The Effects of Gateway To Technology Curriculum on the Washington State Measurement of Student Progress Scores

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A Special Project

Presented to

Dr. Robert P. Kraig

Heritage University

In Partial Fulfillment

of the Requirements for the Degree

Masters of Education Administration

Troy Meier

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FACULTY APPROVAL

The Effects of Gateway To Technology

Curriculum on the Washington State

Measurement of Student Progress Science Scores

A Master's Special Project

By

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Approved for the Faculty

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ABSTRACT

The Effects of Gateway To Technology

Curriculum on the Washington State

Measurement of Student Progress Science Scores

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The researcher conducted a Quasi-Experimental designed study. The purpose of the study was to determine if the Gateway To Technology curriculum, *from Project Lead The Way*, was effective in improving the eighth grade Measurement of Students Progress (MSP) Science scores. Two eighth-grade classrooms at Rochester Middle School participated in the study. The control classroom consisted of 30 eighth-grade students, and the experimental group consisted of 23 eighth-grade students. The curriculum was given for 9 weeks during the winter quarter of 2010. At the end of that time period the pre MSP

scores were examined to determine effectiveness of the program. The growth shown by the experimental group was not significant enough to support the hypothesis, nor was there significant correlation to support the null hypothesis.

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CHAPTER 1

Introduction

Background for the Project

The No Child Left Behind Act (NCLB) of 2001 has been labeled a landmark in education reform designed to improve student achievement and change the culture schools in the United States. This new law, which President George W. Bush signed in to effect in 2001 was described by him as "the cornerstone of my administration." It also represents a sweeping overhaul of federal efforts to support elementary and secondary education in the United States. "These reforms express my deep belief in our public schools and their mission to build the mind and character of every child, from every background, in every part of America," (Lemann, 2002).

The No Child Left Behind Act embodied four key principles–stronger accountability for results; greater flexibility for states, school districts and schools in the use of federal funds; more choices for parents of children from disadvantaged backgrounds; and an emphasis on teaching methods that have been demonstrated to work. The act also placed an increased emphasis on reading, especially for young children, enhancing the quality of our nation's teachers, and

ensuring that all children in America's schools learn English. In keeping with these principles, and as this guide described, the No Child Left Behind (NCLB) Act affected virtually every program authorized under the Elementary and Secondary Education Act (ESEA)—ranging from Title I and efforts to improve teacher quality to initiatives for limited English Proficient (LEP) students and safe and drug-free schools. One of the NCLB requirements was that states provide documented growth by means of a rigorous standardized test. (Lemann, 2002)

To address this requirement, the state of Washington developed the Washington Assessment of Student Learning (WASL). According to the Office of Superintendent of Public Instruction (2009) the WASL was given as the state's primary assessment from spring 1997 to summer 2009 and in 2010 was replaced by the grades 3-8 Measurement of Student Progress (MSP) and the High School Proficiency Exam (HSPE). The WASL was administered to students statewide in grades 3-8, and again in 10th grade. The WASL consisted of assessments in reading, writing, math, and science. (OSPI , 2010)

With this assessment came a new and greater focus on the core subjects, across the state the classes that were not measured by the WASL were drastically changed and in many cases, completely dropped. One such transition is the traditional wood shop class to a STEM (Science, Technology, Engineering,

Mathematics) related class. This transition has led to the acquisition of a new program by our middle school. The program was GTT (Gateway To Technology) put out by PLTW (Project Lead The Way).

Statement of the Problem

Starting in the fall of 2006, Rochester Middle School took a good hard look at the Washington Assessment of Student Learning (WASL) scores for the previous academic year and it was very clear that math (27.7% passing) and science (27.6% passing) scores in particular, were an area of serious concern for the entire school. Several interventions were put in place the following year. One of these interventions was an instructional math coach. After seeing some success with a math coach, Rochester Middle School then added a science coach as well. In 2007 both math and science scores improved. In fact, they continued to increase in the next few years that followed. Though the school had been seeing gains, it was not enough to keep on pace with annual Yearly Progress (AYP). (http://www.k12.wa.us)

The administrators began looking into other ways that we could improve scores. There was some information about a "shop class" that could help kids learn challenging math and science concepts. This program was called Gateway To Technology (GTT) from the nonprofit organization Project Lead The Way

(PLTW). With grant funding from Intel, Rochester Middle School purchased the necessary equipment and supplies to implement this program starting the school year of 2010/2011.

Purpose of the Project

The purpose of this project was to determine the effectiveness of the GTT program as it related to the MSP and whether or not to solidify its place in current Rochester School District adopted curriculum. Another purpose is to determine how students view the relevance of the GTT class and if they feel that it pertains to their life.

Delimitations

This study was delimitated to two eighth grade classes over the course of one quarter at Rochester Middle School located in Rochester School District in Rochester, Washington. This study was conducted during the 2010/2011 school year with an eighth grade Gateway to Technology class of 30 students. The total enrollment at RMS for the May 2010 student count was 521. The demographic ethnic information of RMS was as follows: American Indian/Alaskan Native 4.5%, African American 2.7%, Caucasian 73.7%, Hispanic 14.7%, and Asian/Pacific Islander1.9%. There were 4.3% English Language Learners (ELL). An hour long comprehensive science test was used to measure the effectiveness of

the program. It was given at the beginning of the second quarter and again at the end of the second quarter. (http://www.k12.wa.us)

Assumptions

During this study, several assumptions were made. One assumption was that the students were earnestly trying to meet the learning targets. Another assumption was that the students put forth their best effort on the pre-MSP science exam. Still another assumption was that the given curriculum was age/ability appropriate. Finally, the last assumption was that the classroom instructor was competent in delivering the GTT materials as they were intended to be taught.

Hypothesis

Students who take a course in GTT (Gateway To Technology) will have significantly higher academic growth on the 8th grade science pre-MSP than students who do not take a course in GTT. Students will express greater amount of confidence in taking the science pre-MSP as a direct result of participating in a GTT course.

Null Hypothesis

Students who take a course in GTT (Gateway To Technology) will not have significantly higher growth on the 8th grade science pre-MSP than students who do not take a course in GTT. Students will not express a greater amount of

confidence in taking the science pre-MSP as a direct result of participating in a GTT course.

Significance of the Project

The significance of this project was found in the performance of the students taking the Science MSP. If the study showed that scores improved as a direct result of having taken GTT, Rochester School District would commit to offering more of these courses at the high school. Therefore this study also had the potential to influence what happened at the high school and other districts that implemented similar programs.

Procedure

For the purpose of this project, the following procedures were implemented:

1. Permission to conduct research at Rochester Middle School was granted by Principal William Maus (see Appendix A).

2. A review of selected literature was conducted at Rochester Middle School, Heritage University, and internet search engines (peer reviewed databases).

3. All students took the Science pre-MSP assessment.

4. All GTT students were given the specified curriculum from PLTW(see Appendix B).All students took the Science pre-MSP assessment.

5. All students took the Science pre-MSP assessment (2nd time).

6. Scores from the science pre-MSP assessment were tabulated (see Appendix C).

7. Scores from the science pre-MSP assessment were tabulated and disaggregated by class status (see Appendix D).

8. A post intervention survey was given to all 23 students (see Appendix E).

9. Data from survey was tabulated and graphed (see Appendix F).

10. Results from the study was evaluated and conclusions drawn.

11. A meeting was held to discuss findings and make a decision about the

Definition of Terms

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

Adequate Yearly Progress. The yearly measurement of student progress as measured by the WASL.

Measurement of Student Progress. A state assessment to measure student's levels of proficiency in reading, writing, math, and science (Used from years 2010-2011). Washington Assessment of Student Learning. A state assessment to measure student's levels of proficiency in reading, writing, math, and science. (Used from years 1996 to 2009)

Acronym

AYP. Annual Yearly Progress.

ELL. English Language Learner.

GTT. Gateway To Technology.

HSPE. High School Proficiency Examination.

MSP. Measurement of Student Progress

ME. Multicultural Education.

OSPI. Office of Superintendent of Public Instruction.

PLTW. Project Lead The Way

CHAPTER 2

Review of Selected Literature

Introduction

This chapter has been organized around the following topics: (a) No Child Left Behind (NCLB), (b) Technology, Engineering, and Mathematics (STEM) and its importance in current curriculum, (c) Instructional Technology (IT), (d) Project Lead The Way (PLTW), and(e) Science Instruction.

No Child Left Behind

Many still debated the effectiveness of the NCLB act at advancing lasting school reform that it claimed to target. For the purposes of this study, the only aspect looked at was the requirement for states to publish annual results from standardized tests. The annual results were given in the form of Annual Yearly Progress. (AYP) If AYP wasn't met five years in a row, then the state was required to change the way a failing school was run.

All students were assessed, in order to determine a school's AYP status , by the Washington Assessment of Student Learning. (WASL) This test eventually became known as the Middle School Proficiency Exam. (MSP) Where as math and reading were assessed on an annual basis starting in the third grade and

ending in the tenth grade, science was only assessed in the fifth, eighth, and tenth grades. This project targeted the scores of eighth grade students only.

Science, Technology, Engineering, and Mathematics

In the beginning of President Obama's first term as President of the United States, He commented on the necessity of our education system to increase student achievement in the stem categories specifically in order to compete in the global economy. There had been many studies of comparison that placed students from the United States behind most other students from around the world. Most recent was the Program for International Student Assessment (PISA) study that showed the students from United States scoring 25th place in math out of 30 countries and 27th place in science. (PISA 2008) These were the kinds of studies that led to the push of increased STEM achievement. This push also led to STEM focused course offering and a change in how these subjects have been taught. One such change was the inclusion of technology in instruction.

Instructional Technology

Many educators argued that if students weren't taught all subjects with the most current technology then our students would be crippled when it came time

for them to compete in the job market. Furthermore, they argued that students were more likely to be engaged in classroom activities that offered the use of technology. Moreover, it was also suggested that certain aspects of STEM material was easier to learn with the aid of technological resources. As curriculums began to rise to address these issues, one stood out among the rest, Project Lead the Way. (Genevalogic, 2007)

Project Lead the Way

Project Lead the Way's focus was to prepare students to be the most innovative and productive leaders in Science, Technology, Engineering and Mathematics (STEM) and to make meaningful, pioneering contributions to our world.

PLTW partnered with middle schools and high schools in order to provide a rigorous, relevant STEM education. Through an engaging, hands-on curriculum, PLTW encouraged the development of problem-solving skills, critical thinking, creative and innovative reasoning and a love of learning.

The PLTW middle and high school STEM education programs sought to give students a brighter future by providing them with a foundation and proven

path to college and career success in STEM-related fields. STEM education was at the heart of our high-tech, high-skill global economy.

PLTW argued that for America to remain economically competitive our next generation of leaders must develop the critical-reasoning and problem-solving skills that will help make them the most productive in the world. PLTW suggested that they sparked the ingenuity, creativity and innovation within all of our students.

PLTW was created to address the country's need for more leaders in Science, Technology, Engineering and Mathematics (STEM). In 1986, Richard Blais, chairman of the technology department in the Shenendehowa Central School District in Upstate New York, began offering pre-engineering and digital electronics classes to encourage students to study engineering. He developed a rigorous, relevant curriculum and paired it with a dynamic, interactive learning environment to produce more successful, confident and interested students. Based on the success of these classes, Blais partnered with Richard Liebich, whose family founded the Charitable Leadership Foundation (CLF), to create Project Lead the Way (PLTW 2010).

In 1997, PLTW launched its "Pathway To Engineering" program in 12 New York State high schools. Over the next few years, a partnership with the High Schools That Work initiative of the Southern Regional Education Board (SREB) brought PLTW programs to an additional 30 states. (PLTW 2010)

As of January 2011, PLTW was the nation's leading activities-, project-, and problem-based (APPB) program for middle and high school STEM education. More than 300,000 students were currently engaged in PLTW classes in nearly 4,000 schools. Programs were established in all 50 states, the District of Columbia, and the U.S. Virgin Islands. (PLTW 2010)

PLTW had two areas of focus, the high school grades nine through twelve, and the middle school grades six through eight. The middle school curriculum was the only curriculum used in this study.

PLTW's middle school program, Gateway To Technology (GTT), was an activities-oriented program designed to challenge and engage the natural curiosity and imagination of middle school students. Taught in conjunction with a rigorous

academic curriculum, the program was divided into six independent, nine-week units consisting of the following:

Design and Modeling

This unit used solid modeling software (a sophisticated mathematical technique for representing solid objects) as part of the design process. Utilizing this design approach, students understood how design influenced their lives. Students also learned sketching techniques and used descriptive geometry as a component of design, measurement and computer modeling. Students brainstormed, researched, developed ideas, created models, tested and evaluated design ideas and communicated solutions.

Automation and Robotics

Students traced the history, development, and influence of automation and robotics. They learned about mechanical systems, energy transfer, machine automation and computer control systems. Students acquired knowledge and skills in problem solving, teamwork collaboration and innovation.

Energy and the Environment

Students investigated the importance of energy in our lives and the impact energy use had on the environment. They designed and modeled alternative energy sources and participated in an energy expo to demonstrate energy concepts and innovative ideas. Students evaluated ways to reduce energy consumption through energy efficiency and waste management techniques.

Flight and Space

Students studied the history of aerospace through hands-on activities, research and a presentation in the form of an infomercial. Students explored the science behind aeronautics and used their knowledge to design, build and test a model glider. Simulation software was used to expose students to traveling and living in space.

Science of Technology

Students traced how science had affected technology throughout history and learned about applied physics, chemical engineering and nanotechnology though exploratory activities and projects.

Magic of Electrons

Through hands-on projects, students explored the science of electricity, the behavior and parts of atoms, circuit design and sensing devices. Students acquired

knowledge and skills in basic circuitry design and explored the impact of electricity on their lives. (PLTW, 2010)

Not only was the content critical but the way it was delivered equally so.

Science Instruction

Recent discoveries in psychology and brain neurophysiology have led to many new and renewed theories of learning. Inquiry based curriculum and teaching techniques emerged as a combination of several theories such as, constructivism, Blooms taxonomy of learning, and the multiple intelligences. In simple terms it was a learning process or strategy rather than any specific set of lessons. This process aimed to enhance learning based on (1) increased student involvement, (2) multiple ways of knowing and (3) sequential phases of cognition. By using student derived investigations knowledge was more relevant and meaningful. This investment in the curriculum and learning process led to active construction of meaningful knowledge, rather than passive acquisition of facts transmitted from a lecturer. Next, by engaging students' multiple intelligences more types of students were successful contributors and students were engaged on more than one level. In addition, this process mirrored the stages of Blooms learning phases, which led to more complete cognition by building on previously

learned knowledge. Lastly, the student to student collaboration reinforced assimilation of knowledge, while the teacher to student collaboration built trust for future discovery. Also known as project based curriculum, it typically adhered to the following guidelines: (Wilfred, 2009)

> Started with an open-ended question or demonstration (as opposed to beginning a lesson with definitions and explanations); Gathered responses and subsequent questions from students with little comment or direction. Required students to collaborate on designing experiments or methods of inquiry; Student teams conducted experiments or gather data; If time allowed, re-evaluate question based on new data and re-experimented or collected new data based on revised question; Students presented findings as an oral presentation, a poster presentation or an evaluative write-up. (Wilfred, 2009)

Summary

The focus of this chapter was to address the available evidence to the topics of (a) No Child Left Behind (NCLB), (b) Technology, Engineering, and

Mathematics (STEM) and its importance in current curriculum, (c) Instructional Technology (IT), (d) Project Lead The Way (PLTW), and(e) Science Instruction.

CHAPTER 3

Methodology and Treatment of the Data

Introduction

This chapter has been organized around the following topics: (a) Methodology, (b) Participants, (c) Instruments, (d) Design, (e) Procedure, (f) Treatment of the Data, (g) Summary. ----Provide a brief overview of the processes and procedures utilized in the conduct of the project.

Methodology

The research methods used in the special project was experimental and descriptive. According to Gay (2010), experimental follows a strict format that restricts extraneous influences by having in place the following components:

> A narrow and distinct area of focus; two groups to be tested, an experimental group and a control group. Where the experimental was the only group to receive the manipulated variable; also included was a system of measuring and analyzing the data. Often done with a pretest and a post test.

Also according to Gay, descriptive was used when the study centered on student thoughts and feelings. This was evident in the survey that was given to the experimental group. (i.e., *Educational Research: Competencies for Analysis and Applications,* by Gay, Mills, and Airasian)

Participants

The participants of this study were two classes of eighth grade students at Rochester Middle School (RMS). There was a split of 17 boys and 6 girls in the experimental group and 18 boys and 11 girls in the controlled group. In each group the age range was 13 to 15 years old. The control group was the advanced band class.

Instruments

The main research instrument that was used to compile data was the mid-year assessment developed by Rochester School District in conjunction with Nooksack Valley School District. This test was written using the MSP format (provided by the state of Washington) and followed the Washington State science standards (Grade Level Expectations) for middle school grades six through eight. It had been used by these two districts for three years. Modifications were made each year to align the test with what was being taught. This instrument of

measurement was therefore considered to be both valid and reliable when assessing both the control group and the experimental group.

Design

The design of this experimental study was to use a pretest and a post test. These tests were given to both groups on the same day. They were given as much time as necessary to complete the test. From the time of the first test to the second, the control group in no way interacted with the GTT curriculum. The experimental group received instruction from the GTT unit Design and Modeling. The data was then compiled from both groups and compared to each other.

Procedure

For the purpose of this project, the following procedures were implemented:

1. Permission to conduct research at Rochester Middle School was granted by Principal William Maus on September 12th 2010 (see Appendix A).
2. A review of selected literature was conducted at Rochester Middle School, Heritage University, and internet search engines (peer reviewed databases).

3. All students took the Science pre-MSP assessment on November 4, 2010 and the GTT survey on the 5th of November. This consisted of two classes of eighth grade students. One class was the control group consisting of 29 students (because they had band and not GTT). The experimental class consisting of 23 students was to receive the new curriculum instruction.

4. All GTT students were given the specified curriculum from PLTW(see Appendix B). The curriculum is made up of several instructional units. During the research, the students received instruction from the unit Design and Modeling. This unit focused on the scientific method and the process of prototyping. The students began with basic mechanical drawing and ended with the ability to use a detailed computer aided drawing program (AutoDesk Inventor).

5. At the end of the second quarter, all students took the Science pre-MSP on January 25, 2011 for the second time.

6. Scores from the science pre-MSP assessment were tabulated using Microsoft Excel (see Appendix C).

7. Scores from the science pre-MSP assessment were tabulated and disaggregated by class status (see Appendix D).

8. A post intervention survey was given to all 30 students (see Appendix E).

9. Data from survey was tabulated and graphed (see Appendix F).

10. Results from the study were evaluated and conclusions drawn.

11. A meeting was held to discuss findings and make a decision about the implementation of GTT.

Treatment of Data

The data was collected and tabulated using the software program Microsoft Excel. This program was also used to calculate all center of tendency measures. The data from excel was then transferred to statpak in order to find their t scores.

Summary

This chapter was designed to review the methodology and treatment of data related to the experiment. The analysis of data and findings from this study were reported in Chapter 4.

CHAPTER 4

Analysis of the Data

Introduction

Chapter 4 has been 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

This study was delimitated to two eighth grade classes over the course of one quarter at Rochester Middle School located in Rochester School District in Rochester, Washington. This study was conducted during the 2010/2011 school year with an eighth grade Gateway to Technology class of 23 students and a band class of 30 students. The total enrollment at RMS for the May 2010 student count was 521. The demographic ethnic information of RMS was as follows: American Indian/Alaskan Native 4.5%, African American 2.7%, Caucasian 73.7%, Hispanic 14.7%, and Asian/Pacific Islander1.9%. There were 4.3% English Language Learners (ELL). An hour long comprehensive science test was used to measure the effectiveness of the program. It was given at the beginning of the second quarter and again at the end of the second quarter. The classes tested were

considered to be a random sample that accurately reflects the demographic information given. (http://www.k12.wa.us)

Hypothesis

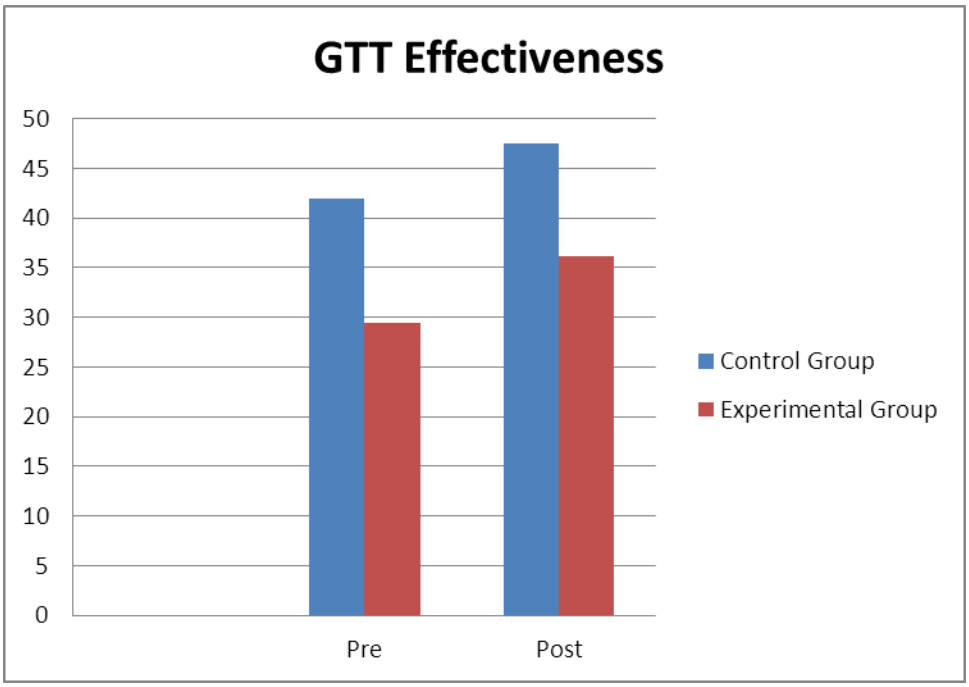
Students who take a course in GTT (Gateway To Technology) will have significantly higher academic growth on the 8th grade science pre-MSP than students who do not take a course in GTT. Students will express greater amount of confidence in taking the science pre-MSP as a direct result of participating in a GTT course.

Null Hypothesis

Students who take a course in GTT (Gateway To Technology) will not have significantly higher growth on the 8th grade science pre-MSP than students who do not take a course in GTT. Students will not express a greater amount of confidence in taking the science pre-MSP as a direct result of participating in a GTT course.

Results of the Study

The following graph shows the pre and post scores to both the control group and the experimental group. As noted below, both groups showed growth over the course of the winter quarter. In fact, the control groups raw scores increase by 5.7 percent and the experimental group increased by 6.7 percent. When this information was transferred into the software program Statpak, it revealed a t-score of .43 which in turn indicated no significant correlation. This table showed that there was growth in the students learning from both groups. The control group started with an average score of 42 out of 64 and ended with an average score of 48 out of 64. The experimental group started with an average score of 29.5 out of 64 and ended with an average score of 36 out of 64.

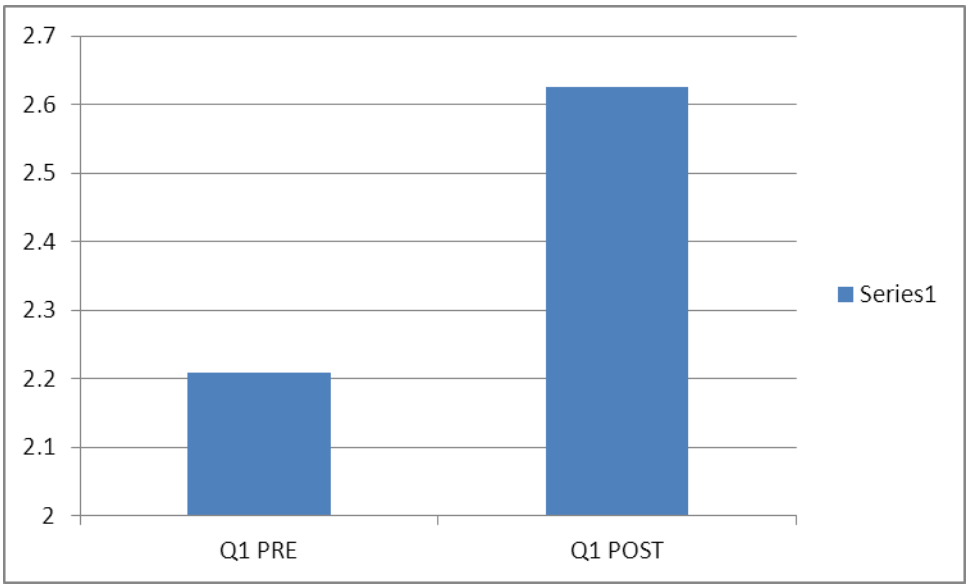


Survey for GTT Effectiveness

1. I am more prepared to take the pre-MSP than if I hadn't taken GTT.

Strongly Agree =4 Agree=3 Disagree=2 Strongly Disagree=1

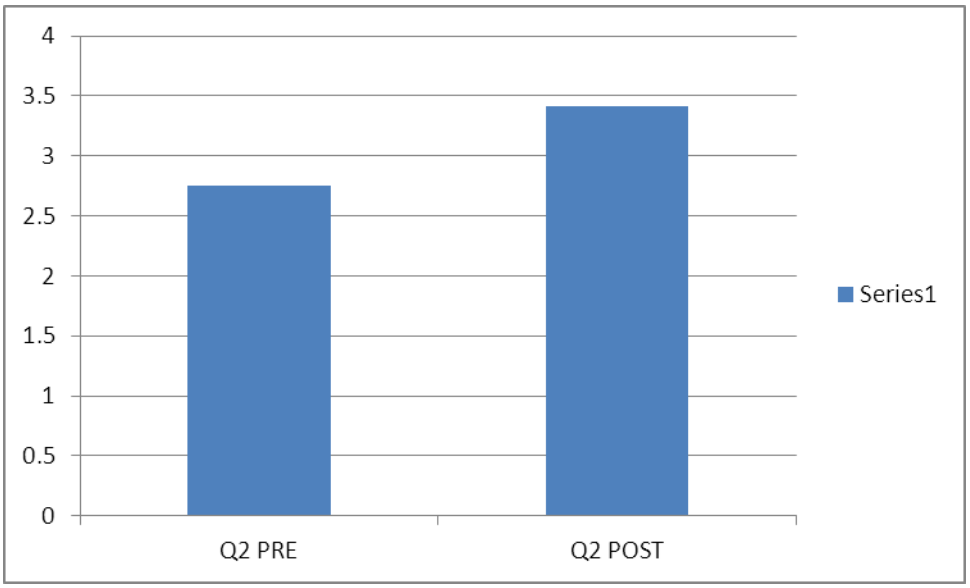
Question one indicated an increased feeling of preparedness



2. I think information from this class will help me later in my school/life.

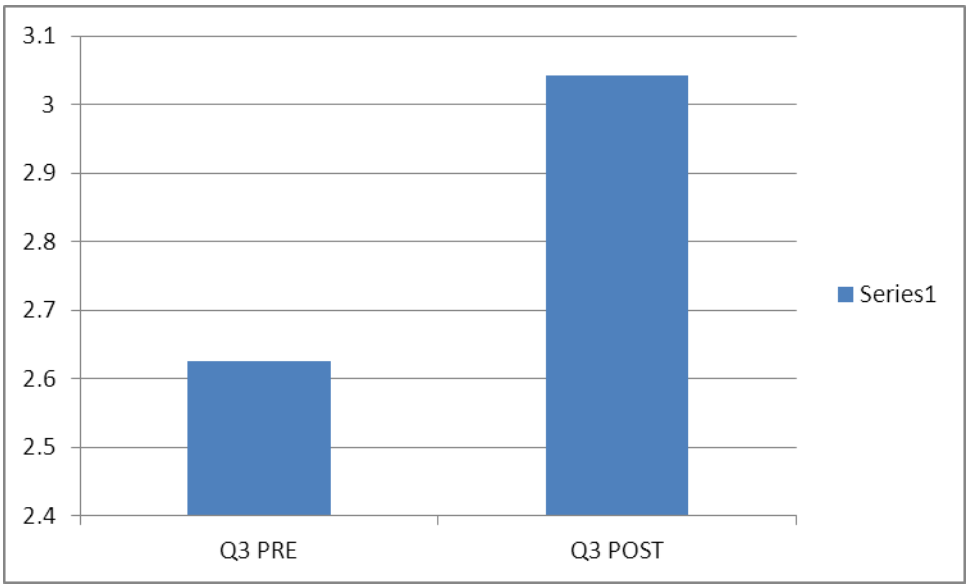
Strongly Agree Agree Disagree Strongly Disagree

Question two indicated that students thought the class had more relevance in their life than before they took the class.



3. I can use the scientific method to solve a problem or answer a question.

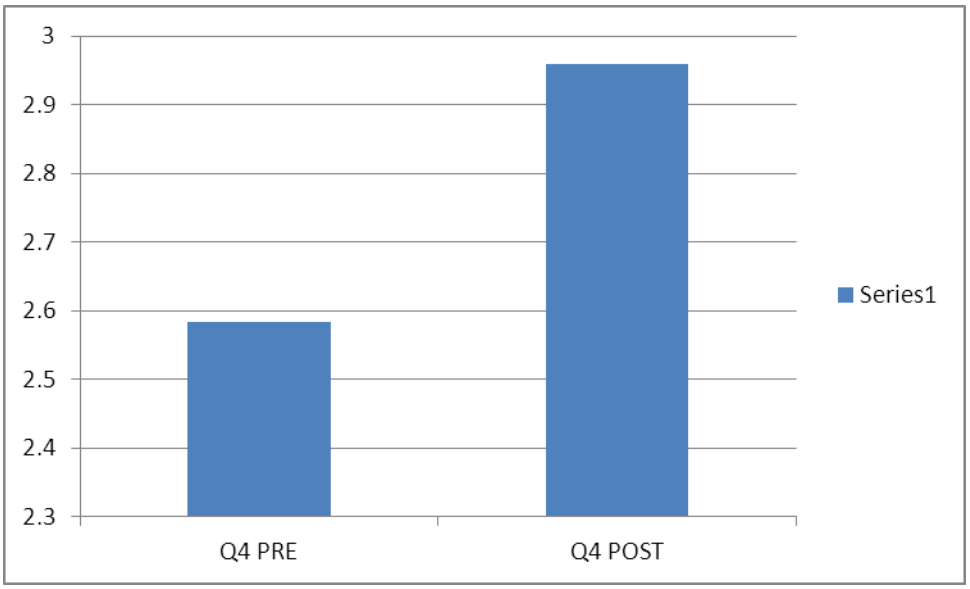
Strongly Agree Agree Disagree Strongly Disagree Question three showed that students felt that they could use the scientific method more than at the beginning of the quarter



4. I can give several examples of energy transfers and/or transformations.

Strongly Agree Agree Disagree Strongly Disagree

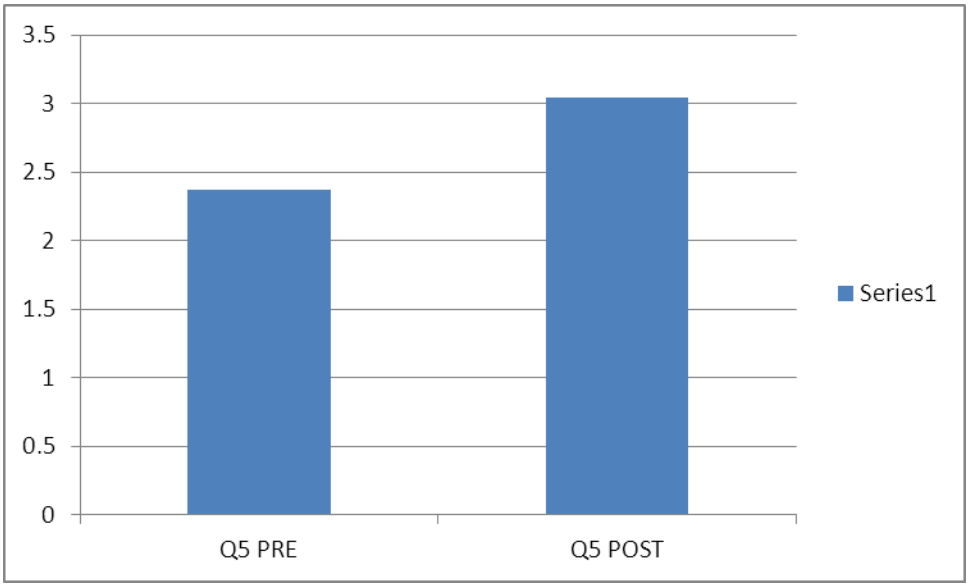
Question four showed that students felt more able to explain energy transfers.



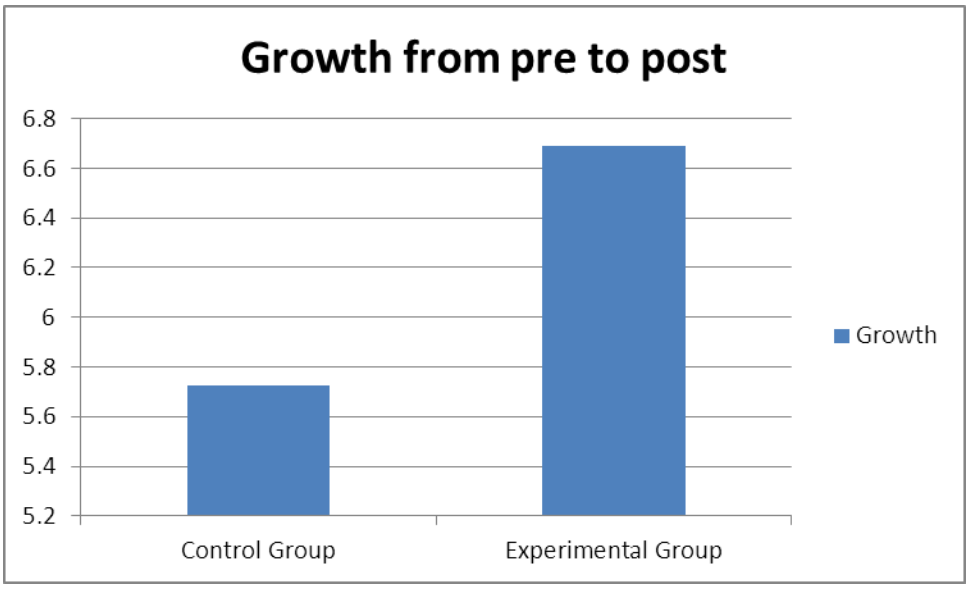
5. I can give an example of how electricity works in an everyday application.

Strongly Agree Agree Disagree Strongly Disagree

Question five showed that students felt more able to explain an example of how electricity works.



The following chart shows growth from pre to post test.



Findings

Given the analysis of the data and the testing of the hypothesis, at least one finding became apparent. Basically, the hypothesis that stated the Gateway to Technology (GTT) curriculum would increase test scores was simply not supported. This means that according to this study, GTT had no significant impact on student learning. This information then leads to the following deduction. Statpak indicated a t-score of .43 which further indicated that there was no significant change between the control group and experimental group.

This all meant that the Hypothesis could not be supported and the Null hypothesis could not be rejected for this study.

Discussion

The results of this study were somewhat mixed and inconclusive. They were mixed in that the survey contradicted the null hypothesis where the students actually showed a greater confidence in their ability to take a test even though the data showed there was no significant gain in student achievement. The results were inconclusive in the disparity between the control group starting scores and the experimental groups starting scores. The control group started well above where the experimental group finished. This indicates that the control group students were not "like" students to compare. One could simply argue that a student that had a stronger aptitude toward academics could also have learned at an increased rate higher than a student that had less academic ability.

The information from chapter two in this study suggested that the experimental group was certain to have had succeeded in improving their test scores. In fact they did, to be exact they had a 6 point increase. The analysis showed this amount to be insignificant but only because it was compared to the growth of the control group (band kids). From this it could have been concluded that there were extraneous and improper test procedures that skewed the results of

this study. Once more, another could argue that the test itself did was not specific enough to fit the curriculum.

CHAPTER 5

Summary, Conclusions and Recommendations

Introduction

This chapter has been organized around the following topic: (a) introduction, (b) summary, (c) conclusions, (d) recommendations.

Summary

Clearly as the study stands, the hypothesis could in no way be supported. On the other hand, the Null Hypothesis, where partially correct, could not be supported either. This leaves this study with ambiguous results.

Conclusions

The conclusion that can be drawn from here is that modifications need to be made to the experimental process. The control group should better match the experimental group in academic ability. The test should be more specific to the curriculum given.

Recommendations

My recommendation would be to re-test a different control group and reconfigure the test that was given to students to reflect the given curriculum better. This researcher would also recommend that more variables be eliminated. For instance, during the quarter there were several breaks in instruction due to fire drills, assemblies, and other external influences. The control group for instance had several band concerts where the experimental group was required to watch and therefor lost instructional time in class.

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APPENDICES

ROCHESTER MIDDLE SCHOOL

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Rochester, WA 98579-0398
Phone: (360) 273-5958

Letter of Permission to Conduct Research

I, Will Maus, with the understanding that I will have the opportunity to review each research item that goes to students, give Troy Meier, permission to conduct research for the Masters Degree at Heritage University during the 2010-2011 academic school year at Rochester Middle School, with the hypothesis of "Students who take a course in GTT (Gateway To Technology) will have significantly higher academic growth on the 8th grade science pre-MSP than students who do not take a course in GTT. Students will express greater amount of confidence in taking the science pre-MSP as a direct result of participating in a GTT course."

Will Maus, Rochester Middle School — Date: 2 Nov 10

NOOKSACK VALLEY MIDDLE SCHOOL, A MIDDLE SCHOOL PCA
By FRED GRANT

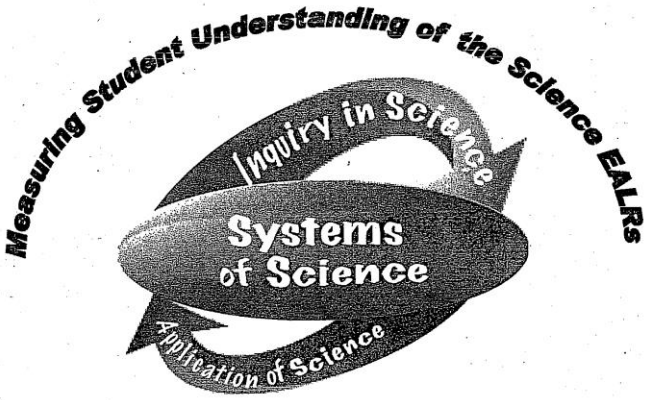
Mid-Year Test
WASL PRACTICE

64 Total Points

Middle School

Powerful Classroom Assessment (PCA)

Student Name: _____



3 The air rises over the land because

- O **A.** the sun heats the land, which heats the air above it, making it more dense, so it rises
- O **B.** the sun heats the water, which heats the air above it, making it more dense, so it settles
- O **C.** the sun heats the land, which heats the air above it, making it less dense, so it rises
- O **D.** the sun has nothing to do with the process

4 The clouds are formed where they are because

- O A. as the warm moist air rises, the moisture condenses forming clouds
- O B. as the cold air rises, the moisture becomes vestibule as it freezes into ice pellets
- O C. in this diagram, the clouds should be more over the water
- O D clouds are only formed over the land

5 As the air rises above the land

- O A. it begins to become less dense, spreads out and then settles back to the surface
- O B. it begins to heat up, spreads out and then settles back to the surface
- O C. it begins to cool off, becomes more dense, and settles back to the surface
- O D. none of the above are explanations of what happens

6. In the diagram on page 2, what do you think explains why there are no clouds over the water

- O A. the air above the water is cool, so the moisture condenses and falls as rain
- O B. the air above the water is so hot that the clouds rise into space
- O C. the air above the water is always about 34 deg F., causing the clouds to fall into the water
- O D. there are no clouds over water

7. The air flow shown in the diagram on page 2 will reverse at some time during the day. When would expect to see the air flow from the land to the sea?

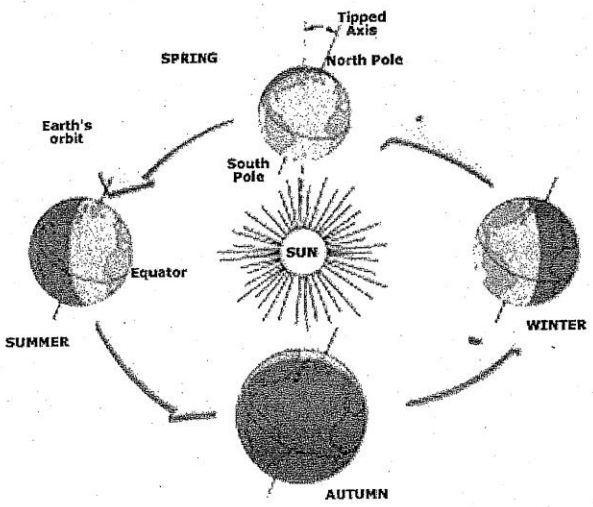
O A. the air flow will shift between 9 pm and midnight

O B. the air flow will shift about 9 am

O C. the air flow will shift about 3 am

O D. the air flow will shift about mid-day (noon)

Directions: Use the following diagram to answer questions 8 through 11 on page 5.
(2 points each)



8 In the diagram on page 4, the Earth is shown as it orbits around the sun. How long will it take for the Earth to travel from the position marked **winter** to the position marked **autumn:**

- O A. approximately 273.5 days
- O B. approximately 365 days
- O C. approximately 91.25 days
- O D. approximately 180.25 days

9 The seasons on earth are caused by

- O A. the tilt of the Earth
- O B. the Earth's distance from the sun
- O C. only the Earth's position on the orbit around the sun
- O D. none of the above

10. This part of the Earth receives the most direct sun light all year long

- O A. the north pole
- O B. the equator
- O C. the south pole
- O D. the core

11. Day and night on Earth are caused by

- O A. the orbit of the Earth around the sun
- O B. the rotation of the Earth on its axis
- O C. the suns movement through the universe
- O D. the stars dim during the day and the sun goes below the Earth at night

Bean Machine

Directions: Use the following information to answer questions 1 through 11. (2 points each)

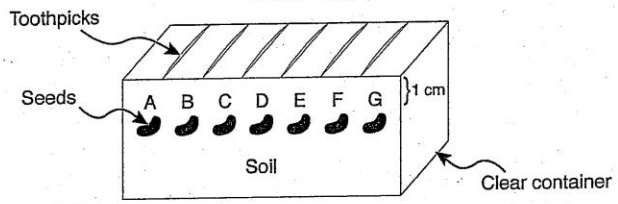
Sharon knew that water was necessary for seeds to germinate and develop roots. She wondered how water affects seed roots so she did the following investigation.

Question: How does the volume of water given to bean seeds affect the direction of root growth?

Hypothesis (prediction): Bean seeds given 3 milliliter (mL) or more of water daily will develop roots that grow straight down because that will be enough water for the seed to perform its life functions.

Materials:
clear plastic container
soil
bean seeds (all the same)
toothpicks
water
graduated cylinder

Investigation Setup
Before Trial 1

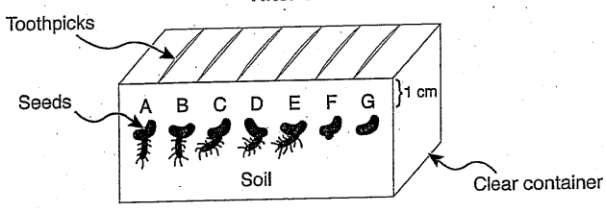


NOOKSACK VALLEY MIDDLE SCHOOL, A MIDDLE SCHOOL PCA
By FRED GRANT

Procedure:

1. Put the materials together as shown in the Investigation Setup Before Trial 1 diagram.
2. Water Seed A with 6 mL, Seed B with 5 mL, Seed C with 4 mL, Seed D with 3 mL, Seed E with 2 mL, and Seed F with 1 mL of water. Add the water every day directly to the soil that covers each seed. Do not water Seed G.
3. Record observations of the root development of each seed after 8 days.
4. Repeat steps 1-3 for a second trial.

Investigation Setup After Trial 1



Data:

Water vs. Direction of Sprouted Root

Seed	Water (mL)	Direction of Sprouted Root	
		Trial 1	Trial 2
A	6	straight down	straight down
B	5	straight down	straight down
C	4	down and toward B	down and toward B
D	3	toward C	toward C
E	2	toward D	no root
F	1	root bud	root bud
G	0	no root	no root

12. In Sharon's investigation, which variable was the responding (dependent) variable?

O A. Amount of water added to each seed

O B. Direction of root growth

O C. Length of root growth

O D, Type of seeds grown

13. Which variable was the controlled (kept the same) variable in this investigation?

O **A.** Length of root sprouted by each seed

O **B.** Volume of water added to each seed

O **C.** Direction the root growth

O **D.** Type of seed planted

NOOKSACK VALLEY MIDDLE SCHOOL, A MIDDLE SCHOOL PCA
By FRED GRANT

Heat's On

Directions: Use the following information to answer questions 14 through 17. (2 points each)

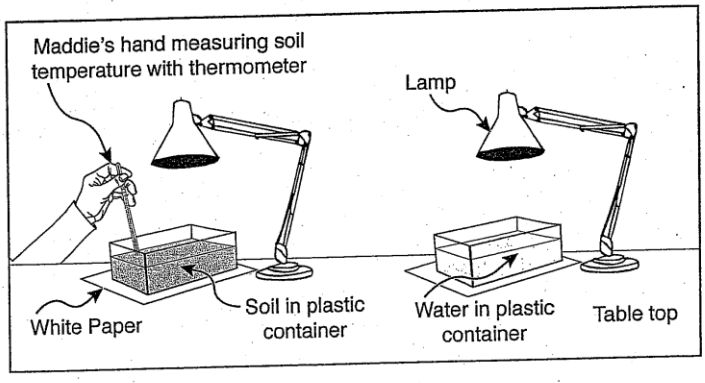
During the summer, Maddie and Dayton visited a lake with a beach. They noticed the soil felt warmer than the water on their feet. They did the following investigation.

Question: What is the effect of the type of Earth material (soil or water) on the temperature of the material when heated with a lamp?

Prediction: The temperature of water will increase faster than the temperature of the soil. In other words, after the same period of time with the lamp on and starting at the same temperature (22 deg), the water will reach a higher temperature before the soil will.

Materials:
Earth materials: soil and water
plastic containers
lamps
thermometer
metric ruler
white paper
timer

Investigation Setup



Procedure:

1. Pour soil into one plastic container and the same amount of water into the other.
2. Put the lamps and white paper as shown in the Investigation Setup diagram.
3. Be sure the lamps are the same type and are 30 centimeters (cm) above the plastic containers.
4. Measure and record the starting temperatures of the soil and of the water 1 cm below the surface.
5. Turn on the lamps for 15 minutes.
6. Measure and record the temperatures of the soil and of the water 1 cm below the surface as Trial 1.
7. Repeat steps 1 through 6 two times as Trials 2 and 3.
8. Find and record the average ending temperatures.

Data:

Earth Materials vs. Temperature

Earth Materials	Temperature (° C)			
	Trial 1	Trial 2	Trial 3	Average
Soil	**53**	**55**	**51**	**53**
Water	**32**	**34**	**33**	**33**

Note: The starting temperatures of the soil and water were 22° C for all the trials.

14 Which of the following variables was kept the same (controlled) in this investigation?

- o **A.** The temperature of the material after being heated
- o **B.** The distance the lamps were placed above the material
- o **C.** The different types of material in the containers

15 Which variable was the changed (manipulated) variable in this investigation?

- o **A.** The type of Earth materials that were tested
- o **B.** The final temperature of each Earth material used
- o **C.** The amount of time each Earth material was heated

16 Which variable was the measured (responding) variable in this investigation?

- o **A.** The temperature of the air after 15 minutes
- o **B.** The temperature of the lamps after 15 minutes
- o **C.** The temperature of the Earth materials after 15 minutes

17 Why did Maddie and Dayton investigate with a model instead of measuring the temperatures of the soil on the beach and the water in the lake?

- o **A.** Thermometers are easy to use in a model.
- o **B.** Light energy can be controlled in a model.
- o **C.** Temperatures of Earth materials can be changed in a model.

18 Write a conclusion for this investigation.

In your conclusion, be sure to:
- Answer the investigative question.
- Include **supporting** data from the Earth Material vs. Temperature table.
- Explain how these data **support** your conclusion.

Question: What is the effect of the type of Earth material (soil or water) on the temperature of the material when heated with a lamp? (6 points)

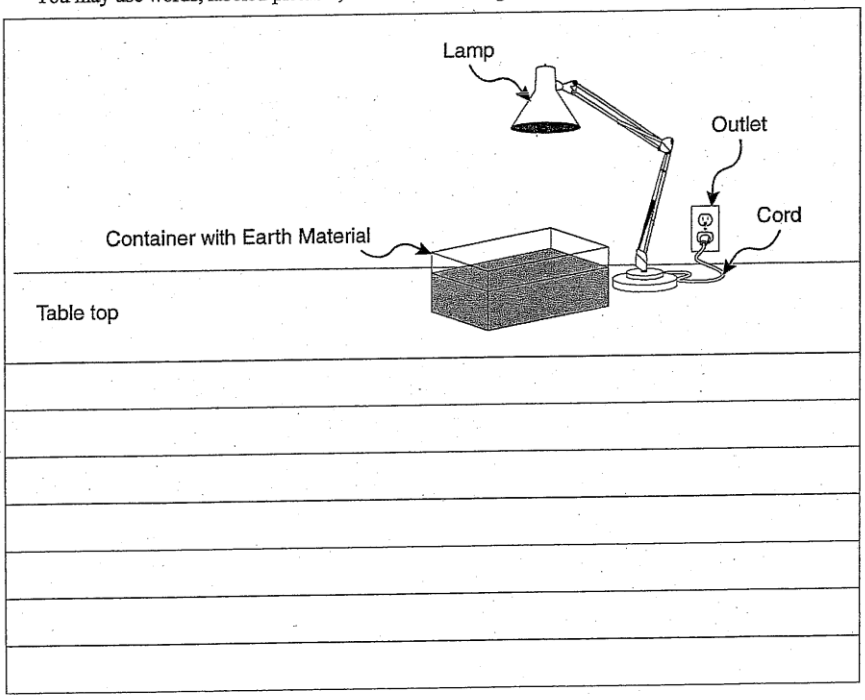
19 Maddie and Dayton's prediction was different from the results of the investigation. What should they do? (2 points)

- o **A.** Fix the prediction to match the results.
- o **B.** Repeat the investigation and compare results.
- o **C.** Complete a brand new procedure to get better results.

20 Describe one energy transfer as the Earth material increases in temperature. (6 points)

In your description, be sure to:
- Identify the forms of energy **before** and **after** the transfer.
- Describe **where** the energy transfer happened.

You may use words, labeled pictures, and/or labeled diagrams on the diagram in the box.



21 Plan a new investigation to answer the new question printed in the box.

In your plan, be sure to include:

- Prediction of the investigation results
- Materials needed to do the investigation
- Procedure that includes:
  - logical steps to do the investigation
  - one variable kept the same (controlled)
  - one changed (manipulated) variable
  - one measured (responding) variable
  - how often measurements should be taken and recorded

Question: What is the effect of different distances between the lamp and the soil on the temperature of the soil? **(10 points)**
Prediction:
Materials:
Procedure: You may use this space for a labeled diagram to support your procedure.

NOOKSACK VALLEY MIDDLE SCHOOL, A MIDDLE SCHOOL PCA
By FRED GRANT

Sliding Away

Directions: Use the following information to answer questions 22 through 24. (2 points each)

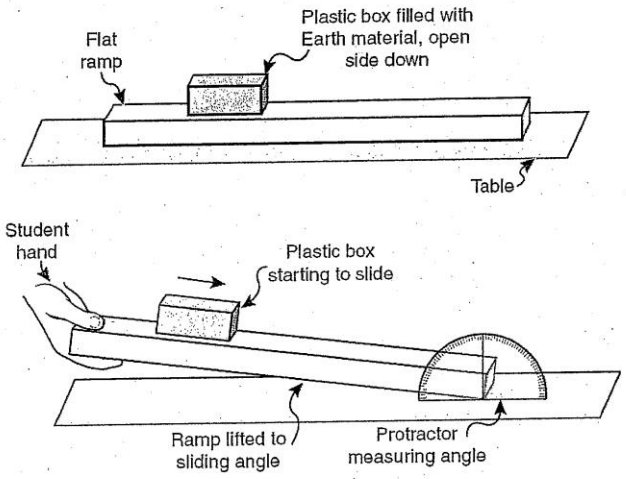
Elizabeth and Billy live in a mountainous area where landslides occur. They noticed that landslides are more common on some steep hills than other steep hills. Elizabeth and Billy wondered if some types of Earth materials tend to slide down steep hills more than others. They conducted the following investigation, using a ramp to model the slope of a hill.

Question: How does the type of Earth material (gravel, sand, and silt) affect the ramp angle at which the Earth material will slide?

Hypothesis: Sand will slide at the lowest ramp angle because sand is made of loose grains.

Materials:
clear, plastic box with an open top
Earth materials: dry gravel, dry sand, and dry silt
scale
protractor
ramp

Investigation Setup



15

NOOKSACK VALLEY MIDDLE SCHOOL, A MIDDLE SCHOOL PCA
By FRED GRANT

Sliding Away

Procedure:

1. Make sure the ramp is clean and dry before each trial.
2. Fill the plastic box with 4.9 newtons (N) or 1.1 pounds of gravel.
3. Carefully place the plastic box open side down on the middle of the ramp when the ramp is flat on the table as shown in the Investigation Setup diagram.
4. Slowly lift one end of the ramp until the plastic box filled with gravel starts to slide down the ramp as shown in the Investigation Setup diagram.
5. Measure and record the angle at which the plastic box filled with gravel starts to slide as Trial 1.
6. Repeat steps 1 through 5 as Trials 2 and 3 for the gravel.
7. Repeat the investigation using sand and then silt.
8. Calculate and record the average ramp angle for each Earth material.

Data:

Earth Material vs. Ramp Angle

Earth Material	Ramp Angle (degrees)			
	Trial 1	Trial 2	Trial 3	Average
Gravel	19	20	22	20
Sand	25	23	23	24
Silt	28	28	25	27

22 Which variable was the manipulated (changed) variable in this investigation?

- o **A.** Type of Earth material
- o **B.** Weight of Earth material
- o **C.** Amount of moisture in the Earth material
- o **D.** Shape of the plastic box holding the Earth material

23 Which difference between sand and gravel most likely accounts for different results on the ramp?

- o **A.** The force of gravity changes with the smaller particles of sand.
- o **B.** The mass of the sand is less, causing a smaller gravitational force.
- o **C.** The volume of gravel is higher, resulting in greater pressure on the ramp.
- o **D.** The particles of gravel have fewer surfaces in contact with the ramp.

o

24 What happened to the plastic box's potential energy just as the box began to slide down the ramp?

- o **A.** The potential energy of the box began transforming into kinetic energy.
- o **B.** The potential energy of the box began transforming into heat energy.
- o **C.** The potential energy of the box remained the same.
- o **D.** The potential energy of the box began increasing.

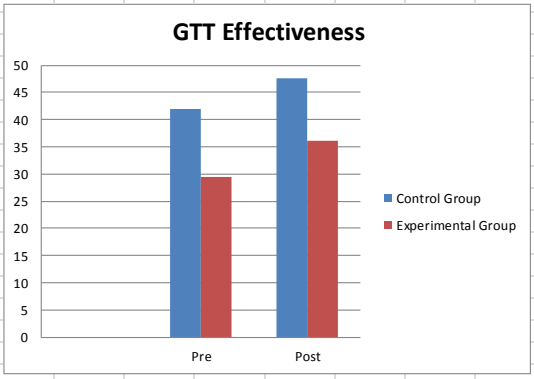
25 Trees and other plants need energy from the Sun to live. What form of energy does the tree get from the Sun?

- o **A.** Light energy
- o **B.** Electrical energy
- o **C.** Chemical energy

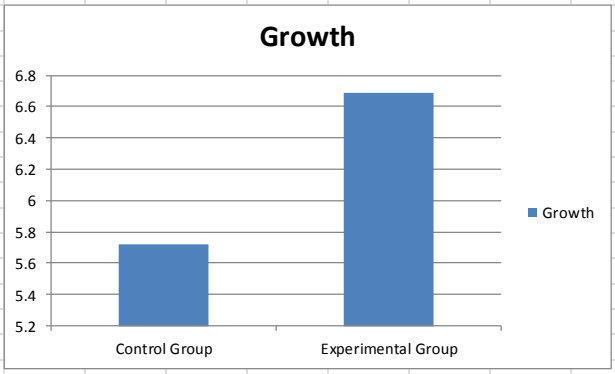
Midyear MSP Scores for Pre and Post Test for Experimental Group						
Student	Gender	Pre	Post	Growth		
A	M	14	12	-2		
B	M	23	22	-1		
C	M	38	49	11		
D	M	20	37	17		
E	M	46	56	10		
F	M	28	22	-6		
G	M	54	61	7		
H	M	20	24	4		
I	M	43	56	13		
J	M	38	46	8		
K	M	34	37	3		
L	M	34	38	4		
M	M	26	22	-4		
N	M	12	18	6		
O	M	44	53	9		
P	M	6	28	22		
Q	M	18	26	8		
R	F	44	62	18		
S	F	32	46	14		
T	F	40	41	1		
U	F	40	52	12		
V	F	10	8	-2		
W	F	14	16	2		
Sum		678	832	154		
Mean		29.48	36.17	6.70		

Midyear MSP Scores for Pre and Post Test for Control Group					
Student	Gender	Pre	Post	Growth	
A	M	46	56	10	
B	M	48	50	2	
C	M	48	60	12	
D	M	53	62	9	
E	M	22	36	14	
F	M	20	24	4	
G	M	54	56	2	
H	M	30	44	14	
I	M	44	47	3	
J	M	4	14	10	
K	M	50	54	4	
L	M	40	56	16	
M	M	48	48	0	
N	M	52	61	9	
O	M	34	47	13	
P	M	50	60	10	
Q	M	42	44	2	
R	M	58	62	4	
S	F	56	54	-2	
T	F	8	16	8	
U	F	50	53	3	
V	F	46	57	13	
W	F	56	57	1	
X	F	34	34	0	
Y	F	56	56	0	
Z	F	60	58	-2	
AA	F	52	54	2	
BB	F	38	41	3	
CC	F	16	18	2	
SUM		1215	1379	166	
Mean		41.90	47.55	5.72	

Midyear MSP Mean Score Comparison		
	Pre	Post
Control Group	41.89655	47.55172
Experimental Group	29.47826	36.17

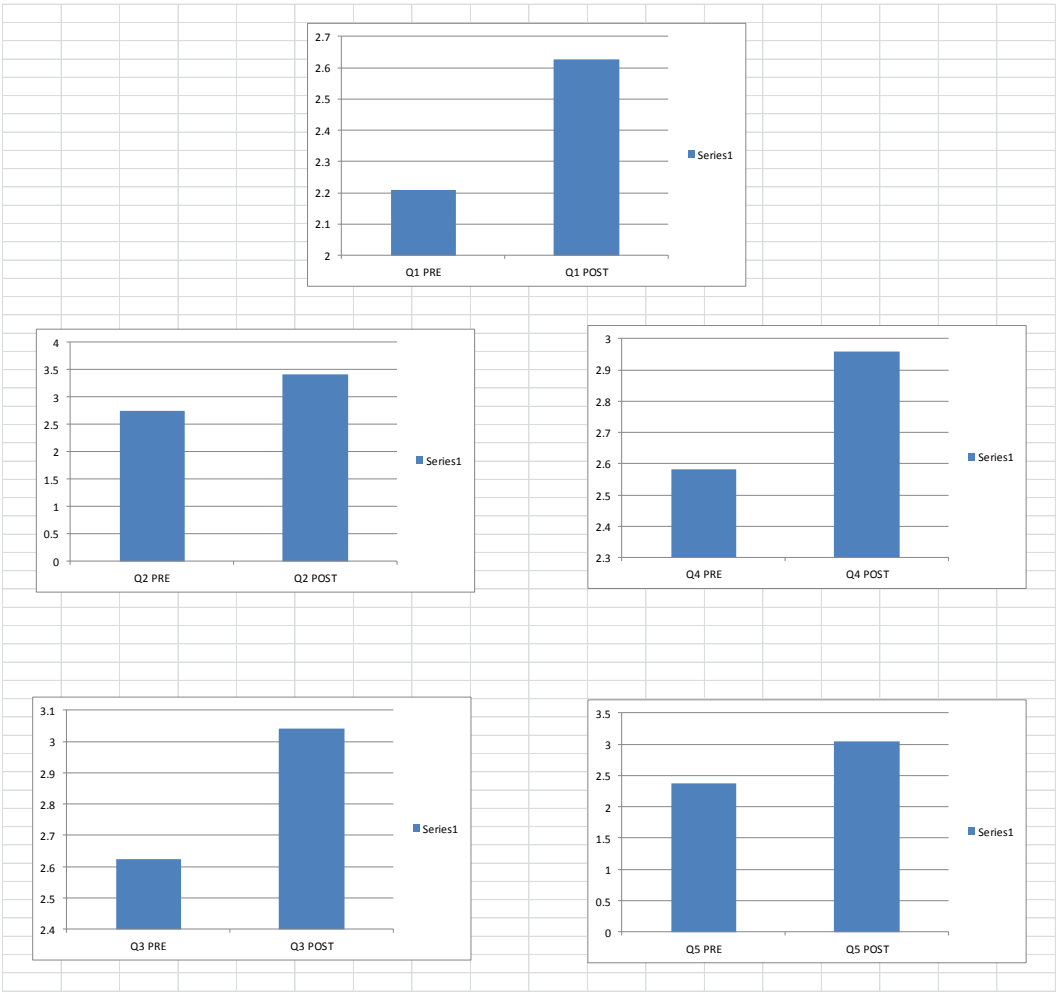


Average Growth per Student on Midyear MSP Test	
	Growth
Control Group	5.724138
Experimental Group	6.69174



Survey for Gateway To Technology Experimental Group														
Students who participate in the GTT program will feel more confident in their overall reading ability than students who do not participate in the program.														
Key	4-Strongly Agree		3- Agree		2-Disagree		1- Strongly Disagree							
Student	MALE	FEMALE	Q1 PRE	Q1 POST	Q2 PRE	Q2 POST	Q3 PRE	Q3 POST	Q4 PRE	Q4 POST	Q5 PRE	Q5 POST		
AA			2	2	3	3	3	3	1	2	3	4		
BB			3	3	3	3	3	3	2	2	2	2		
CC			2	3	3	4	3	2	2	4	4	4		
DD			2	3	3	4	3	3	3	3	3	3		
EE			3	3	3	3	3	3	2	2	2	2		
FF			2	2	3	3	2	2	2	2	4	4		
GG			2	2	3	4	3	3	2	3	3	3		
HH			3	3	3	3	3	3	3	4	2	4		
II			3	3	2	3	3	3	3	3	2	3		
JJ			1	3	3	4	2	3	3	4	2	2		
KK			3	2	3	3	2	3	2	4	2	3		
LL			2	3	2	4	1	3	2	2	2	2		
MM			1	3	3	3	3	3	3	2	2	2		
NN			3	3	2	4	3	2	4	4	3	4		
OO			3	3	3	3	2	4	3	3	2	3		
PP			2	3	3	4	3	3	3	3	2	4		
QQ			1	1	3	3	2	3	2	2	2	3		
RR			1	4	2	4	2	4	4	4	1	3		
SS			3	3	3	4	3	3	2	4	1	3		
TT			3	3	3	3	3	3	3	4	3	3		
UU			3	3	2	4	1	4	2	2	1	3		
VV			2	2	2	3	3	3	3	3	3	4		
WW			1	1	3	3	4	4	4	4	3	3		
XX			2	2	3	3	3	3	2	1	3	2		
YY			3	2	3	3	3	3	2	4	1	4		
ZZ			2	2	3	3	3	3	2	2	2	3		
aa			3	4	3	3	2	4	3	3	2	3		
bb			2	4	1	3	4	3	3	3	3	4		
cc			3	4	3	4	3	3	2	2	2	4		
dd			3	4	3	3	2	2	2	3	3	4		
			Q1 PRE	Q1 POST	Q2 PRE	Q2 POST	Q3 PRE	Q3 POST	Q4 PRE	Q4 POST	Q5 PRE	Q5 POST		
Mean			2.208333	2.625	2.75	3.416667	2.625	3.041667	2.583333	2.958333	2.375	3.041667		
Total			53	63	66	82	63	73	62	71	57	73		

Survey for Gateway To Technology Control Group												
Students who participate in the GTT program will feel more confident in their overall reading ability than students who do not participate in the program.												
Key	4-Strongly Agree		3- Agree		2-Disagree		1- Strongly Disagree					
Student	MALE	FEMALE	Q1 PRE	Q1 POST	Q2 PRE	Q2 POST	Q3 PRE	Q3 POST	Q4 PRE	Q4 POST	Q5 PRE	Q5 POST
AA			2	2	3	3	3	3	1	2	3	4
BB			3	3	3	3	3	3	2	2	2	2
CC			2	3	3	4	3	2	2	4	4	4
DD			2	3	3	4	3	3	3	3	3	3
EE			3	3	3	3	3	3	2	2	2	2
FF			2	2	3	3	2	2	2	2	4	4
GG			2	2	3	4	3	3	2	3	3	3
HH			3	3	3	3	3	3	3	4	2	4
II			3	3	2	3	3	3	3	3	2	3
JJ			1	3	3	4	2	3	3	4	2	2
KK			3	2	3	3	2	3	2	4	2	3
LL			2	3	2	4	1	3	2	2	2	2
MM			1	3	3	3	3	3	3	2	2	2
NN			3	3	2	4	3	2	4	4	3	4
OO			3	3	3	3	2	4	3	3	2	3
PP			2	3	3	4	3	3	3	3	2	4
QQ			1	1	3	3	2	3	2	2	2	3
RR			1	4	2	4	2	4	4	4	1	3
SS			3	3	3	4	3	3	2	4	1	3
TT			3	3	3	3	3	3	3	4	3	3
UU			3	3	2	4	1	4	2	2	1	3
VV			2	2	2	3	3	3	3	3	3	4
WW			1	1	3	3	4	4	4	4	3	3
XX			2	2	3	3	3	3	2	1	3	2
YY			3	2	3	3	3	3	2	4	1	4
ZZ			2	2	3	3	3	3	2	2	2	3
aa			3	4	3	3	2	4	3	3	2	3
bb			2	4	1	3	4	3	3	3	3	4
cc			3	4	3	4	3	3	2	2	2	4
dd			3	4	3	3	2	2	2	3	3	4
			Q1 PRE	Q1 POST	Q2 PRE	Q2 POST	Q3 PRE	Q3 POST	Q4 PRE	Q4 POST	Q5 PRE	Q5 POST
Mean			2.208333	2.625	2.75	3.416667	2.625	3.041667	2.583333	2.958333	2.375	3.041667
Total			53	63	66	82	63	73	62	71	57	73


2.7
2.6
2.5
2.4
2.3
2.2
2.1
2
Q1 PRE
Q1 POST
Series1
4
3.5
3
2.5
2
1.5
1
0.5
0
Q2 PRE
Q2 POST
Series1
3
2.9
2.8
2.7
2.6
2.5
2.4
2.3
Q4 PRE
Q4 POST
Series1
3.1
3
2.9
2.8
2.7
2.6
2.5
2.4
Q3 PRE
Q3 POST
Series1
3.5
3
2.5
2
1.5
1
0.5
0
Q5 PRE
Q5 POST
Series1

Midyear MSP Scores for Pre and Post Test for Experimental Group							Midyear MSP Scores for Pre and Post Test for Control Group					
Student	Gender	Pre	Post	Growth			Student	Gender	Pre	Post	Growth	
A	M	14	12	-2			A	M	46	56	10	
B	M	23	22	-1			B	M	48	50	2	
C	M	38	49	11			C	M	48	60	12	
D	M	20	37	17			D	M	53	62	9	
E	M	46	56	10			E	M	22	36	14	
F	M	28	22	-6			F	M	20	24	4	
G	M	54	61	7			G	M	54	56	2	
H	M	20	24	4			H	M	30	44	14	
I	M	43	56	13			I	M	44	47	3	
J	M	38	46	8			J	M	4	14	10	
K	M	34	37	3			K	M	50	54	4	
L	M	34	38	4			L	M	40	56	16	
M	M	26	22	-4			M	M	48	48	0	
N	M	12	18	6			N	M	52	61	9	
O	M	44	53	9			O	M	34	47	13	
P	M	6	28	22			P	M	50	60	10	
Q	M	18	26	8			Q	M	42	44	2	
R	F	44	62	18			R	M	58	62	4	
S	F	32	46	14			S	F	56	54	-2	
T	F	40	41	1			T	F	8	16	8	
U	F	40	52	12			U	F	50	53	3	
V	F	10	8	-2			V	F	46	57	13	
W	F	14	16	2			W	F	56	57	1	
Sum		678	832	154			X	F	34	34	0	
Mean		29.48	36.17	6.70			Y	F	56	56	0	
							Z	F	60	58	-2	
							AA	F	52	54	2	
							BB	F	38	41	3	
							CC	F	16	18	2	
							SUM		1215	1379	166	
							Mean		41.90	47.55	5.72	

Survey for GTT Effectiveness

Circle one: Boy Girl

1. I am more prepared to take the pre-MSP than if I hadn't taken GTT.

   Strongly Agree Agree Disagree Strongly Disagree

2. I think information from this class will help me later in my school/life.

   Strongly Agree Agree Disagree Strongly Disagree

3. I can use the scientific method to solve a problem or answer a question.

   Strongly Agree Agree Disagree Strongly Disagree

4. I can give several examples of energy transfers and/or transformations.

   Strongly Agree Agree Disagree Strongly Disagree

5. I can give an example of how electricity works in an everyday application.

   Strongly Agree Agree Disagree Strongly Disagree

Survey for GTT Effectiveness

Circle one: Boy Girl

2. I am more prepared to take the pre-MSP than if I hadn't taken GTT.

   Strongly Agree Agree Disagree Strongly Disagree

3. I think information from this class will help me later in my school/life.

   Strongly Agree Agree Disagree Strongly Disagree

4. I can use the scientific method to solve a problem or answer a question.

   Strongly Agree Agree Disagree Strongly Disagree

5. I can give several examples of energy transfers and/or transformations.

   Strongly Agree Agree Disagree Strongly Disagree

6. I can give an example of how electricity works in an everyday application.

   Strongly Agree Agree Disagree Strongly Disagree