Science Washington Assessment of Student Learning passed the science portion of the test.

Definition of Terms

Essential Academic Learning Requirements. Essential Academic Learning Requirements were an overview of information students should know and be able to use in grades kindergarten through tenth grades in the state of Washington.

kit. Kit referred to a set of curriculum materials with books and equipment for activities.

Measure of Academic Progress. The Measure of Academic Progress was a computer-based test given to students to assess performance and level of understanding on science, mathematics, and reading.

Northwest Evaluation Association. The Northwest Evaluation Association was an organization that provided research-based assessments, professional training, and consulting training to improve teaching and learning.

Rasch Unit. A Rash Unit was a score given to student on the Measure of Academic Progress.

Science Assessment Leadership Team. The Science Assessment Leadership Team was a group of science educators who had developed assessment literacy.

Washington Assessment of Student Learning. Washington Assessment of Student Learning was the state of Washington's state-wide test given to all students in grades three through ten.

Acronyms

EALR: Essential Academic Learning Requirement

GLE: Grade Level Expectations

IAPSE: Issues and Physical Science: Energy

MAP: Measurement of Academic Progress

NWEA: Northwest Evaluation Association

OSPI: Office of Superintendent for Public Instruction

PCA: Powerful Classroom Assessment

PNNL: Pacific Northwest National Laboratories

POM: Properties of Matter

RiT: Rasch Unit

SALT: Science Assessment Leadership Team

SCIF: Science Curriculum Instructional Frameworks

SEPUP: Science Education for Public Understanding Program

STC/MS: Science and Technology Concepts for Middle School

TAC: Technical Advisory Committee

WASL: Washington Assessment for Student Learning

CHAPTER 2

Review of Selected Literature

Introduction

The project focused on several areas of interest regarding the relationship between the Science Washington Assessment of Student Learning (WASL) and the Science Measure of Academic Progress (MAP) test. Some of the key areas that the author was interested in were the history of the Science WASL, the MAP test format, and the reliability and validity of the MAP test. The author was also interested in how the curriculum implemented by the author would impact the relationship between the MAP and WASL tests. In the following sections many of these areas of interest were discussed.

History of the Science Washington Assessment of Student Learning

In 1996, the Science Essential Academic Learning Requirements (EALRs) were established by the Science Subject Area Committee for the Commission on Student Learning. In the summer of 1998, a group was brought together to develop the first Science WASL with the recommendations that the Science WASL focus 40% of the points to science concepts and processes, 30% on inquiry and problem solving, and 30% to the nature of science and science, technology and society issues. The first pilots of the Science WASL were not successful and in November 2000 two advisory groups came together to reconsider the science assessment for the State of Washington. Based on the recommendations of the 2000 advisory committee a scenario-based Science WASL was successfully piloted in the spring of 2001.

In the summer of 2001, the Office of Superintendent for Public Instruction (OSPI) established a position where one person, Roy Beven, was to develop the WASL. In January of the following year, 60 science teachers formed the Science Assessment Leadership Team (SALT). Roy Beven, along with the SALT team, developed the Science Assessment Leadership Team's assessment literacy by participating in professional development, content review, range finding, scoring, and data reviews. Based on the work done by Roy Beven and the Science Assessment Leadership Team, a new Science WASL was piloted in eighth and tenth grades in the spring of 2002. The Science WASL pilot of 2002 provided test items and scenarios for the first Science WASL in April of 2003.

In 2003, Science EALRs 2 and 3 were reorganized based on the recommendation from the Science Curriculum Instructional Frameworks and SALT teams. Moving the nature of science to EALR 2 clearly focused the standard on the Inquiry of Science. Moving the processes of science and technology to solve a human problem clearly focused EALR 3 on the Application of Science. Although the changes to EALR 2 and 3 occurred, the EALRs were essentially the same EALRs that were adopted by the Commission on Student Learning in 1998.

In 2004, the OSPI took more of the responsibility for developing the Science WASL and as a result added a second full-time Science Assessment Specialist, Cinda Parton. None of the contractors that had been used by OSPI demonstrated great expertise in the development of the Science WASL so by 2006 the entire science WASL was written and developed by OSPI and members of SALT.

In 2003-2004, the level of proficiencies for grades five, eight, and at the high school level were set by committees of about 30 stakeholders. The stakeholders included science teachers, administrators, specialists, informal educators, businesses, parents, students, and universities. Most of the individuals on these committees felt the level of difficulty was appropriate for the students that were taking the test. By 2004, the fifth grade proficiency standards were set and, in 2005, the Science WASL was required for all fifth, eighth, and tenth grade students in the state of Washington.

In the beginning of 2005, the OSPI published the first science GLEs. The release of this document clearly showed how the Science GLEs and Science WASL were completely aligned. At the same time of the GLE's release, the OSPI released Powerful Classroom Assessments (PCAs) to be used in the classroom. With the PCAs also came student samples of how the different levels of performance looked. This allowed teachers and students to better understand what the state was looking for when it came to test questions and gave the students an opportunity to see test-type questions before the students actually took the test. In addition to the release of PCAs, the OSPI also started to offer training to teachers on how to develop and write other PCAs from the teachers' curriculum.

In 2004, the WASL was proven to have validity and reliability by the Technical Advisory Committee (TAC). The TAC found, "the level of validity and reliability for reporting individual student and school results is acceptable…" (National Technical Advisory Committee, 2004, p. 50). The TAC also found that performance standards stayed stable over time for each grade level and each subject (National Technical Advisory Committee, 2004).

Measurement of Academic Progress Including Validity and Reliability

The Measurement of Academic Progress (MAP) test was a computerized test that had been in existence for 20 plus years and was given to students in the school district where the study took place. Students answered multiple-choice questions on the computer that dealt with a variety of science concepts. The MAP test was created to determine if students understood concepts in mathematics, reading and in science. Another purpose of the MAP test was to determine if students were said to be on grade level. The determination of grade level was based on if the students met the benchmark for a particular grade level. Due to the fact the MAP test adjusted the questions for each student, the test was at the student's own level and assessed the student's instructional level (Instructional Measure, 2004-2008).

The MAP was a norm-referenced test with an equal-interval scale called Rasch Units (RIT). Rasch Units were the score that was given to the students once the students had completed the test. These RIT scores then placed the students below grade level, at grade level, or above grade level depending on how well the students did on the MAP test. The RIT score was determined by how well students performed on the test. Due to the fact the MAP test had a question bank of over 15,000 test items, the student could perform at many different levels. The questions that the student received from the 15,000 questions depended on how well the student answered each of the preceding questions. For example if the student got the previous question correct, they would then receive a more difficult question for the student's next question. The student would continue in this fashion until the student was unable to correctly answer the question. Once the student was unable to answer the question correctly the test would then adjust to give the student a question that was less difficult. Based on this information the RIT score was determined (Research-based Accuracy, 2004-2008).

The Northwest Evaluation Association (NWEA) approach to test-retest reliability was more rigorous than most. The test-retest format did not follow the traditional model. Rather, NWEA gave the first test and then seven to twelve months later gave a second test that was similar to the first. However, the second test was more difficult. One of the problems that was typically of concern when a test was given so far apart was a decrease in reliability, but this was not the case with NWEA. Most of the reliability coefficients were still in the middle .80s and the low .90s. The reliability coefficients were much higher than what was typical. To determine the internal consistency of the test done by NWEA, NWEA calculated the marginal reliability coefficient. The marginal reliability coefficient method used two test characteristics that were developed by item response theory. The test information had an inverse correlation. Smaller measurement error meant that less test information was provided. This was also true in the reverse; the larger the measurement error, the more test information was provided. The marginal reliability for the test resulted from combining measurement error estimations at different points on the achievement scale. The test developed by NWEA had the reliability coefficient in the middle .90s (Reliability and Validity Estimate, 2004).

Validity was achieved by knowledge of the content standards from a district or state; the more accurately a test measured the information from the district or state standards the more the test was said to have validity. The validity evidence for the NWEA test came from concurrent validity. Concurrent validity was found by performing a Pearson correlation. Pearson correlations were determined by the administration of two different tests and then identifying how well students performed on each test. Pearson correlations greater than the middle .80s were said to have a strong correlation. The correlation for the Measure of Academic Performance (MAP) was in the upper .70s and lower .80s (Reliability and Validity Estimate, 2004).

Science and Technology Concepts for Middle School: *Properties of Matter*

The concepts covered in *Properties of Matter* (POM) corresponded to the National Science Education Standards in grades five through eight. The focus of POM was on the physical and chemical properties that characterized matter. The POM kit was broken down into three parts: Characteristic Properties of Matter; Mixtures and Solutions; and Compounds, Elements, and Chemical Reactions. In each of these sections students performed a variety of activities that included but were not limited to readings, lab experiments, hypothesizing, conclusions, and data collecting. A typical lesson sequence for the students was to read an introduction of the specific topic that the students were to learn (example: density). Students would then answer some initial question to get the students' understanding of density on paper. Once students had this information down, students would typically do the lab preparation. Lab preparation consisted of students creating a hypothesis, materials list and data table, and identifying the manipulated, responding, and controlled variable. The next day students would perform the lab, collect data and display the data on an appropriate graph. After the data was collected the students would answer reflection questions and/or write a conclusion for the lab. Students would then typically read additional information or conformational information on the subject the students had just tested in the lab.

Science Education for Public Understanding Program: *Issues and Physical Science: Energy*

The issues covered in the kit, Science Education for Public Understanding (SEPUP): *Issues and Physical Science: Energy* (IAPSE), dealt with different types of energy, energy transformations, energy movement, and energy production, to name a few. The materials in the kit provided by SEPUP were inquiry-based. Due to the fact the learning module was one part of a larger unit of study, the kit was not broken down into smaller sections. The kit was one complete section of a larger, year-long, unit of study on physical science. When the students read through the kit, the students followed the story of an individual close to the student's own age. The story line enabled the students to more closely relate to the information that the students were receiving and made it more real for the students. Throughout the IAPSE unit of study, students performed a variety of activities that included but were not limited to readings, lab experiments, hypothesizing, conclusions, and data collecting. A typical lesson sequence for the students was to read an introduction of the specific topic that the students were to learn (example: density). Students then answered some initial question to get the students' understanding of density on paper. Once students understood this information, students typically did the lab preparation. Lab preparation consisted of students creating a hypothesis, materials list and data table, and identifying the manipulated, responding, and controlled variable. The next day students performed the lab, collected data and displayed the data on an appropriate graph. After the data was collected the students answered reflection questions and/or wrote a conclusion for the lab. Students then typically read additional information or conformational information on the subject the students had tested in the lab.

Summary

The Science WASL had a long history with problems that continued to come up over time such as how to make the test better and what information should be on the test. The Science MAP was a much more established test that had been in existence for more than 20 years. The ability to find a correlation between these two tests would be valuable to educators who taught with POM or IAPSE. Knowledge of a predictor of how student would perform from one test to another would help educators in a variety of ways.

CHAPTER 3

Methodology and Treatment of Data

Introduction

The participants for this project were eighth grade students. A Pearson correlation was performed to determine if there was a correlation with statistical significance between the Science MAP test and the Science WASL test. The author wanted to prove the possibility of a correlation between the fall Science MAP and the Science WASL that was taken in the spring of the students' eighth grade year.

Methodology

The research method for the study was quantitative relationship. The author conducted a correlation study investigating the relationship between the Science MAP and Science WASL. The correlation used in this study was a Pearson Product Moment. The Pearson correlation was used to establish the relationship between Science MAP and Science WASL at statistically significant levels.

Participants

The participants of the study were in the author's science classes in the 2007-2008 school year. One hundred thirteen eighth graders were the subjects of this study. The middle school where this study took place was made up of 828 students (50% male and 50% female). The ethnic make-up of the school was 82.5% White, 8.2% Hispanic, 5.2% Asian, 2.7% Black, and 1.3% American Indian. The school had 31.1% of students who received a free or reduced lunch. The population of the school had 9.3% of students receiving special education services. The school's staff was made up of 45 teachers with an average of 13.7 years experience, and 66.7% of the teachers had masters' degrees (Report Card, 2007-2008).

Instruments

The instruments used in this study were the Science MAP and the Science WASL assessments. The MAP test was a computerized test that had been in existence for 20 plus years and was given to students in the school district where the study took place. Students answered multiple-choice questions on the computer that dealt with a variety of science concepts. The MAP test was created to determine if students understood concepts in mathematics, reading and in science. Another purpose of the MAP test was to determine if students were said to be on grade level. The determination of grade level was based on if the students met the benchmark for a particular grade level. Due to the fact the MAP test adjusted the questions for each student, the test was at the student's own level and assessed the student's instructional level (Instructional Measure, 2004-2008). The Science WASL test was an assessment given to students in the spring of the students' eighth grade year. Instead of a computer-based test, the WASL was done by the students having completed a paper booklet covering several science concepts. Students answered multiple-choice, short-answer, and extended response questions with pencils rather than a key board. Neither the Science MAP nor the Science WASL allowed the students to use manipulatives on the test. The Science MAP scores were calculated and given to the teacher immediately while the Science WASL scores were delivered to the school (district) during the following summer-to-fall time period.

The Science MAP and Science WASL were found to have validity and reliability. Validity was "the degree to which a test measures what it is intended to measure" (Gay, Mills, & Airasian, 2006, p. 603) according to *Educational Research: Competencies for Analysis and Applications* (8th ed.). Reliability was "the degree to which a test consistently measures whatever it measures" (Gay, Mills, & Airasian, 2006, p. 601) according to *Educational Research: Competencies for Analysis and Applications* (8th ed.).

The Northwest Evaluation Association (NWEA) approach to test-retest reliability was more rigorous than most. Even with the increased rigor the reliability coefficients were still in the middle .80s and the low .90s. The reliability coefficients were much higher than what was typically seen. To determine the internal consistency of the test done by NWEA, NWEA calculated the marginal reliability coefficient. The marginal reliability coefficient was in the middle .90s (Reliability and Validity Estimate, 2004).

Validity was achieved by knowledge of the content standards from a district or state; the more accurately a test measured the information from the district or state standards the more the test was said to have validity. The correlation for the Measure of Academic Performance (MAP) was in the upper .70s and lower .80s (Reliability and Validity Estimate, 2004).

In 2004, the WASL was proven to have validity and reliability by the Technical Advisory Committee (TAC). The TAC found, "the level of validity and reliability for reporting individual student and school results is acceptable…" (National Technical Advisory Committee, 2004, p. 50). The TAC also found that performance standards stayed stable over time for each grade level and each subject (National Technical Advisory Committee, 2004).

Design

The design method for the study was a correlation. The fall Science MAP scores and the spring Science WASL scores were used in the study. The author wanted to prove the correlation at a statistically significant level between the Science MAP and the Science WASL. The author chose a Pearson correlation between the Science MAP and the Science WASL to determine if the correlation did exist at a statistically significant level.

Procedure

The Measurement of Academic Progress science test was taken in October of the 2007-2008 school year. Approximately 150 students took the two part test in a 55 minute testing window. Each of the students took two parts of the Science Measurement of Academic Progress test. One part of the test dealt with General Science while the second part of the test dealt with Concept and Processes. The data from the test was evaluated by the Northwest Evaluation Association and was translated into a score called a Rasch Unit. A Rasch Unit score of 213 for each test was considered to be on grade level for 8^{th} grade students.

The Science Washington Assessment of Student Learning was taken by eighth grade students in April of the 2007-2008 school year. Students took the test during their first period class between the hours of 8:00 and 11:00 a.m. The Science Washington Assessment of Student Learning did not have a time limit, so if students needed more time for the Science Washington Assessment of Student Learning, the students were relocated to another location to finish the test. Teachers followed strict guidelines during the administration of the tests and were responsible for picking up the tests for the students and returning them to a secure location at the end of the day. Administrations, along with teachers, were responsible for the security of the tests to ensure that no tests were missing. Students who scored 400 or above on the Science Washington Assessment of Student Learning passed the science portion of the test.

Treatment of the Data

The StatPak was used to calculate the data for the Chi Square correlation. The data for both the Science MAP and the Science WASL was categorized into two groups – those who passed and those who did not pass. The number of students who passed the Science MAP was compared to the students who passed the Science WASL and to the students who did not pass the Science WASL. The number of students who did not pass the Science MAP was also compared to the number of students who passed the Science WASL and to the students who did not pass the Science WASL

Summary

In the fall of the 2007-2008 school year, eighth grade students took the Science MAP test. In the spring of the same school year, students then took the Science WASL test. The scores from both the Science MAP and Science WASL were then compared to conduct the correlation for this study. To compare the scores the author used a Pearson Correlation to determine if statistical significance could be found.

CHAPTER 4

Analysis of the Data

Introduction

Eighth grade students were involved in this project. Students were given the Science MAP test in October of the students' eighth grade school year and the Science WASL in April of the students' eighth grade year. The findings of the correlation between the Science WASL and Science MAP were discussed and student scores were analyzed.

Description of the Environment

In the 2007-2008 school year, the middle school where this study took place was made up of 828 students (50% male and 50% female). The ethnic make-up of the school was 82.5% White, 8.2% Hispanic, 5.2% Asian, 2.7% Black, and 1.3% American Indian. The school had 31.1% of students who received a free or reduced lunch. The population of the school had 9.3% of students receiving special education services. The school's staff was made up of 45 teachers with an average of 13.7 years experience, and 66.7% of the teachers had masters' degrees (Report Card, 2007-2008).

The community surrounding the school was mostly middle and upper middle class with approximately 31% in a lower social-economic class. Many of the parents that had students at the school had a background in science due to the fact that companies such as Pacific Northwest National Laboratories, Bechtel, Flour, and others were located in the community where the school was built.

The students who were a part of the research project were all eighth grade students at a middle school in the Columbia Basin. The students had six 55-minute periods each day. Two of these periods were the student's choice (Technology, Art, Choir, etc.) and four were mandatory core classes (Language Arts, Social Studies, Mathematics, and Science). All students had the ability to learn and move to high school after the students' eighth grade year. All students took the Science MAP in October of the students' eighth grade year. All students were required to take the Science WASL in the spring of the students' eighth grade year. All students performed activities from the STC/MS kit, POM, and the SEPUP kit, IAPSE.

Hypothesis

Test scores received by eight grade students who received an average Rasch Unit score of 216 or higher on the fall Measurement of Academic Progress test would pass the spring Science Washington Assessment of Student Learning in greater numbers than student who did not pass the fall Science Measurement of Academic Progress with a Rasch Unit score of 216 or higher.

The data from the Chi Square performed on the students' fall Science MAP scores and the spring Science WASL was seen in the data table. The hypothesis was supported due to the fact that statistical significance was reached in the correlation between the Science MAP and the Science WASL. Therefore, the hypothesis was accepted.

Null Hypothesis

Test scores received by eight grade students who received an average Rasch Unit score of 216 or higher on the fall Measurement of Academic Progress test would not pass the spring Science Washington Assessment of Student Learning in greater numbers than student who did not pass the fall Science Measurement of Academic Progress with a Rasch Unit score of 216 or higher.

The data from the Chi Square performed on the students' fall Science MAP scores and the spring Science WASL was seen in the data table. The hypothesis was supported due to the fact that statistical significance was reached in the correlation between the Science MAP and the Science WASL. Therefore, the null hypothesis was rejected.

Results of the Study

Table 1.

Chi Square Correlation of Fall MAP and Spring WASL Science Scores

WASL score	Passed	Did not Pass
Passed MAP	47	0
Did not Pass MAP	26	40

df=1 x^2=46.0411 p<.001

A two-dimensional Chi-Square was used to calculate the data to find statistical significance. The table was divided into two columns and two rows. The first number column of the table was students who passed the Science WASL. The second number column was students who did not pass the Science WASL. The first numbered row was students who passed the Science MAP. The second numbered row was students who did not pass the Science MAP. The numbers were split into four quadrants, numbering the quadrants one through four, and moving from left to right and top to bottom. The first quadrant were students who passed the Science WASL and the Science MAP. Quadrant two were students who passed the Science MAP but did not pass the Science WASL. Quadrant three were students who did not pass the Science MAP but did pass the Science WASL. The fourth quadrant was the students that did not pass the Science WASL or the Science MAP. The data was put into a Chi Square that was in the StatPak to see if there was a statistical significance between the Science MAP and the Science WASL. The

StatPak indicated that the degree of freedom (df) was 1 and the Chi Square (x^2) value was 46.0411 (StatPak). The level of significance was determined by using Table A.6 Distribution of X^2 in *Educational Research: Competencies for Analysis and Application* (8th ed.). The author found 46.0411>10.827, which meant that the p-value was .001. This meant statistical significance was found at 99.9% of the time (Gay, Mills, & Airasian, 2006).

Findings

The analysis of the data demonstrated a statistical significance relationship between the Science MAP and the Science WASL scores. The data supported the hypothesis of the project, which was accepted. Test scores received by eight grade students who received an average Rasch Unit score of 216 or higher on the fall MAP test passed the spring Science WASL in greater numbers than student who did not pass the fall Science MAP. Therefore, the null hypothesis was rejected.

Discussion

The author expected to find the hypothesis accepted because of previous research the author had seen. The project confirmed what the author had been told by administration when discussing the purpose of doing the Science MAP and Science WASL. Although the author did not know the sample size of previous research nor the test that was performed, it was evident that when running a Chi-Square on 113 students the correlation showed statistically significant results.

Summary

The purpose of the project was to find statistical significance between the fall Science MAP scores and the spring Science WASL scores. The data from the fall

Science MAP and the spring Science WASL were entered into a Chi-Square correlation which proved statistically significant at the 99.9% level. This showed a statistically significant relationship between the fall MAP and spring WASL scores. The hypothesis was supported by these findings and the null hypothesis was rejected.

CHAPTER 5

Summary, Conclusions and Recommendations

Introduction

Conclusions and recommendations for the project were made based on the data. The findings from the data were discussed. The data showed a relationship between the students' fall Science MAP scores and the students' spring Science WASL scores. The author discussed recommendations based on the findings of the project

Summary

In the summer of 1998, a group was brought together to develop the first Science WASL with the recommendations that the Science WASL focus 40% of the points to science concepts and processes, 30% on inquiry and problem solving, and 30% to the nature of science and science, technology and society issues. The Science WASL was successfully piloted in the spring of 2001. By 2004, the fifth grade proficiency standards were set and, in 2005, the Science WASL was required for all fifth, eighth, and tenth grade students in the state of Washington.

The Measurement of Academic Progress (MAP) test was a computerized test that had been in existence for 20 plus years and was given to students in the school district where the study took place. Students answered multiple-choice questions on the computer that dealt with a variety of science concepts. The MAP test was created to determine if students understood concepts in mathematics, reading and in science. Another purpose of the MAP test was to determine if students were said to be on grade level. The determination of grade level was based on if the students met the benchmark for a particular grade level. Due to the fact the MAP test adjusted the questions for each student, the test was at the student's own level and assessed the student's instructional level (Instructional Measure, 2004-2008).

The concepts covered in STC/MS: POM corresponded to the National Science Education Standards in grades five through eight. The SEPUP: IASPE program was examined in the project as well. The materials in the kit provided by STC/MS and SEPUP were inquiry-based. The science programs were research-based and found to be superior to other science kits published at the same time.

The purpose of the project was to determine if fall Science MAP score would predict spring Science WASL scores. In the project, 113 students showed that performance on the fall Science MAP did predict spring WASL scores. All students were taught from the same instructional materials and had the same teacher.

The data was put into a Chi-Square and statistical significance was found at the 99.9% level. This showed a statistically significant relationship between the fall MAP and spring WASL scores. Therefore, the hypothesis was supported by these findings and the null hypothesis was rejected.

<u>Conclusions</u>

The results of the data showed a statistical significance between the fall Science MAP and the spring Science WASL. A Chi-Square value of 46.0411 showed statistical significance to the .001 level. Students who scored 216 or higher on the fall Science MAP had a statistically better chance of passing the spring Science WASL. Students who scored less than 216 on the fall Science MAP had a statistically worse chance of passing the spring Science WASL. Of the 47 students who received 216 or higher on the fall Science MAP and received instruction from STC/MS: POM and SEPUP: IAPSE, all students passed the spring Science WASL.

Recommendations

Based on the findings, the author recommends the study be repeated with a larger number of students. However, the author believes that increasing the number of students who participate in the study would have little impact on the findings of the project due to the fact that the findings were so one sided.

A second recommendation would be to find a RiT score on the fall Science MAP where student would have a statistically significant lower chance to pass the Science WASL than students with higher scores. Educators would know which students needed intensive intervention allowing a greater chance for them to be successful in passing the spring Science WASL.

The final recommendation the author would make would be to test other Science instructional materials, kits, and Science textbooks to determine if other combinations of instructional materials would give the students a greater advantage in passing the spring Science WASL. Educators need to find the best combination of instructional materials to instruct the students in the classroom.

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APPENDIXES

Student Number	Fall CP	Fall GS	Average Fall Score	Science WASL	Level on the WASL	
1	216	202	209	394	2	Did not Pass
2	185	186	185.5	329	1	Did not Pass
3	210	213	211.5	401	3	Passed
4	201	208	204.5	373	1	Did not Pass
5	223	227	225	427	4	Passed
6	222	220	221	427	4	Passed
7	226	209	217.5	400	3	Passed
8	211	208	209.5	427	4	Passed
9	219	221	220	424	3	Passed
10	217	214	215.5	390	2	Did not Pass
11	213	209	211	375	2	Did not Pass
12	224	216	220	427	4	Passed
13	213	213	213	392	2	Did not Pass
14	227	220	223.5	449	4	Passed
15	224	223	223.5	421	3	Passed
16	219	212	215.5	410	3	Passed
17	226	214	220	408	3	Passed
18	209	209	209	401	3	Passed
19	183	208	195.5	365	1	Did not Pass
20	215	211	213	400	3	Passed
21	211	212	211.5	392	2	Did not Pass
22	220	218	219	413	3	Passed
23	219	218	218.5	449	4	Passed
24	191	185	188	359	1	Did not Pass
25	211	224	217.5	415	3	Passed
26	203	205	204	384	2	Did not Pass
27	216	211	213.5	432	4	Passed
28	225	217	221	433	4	Passed
29	217	216	216.5	427	4	Passed
30	213	213	213	392	2	Did not Pass
31	205	208	206.5	359	1	Did not Pass
32	208	200	204	373	1	Did not Pass
33	217	209	213	388	2	Did not Pass
34	209	195	202	359	1	Did not Pass
35	195	198	196.5	362	1	Did not Pass
36	197	196	196.5	379	2	Did not Pass

37	217	210	213.5	406	3	Passed
38	215	218	216.5	413	3	Passed
39	199	206	202.5	368	1	Did not Pass
40	226	214	220	433	4	Passed
41	176	186	181	329	1	Did not Pass
42	208	210	209	408	3	Passed
43	213	219	216	440	4	Passed
44	209	217	213	377	2	Did not Pass
45	230	222	226	433	4	Passed
46	208	217	212.5	415	3	Passed
47	215	216	215.5	397	2	Did not Pass
48	228	226	227	464	4	Passed
49	225	216	220.5	413	3	Passed
50	208	221	214.5	375	2	Did not Pass
51	203	216	209.5	386	2	Did not Pass
52	211	214	212.5	437	4	Passed
53	210	208	209	408	3	Passed
54	221	216	218.5	418	3	Passed
55	227	224	225.5	424	3	Passed
56	213	214	213.5	386	2	Did not Pass
57	216	212	214	388	2	Did not Pass
58	215	221	218	400	3	Passed
59	218	216	217	424	3	Passed
60	210	214	212	406	3	Passed
61	222	222	222	432	4	Passed
62	196	197	196.5	384	2	Did not Pass
63	215	214	214.5	390	2	Did not Pass
64	213	218	215.5	386	2	Did not Pass
65	215	217	216	437	4	Passed
66	228	227	227.5	444	4	Passed
67	207	204	205.5	368	1	Did not Pass
68	213	216	214.5	421	3	Passed
69	211	205	208	410	3	Passed
70	217	219	218	424	3	Passed
71	207	195	201	388	2	Did not Pass
72	222	225	223.5	437	4	Passed
73	218	224	221	437	4	Passed
74	213	225	219	413	3	Passed
75	235	229	232	400	3	Passed
76	225	233	229	449	4	Passed
77	225	220	222.5	410	3	Passed

78	205	207	206	424	3	Passed
79	195	205	200	379	2	Did not Pass
80	204	217	210.5	418	3	Passed
81	213	207	210	397	2	Did not Pass
82	223	217	220	415	3	Passed
83	218	226	222	449	4	Passed
84	218	219	218.5	432	4	Passed
85	218	219	218.5	440	4	Passed
86	215	218	216.5	406	3	Passed
87	212	208	210	397	2	Did not Pass
88	221	207	214	406	3	Passed
89	195	199	197	379	2	Did not Pass
90	216	205	210.5	384	2	Did not Pass
91	231	227	229	437	4	Passed
92	216	213	214.5	424	3	Passed
93	225	231	228	437	4	Passed
94	206	210	208	386	2	Did not Pass
95	205	209	207	382	2	Did not Pass
96	209	213	211	421	3	Passed
97	216	213	214.5	413	3	Passed
98	215	215	215	406	3	Passed
99	225	216	220.5	413	3	Passed
100	220	222	221	440	4	Passed
101	216	215	215.5	427	4	Passed
102	222	227	224.5	433	4	Passed
103	207	201	204	400	3	Passed
104	193	207	200	382	2	Did not Pass
105	228	226	227	444	4	Passed
106	212	204	208	365	1	Did not Pass
107	215	206	210.5	408	3	Passed
108	222	226	224	449	4	Passed
109	211	213	212	406	3	Passed
110	224	230	227	432	4	Passed
111	197	206	201.5	365	1	Did not Pass
112	216	219	217.5	401	3	Passed
113	215	210	212.5	418	3	Passed