12-2007

Integration of Fifth Grade Math and Science Curriculum, Accompanied by Increased Parental Involvement, Produces Higher Virginia Test Scores.

Kathy Diane Perkins
East Tennessee State University

Integration of Fifth Grade Math and Science Curriculum Accompanied by Increased Parental
Involvement Produces Higher Virginia Test Scores

_____

A thesis

presented to

the faculty of the Department of Mathematics

East Tennessee State University

In partial fulfillment

of the requirements for the degree

Master of Science in Mathematical Sciences

_____

by

Kathy D. Perkins

December 2006

_____

Jeff Knisley

Michel Helfgott

Anant Godbole

Keywords: Math, Science, Integration, Parental Involvement, Higher Scores

ABSTRACT

Integration of Fifth Grade Math and Science Curriculum Accompanied by Increased Parental
Involvement Produces Higher Virginia Test Scores

by

Kathy D. Perkins

The National Educational Society, through much research and testing, discovered that American students are not performing as well on the academic level as their counterparts. As a nation the math and science scores fell behind other tested disciplines. The Virginia Department of Math and Science Report Card scores confirm that students are struggling in these areas.

As a resolution to correct this problem a proposal for the integration of fifth grade math and science curriculum accompanied by increased parental involvement was devised. The program involved thirteen elementary students and their parents. Pretesting, math and science labs, worksheets, posttesting, and a school beautification project were used. The condensed summary of findings proved that the integration of math and science curriculum accompanied with parental involvement produces higher test scores.

CONTENTS

LIST OF TABLES

CHAPTER1

INTRODUCTION

The Problem

Major concerns for America's education prompted the passing of the No Child Left Behind (NCLB) Act in 1999 (No Child Left Behind). The concerns were that as a nation America was trailing behind other countries in technological advances and research and discovery (A Nation at Risk). After much research and testing, the National Educational Society found that American students were not performing as well on the academic level as its counter parts (No Child Left Behind). Not realizing the true reason for academic deficiency, President Bush initiated the NCLB Act to secure America's future. Many educational areas were examined but the true reason for educational listlessness was still uncertain. The NCLB Act was established to make sure that every student in the United States would perform on grade level by the year 2014 (No Child Left Behind). Strict academic guidelines and professional accountability were enforced (No Child Left Behind). State-wide academic tests were given in order to monitor student success and national improvement (No Child Left Behind). The Virginia 2005 annual test results indicate that fifth grade students improved on the state-wide test scores but were still below the expected 100% proficiency for the year 2014 (School Report Card). Controversy over the NCLB Act had many educators teaching to the test while leaving many important details behind. Educators no longer had a choice of what to teach. They were required to follow state curriculum guides and county pacing guides that diminish time for inquiry-based learning (No Child Left Behind). Math and science test scores fell behind the other tested academic areas (School Report Card). The math and science national average test scores confirmed that students were struggling, and without an understanding of the math and science disciplines Americans would trail behind others using new and

improved technology. Although many efforts were being made to strengthen the quality of education and the enthusiasm of learning math and science, there was still more to be done.

<u>Low Math Scores</u>

The Virginia School Report Card (Table 1) shows that 78% of all students passed the math test in 2002-2003, 83% passed in 2003-2004, and 84% passed in the 2004-2005 school year. However, if we examine ethnic groups, students with disabilities, economically disadvantaged, and limited English proficient students we saw a noticeable discrepancy in the math passing rate percentages for 2002 - 2005. White students had the leading math percentages from 2002 to 2005 with an average of 86.7 % pass rate. Hispanic students trailed in second with 75% and limited English proficient students held third place with 74.3%. True, the percentages were fairly decent, but when you factored in the economically disadvantaged with 70.3 %, black students with 69%, and students with disabilities at 56.3% we realized that something was awry.

TABLE 1

Virginia School Report Card Statewide Achievement Results in Reading/ Language Arts, Mathematics & Science

Virginia School Report Card:
Statewide Achievement Results in
Reading/Language Arts, Mathematics & Science
Terminology

School Year Assessment was given	Reading/Language Arts Percentage of Students Passing			Mathematics Percentage of Students Passing			Science Percentage of Students Passing		
	2002-03	2003-04	2004-05	2002-03	2003-04	2004-05	2002-03	2003-04	2004-05
All Students	79	79	81	78	83	84	81	84	84
Black	65	66	70	64	70	73	65	70	72
White	85	85	87	84	87	89	88	90	90
Hispanic	67	69	73	72	76	77	70	72	73
Students with Disabilities	54	51	56	51	57	61	60	64	64
Economically Disadvantaged	63	64	69	65	72	74	66	72	73
Limited English Proficient	58	65	70	70	76	77	60	67	68

The 1998-2005 Statewide Virginia Standards of Learning Spring Assessment Results (Table 2) indicate that the percentage of students who passed the test increased by 33% in an eight-year span. A slow but steady increase began with the 1998 pass rate of 47% and increased to the 2005 pass rate of 80%.

TABLE 2

1998-2005 Statewide Standards Of Learning Spring Assessment Results

SOL Test	1998 Pass Rate	1999 Pass Rate	2000 Pass Rate	2001 Pass Rate	2002 Pass Rate	2003 Pass Rate	2004 Pass Rate	2005 Pass Rate	Change from 1998 to 2005
Grade 3									
English: Reading	55	61	61	65	72	72	71	77	22
Mathematics	63	68	71	77	80	83	87	87	24
History & Social Science	49	62	65	72	76	82	87	89	40
Science	63	68	73	74	78	82	85	89	26
Grade 5									
English: Reading	68	69	68	73	78	82	85	85	17
English: Writing	65	81	81	84	84	85	88	91	26
Mathematics	47	51	63	67	71	74	78	80	33
History & Social Science	33	46	51	63	72	79	86	85	52
Science	59	67	64	75	76	79	84	81	22
Grade 8									
English: Reading	65	67	70	73	69	68	72	76	11
English: Writing	67	70	76	75	76	74	77	74	7
Mathematics	53	60	61	68	71	73	78	78	25
History & Social Science	35	40	50	56	78	80	83	81	46
Science	71	78	82	84	85	84	88	87	16
Content Specific									
US History to 1877*	N/A	N/A	N/A	N/A	N/A	N/A	58	63	N/A
US History from 1877 to Present*	N/A	N/A	N/A	N/A	N/A	N/A	76	84	N/A
Civics & Economics*	N/A	N/A	N/A	N/A	N/A	N/A	81	84	N/A
High School									
English: Reading	72	75	78	82	86	93	89	85	13
English: Writing	71	81	85	84	86	91	87	88	17
Algebra I	40	56	65	74	78	78	80	84	44
Algebra II	31	51	58	74	77	81	86	87	56
Geometry	52	62	67	73	76	79	82	81	29
Virginia & US History	30	32	39	48	72	75	87	88	N/A
World History & Geography to 1500**	62	68	75	83	86	86	83	82	N/A
World History & Geography 1500 to Present**	41	47	60	65	79	82	83	86	N/A
World Geography	N/A	N/A	76	77	74	76	71	70	N/A
Earth Science	58	65	70	73	70	73	71	75	17
Biology	72	81	79	81	83	82	80	79	7
Chemistry	54	64	64	74	78	84	86	86	32

* Content Specific tests first administered in 2004 for US History to 1877, US History from 1877 to Present, and Civics & Economics

** 2004 end-of-course tests for Virginia & US History, World History & Geography to 1500, World History & Geography 1500 to Present, and World Geography based on 2001 revision of History/Social Science

TABLE 3

The Virginia School Report Card Proficiency Results

Grade 5 – All Subjects

Run on February 27, 2006

Category	English Proficient 2003	English Advanced 2003	English Passed 2003	English Proficient 2004	English Advanced 2004	English Passed 2004
All Students	63	19	82	53	31	85
Am Indian/Alaskan Native	66	19	85	54	30	84
Asian/Pacific Islander	68	20	88	51	42	93
Black	62	7	70	57	16	74
Hispanic	64	9	73	61	20	81
White	63	25	88	51	38	89
Native Hawaiian	.	.	.	53	35	88
Ethnicity Unknown	60	21	81	50	36	86
Female	64	20	85	52	35	88
Male	62	18	80	54	28	82
Gender Unknown	61	6	68	50	17	67
Students with Disabilities	52	5	57	50	9	59
Limited English Proficient	60	5	65	62	19	80

English Proficient 2005	English Advanced 2005	English Passed 2005	Math Proficient 2003	Math Advanced 2003	Math Passed 2003	Math Proficient 2004	Math Advanced 2004
56	30	85	56	17	74	58	20
59	32	90	62	13	76	65	16
55	38	93	56	31	87	56	33
61	14	75	52	7	59	57	8
64	17	81	53	11	64	57	10
53	37	90	59	22	80	59	25
56	33	89	.	.	.	57	20
54	33	88	55	18	73	58	20
55	33	88	58	17	75	60	19
56	27	83	55	18	72	56	20
57	23	80	48	6	55	44	13
52	10	62	43	4	47	41	6
66	15	80	50	10	60	53	12

TABLE 3 Continued

Math Passed 2004	Math Proficient 2005	Math Advanced 2005	Math Passed 2005	History Proficient 2003	History Advanced 2003	History Passed 2003	History Proficient 2004
78	55	25	80	59	20	79	48
80	56	25	81	61	20	81	48
89	48	41	89	60	26	86	42
65	57	12	68	57	10	67	55
67	56	14	70	57	12	69	53
84	55	31	86	60	25	84	45
77	58	30	88	.	.	.	50
78	53	28	81	60	18	78	48
79	57	25	82	61	18	78	50
76	53	25	79	57	22	79	46
57	45	24	69	66	7	73	55
48	43	8	50	47	7	54	47
66	52	15	67	53	10	63	53

Science Proficient 2004	Science Advanced 2004	Science Passed 2004	Science Proficient 2005	Science Advanced 2005	Science Passed 2005
62	22	84	66	15	81
65	23	87	73	13	87
61	29	90	69	19	88
62	8	70	61	5	66
63	11	73	63	6	70
63	28	91	68	20	88
70	16	86	77	12	89
63	22	85	68	15	83
64	19	83	67	13	80
60	25	85	66	16	82
52	15	67	68	9	77
54	8	63	53	6	58
60	8	68	61	6	67

Low Science Scores. Similarly, if we observe the 1998-2005 Statewide Virginia Standards of Learning Spring Assessment Results (Table 2) for fifth grade science we assessed that the percentage of students who passed the test increased by 22% in the eight-year span. The 1998 science pass rate was 59% and slowly increased to the 2005 pass rate of 81%. Once again when we disaggregated the ethnic,

disabled, disadvantaged, and ELP students on the School Report Card, we learned that white students were leading a three-year average of 89.35 % passing rate, Hispanics trailed once again with a 71.7% pass rate, economically disadvantaged had a 70.3% pass rate, Black students came in fourth with 69% pass rate, LEP obtained a 65% rate, and lastly students with disabilities ended with an average of 62.7 % pass rate. Ultimately, the Virginia School Report Card (Table 3) revealed that there was an overall pass rate of 77% for three years in mathematics and 83% pass rate for three years in science. There was only a 6% difference in the pass rates of these two disciplines. However, when one compared the yearly averages of fifth grade math and science SOL test scores on the 1998-2005 Statewide Standards of Learning Spring Assessment Results, (Table 2) he or she found that math trailed science by 7%. If we compared the averages from Tables 1, 2, and 3 we found that the fifth grade math scores trailed behind science and reading. Math had a composite score of 75%, science had a composite score of 80%, and reading had a composite score of 80%. The signification that math was a critical area of the Virginia Assessment Program lead educators to rally for additional support and reform.

Lack of Parental Involvement. Support from The Parental Involvement: Title 1, Part A, of the No Child Left Behind Act provided a framework through which families, educators, and communities could work together and improve teaching and learning (Parental Involvement Act, 1). "Title 1, Part A was not only designed to help close the achievement gap between disadvantaged and minority students and their peers, but also to change the culture of America's schools so that success was defined in terms of student achievement, and that schools invest in every child" (qtd. in Parental Involvement Act, 1). "Three decades of research provided convincing evidence that parents were an important influence in helping their children achieve high academic standards. When schools collaborated with parents to help their children learn and when parents participated in school activities and decision-making about their children's education, children achieved at higher levels. In short, when parents were involved in

education, children did better in school and schools improved" (qtd. in Parental Involvement Act, 2). Parental Involvement under the No Child Left Behind Act was defined by participation of parents in regular, two-way, meaningful communication that involved student academic learning and other school activities (Parental Involvement Act, 3). Parents were expected to play an integral role in assisting their child's learning by being actively involved in their child's education at school (Parental Involvement Act, 3). "Studies have found that students with involved parents, no matter what their income or background, are more likely to earn high grades and test scores, pass their classes, attend school regularly, and graduate" (qtd. in Parental Involvement Act, 4).

CHAPTER 2

RESEARCH

<u>Science and Engineering Indicators 2006 Report</u>

The National Science Teachers Association Reports, May 2006, Vol 17, No. 8 conveyed a need for science education reform. Debra Shapiro reported that Science Engineering (S & E) Indicators along with America's Pressing Challenge- Building a Stronger Foundation focused on conditions of U.S. precollegiate education in science, technology, engineering, and mathematics (STEM) fields. Shapiro reported that Jo Anne Vasquez, the sole K-12 educator appointed to the NCLB Act and the 1996-97 NSTA President, told members of Congress and their staff during a Capitol Hill forum on the Science and Engineering Indicators 2006 report that "quantitatively the nation is not seeing uniform improvements in student achievement in mathematics and science" (Shapiro, 7).

<u>The Handbook for Enhancing Strategic Leadership in Math and Science Partnerships</u>

"The Handbook for Enhancing Strategic Leadership in the Math and Science Partnerships" propose that Math and Science reform were among the nation's top educational priorities. The Math and Science Partnerships (MSP) program was seeking deep, meaningful, and sustained changes in mathematics and science education in participating school districts, institutions of higher education, and other core partners (Weiss, 1). To achieve the long-term outcomes, the MSP program wanted to ensure that all K-12 students had access to, were prepared for, and are encouraged to participate and succeed in challenging curricula in math and science courses.

<u>Inquiry-Based Classrooms and Middle School Student Perceptions about Science and Math</u>. A report on "Inquiry-Based Classrooms and Middle School Student Perceptions about Science and Math" was also controversial. A recent study at Arkansas University paired its science and math graduate students with area middle school teachers. The science and math graduate students wanted to share their

knowledge and help develop student interest in science and math through the use of inquiry-based learning activities. After three months of the program, students and parents were surveyed to investigate the students' attitudes about science and math.

Results indicate moderate correlations between parent and student perceptions of students' confidence and interest. Comparisons between participating and nonparticipating classrooms indicate that in math classes there is a positive attitudinal impact toward both math and science, but in science classrooms there is a positive impact in science only. The project is currently in refinement (Hulett, 2).

MaTe Program. The Science MaTe Program, math and science integration labs, was designed to use problem-solving and critical thinking techniques. In this program teachers learned the weekly components of the program by reading Pre-Lab, Lab, and Post-Lab themes for the week. Technology allowed this program to experiment with implementation models in developing countries (Blueford). Overall the product was one of the most innovative, comprehensive, rigorous, and fun science programs that have emerged in the U.S. It brought students and teachers into the future so students would understand science and how it was part of their lives (Blueford).

Seeds of Learning. One Alabama school teacher implemented an outside classroom for her students in order to reveal the real life connection that science plays in their everyday lives. Mary Ellen Flannery recently published an article in the February 2006 NEA Today magazine titled, "Seeds of Learning". Flannery reported that scientists agreed that "the natural world with its multisensory stimulation helped rev up brain function, particularly in younger learners" (Flannery, 32). With a majority of today's students being raised in an asphalt society, a true outside hands-on project could be beneficial (Flannery, 32). Teacher Peggy Long learned about the Alabama Wildlife Federation's efforts to support new outdoor classrooms. Long searched for support and won about $7,000 in formal grants and $19,000 in other donations to incorporate her outside classroom (Flannery, 32). Flannery reported

that the classroom met educational standards and more. The majority of teachers at this school shared the classroom for successful science teaching of plants and animals. Flannery reported that by 2007 the Alabama State science test from the NCLB act would require that all states test for mastery of specific science standards (Flannery, 32).

CHAPTER 3

HYPOTHESIS

<u>Integration of Fifth Grade Math and Science Curriculum, Accompanied by Increased Parental</u>

<u>Involvement, Will Produce Higher Virginia Test Scores</u>

Major concerns for America's prosperity and universal leadership have prompted the National Government, school districts, and educators to reform education. The National Report card accompanied by state report cards reveals that Americans are not excelling in the math and science disciplines. Many Americans are not pursuing employment in these critical areas. American students are not performing well on standardized tests. Therefore, America's future may be in jeopardy. Congress passed the NCLB Act in 1999 (No Child Left Behind) in hopes of increasing America's education and intelligence. Many educational reformers have produced guidelines, projects, workshops, and teacher training sessions. My love for teaching the math and science disciplines has prompted me to devise a way of increasing math and science conceptual and applied knowledge skills within my school system. I hypothesize that integrating fifth grade math and science curriculum accompanied by parental involvement will produce higher Virginia test scores.

I developed workshops that would transform the curriculum by combining fifth grade math and science educational objectives, with manipulatives and parental involvement, that would target fifth grade math measurement strands in conjunction with the science life processes strands of the Virginia SOL curriculum guides. The intended educational goal for the math/ science workshop was to produce an 80% pass rate on the 2006 math and science SOL test scores and increase student/ parent awareness of the relationship between math, science, and real life applications. This project fulfilled educational needs by combining instruction, hands on manipulatives, real life applications, and parental involvement. It was proven that parental involvement helped to increase student learning and

participation (Parental Involvement). I used the Virginia SOL guidelines for a curriculum guide since I am a Virginia educator. This project met the math measurement and science life process criterion for all fifth grade students in America. Although I targeted the Virginia students, I hope that other educators will freely use this project.

CHAPTER 4

IMPLEMENTATION

<u>Math Pretest</u>

I began my workshops by recruiting fifth grade students and their parents who were interested in an after-school tutoring project. When I received thirteen volunteer pairs, I began pretesting students' knowledge of fifth grade science and math standards. Parents were given the option of pretesting. The pretest method used was Stuart Flanagan Mott Testing for Higher Standards 2002(Flanagan). The Stuart Flanagan Mott Test is an indicator of Virginia SOL Test Results (Flanagan). Students took the 5th grade math pretest and results were appalling. The Stuart Flanagan Mott math test was a composite of all fifth grade math SOLs and accumulated a score that was comparable to the entire SOL. Consequently, we were only interested in the questions pertaining to math SOL 5.8 through 5.11a entitled Measurement. SOL 5.8 states that "The student will describe and determine the perimeter of a polygon and the area of a square, rectangle, and right triangle, given the appropriate measures" (Standards of Learning). The relevant questions for this test were numbers 26 through 29. The total accumulated percentage for correct answers on this SOL was 33%. Math SOL 5.9 states that "The student will identify and describe the diameter, radius, chord, and circumference of a circle" (Standards of Learning). The relevant questions were numbered 30 through 33 with a total score of 35%. Math SOL 5.10 states that "The student will differentiate between perimeter, area, and volume, and identify whether the application of the concept of perimeter, area, or volume is appropriate for a given situation" (Standards of Learning). Test question numbers 34, 35, and 36 were totaled into a score of 33%. The last math SOL I pretested was SOL 5.11a. It stated that "The student will choose an appropriate measuring device and unit of measure to solve problems involving measurements of length including part of an inch (½, ¼, ⅛), inches, feet, yards, miles, millimeters, centimeters, meters, and kilometers" (Standards of Learning). The

totaled results for the 13 students on this SOL were 38%. A composite score for the fifth grade math SOLs 5.8 through 5.11a equaled 35%.

<u>Math Workshops</u>

After compiling the pretest information, I began to set up my class. The class met four days per week from 3:30 p.m. until 6:00 p.m. I began my first class by teaching fifth grade math measurement SOL 5.11a. The objective of the lesson was for students and their parents to be able to measure length to the nearest sixteenth of an inch. (This was to be done in order to better understand millimeters when using metric measurements). I began the class with a review activity that measured and compared lengths using nonstandard units. We used a paperclip to measure the length of the classroom and recorded the results in the number of paperclips we used. Then, we used a twelve-inch string to measure the length of the classroom. Once again, we recorded the results by using the number of strings used. Lastly, we used a yard stick to measure the length of the classroom and recorded the results. I asked the students which unit was shorter, a paperclip, string, or yard stick? Which unit would be more appropriate for measuring the length of your classroom and why do you think so? Which unit would be best for measuring your classroom, inches, feet, yards, or miles? Why? How do you choose the most appropriate standard unit or measuring tool?

After the pre-activity I instructed the students by giving them a twelve-inch standard ruler. I demonstrated on the overhead projector that each inch was made of 16 marks. At this time students should have prior knowledge of one-half inch and one inch. I had the students to count and number each mark in an inch section of the ruler (students counted 16 marks). I discussed that one mark was 1/16 of the inch. I had students write below the marks as 1/16, 2/16, 3/16 …16/16. Then the students reduced 4/16 as ¼ inch, 8/16 as ½ inch, 12/16 as ¾ inch, and 16/16 as one inch. (It looked like a fraction tile). When the lab was completed, I gave them Practice 1 as an assessment guide (Appendix A).

On day two, I taught a lesson titled Appropriate Customary Measuring Tools for length. The objective was for students and their parents to be able to measure length with the most appropriate measuring tools. I introduced the lesson with a review of customary units of length involving inches, feet, yards, and miles. I had the students measure the length of a school hallway with a ruler and record their results in number of inches. Then I asked them to record the same results in number of feet. Once students had completed the task, they were assigned to measure the same hallway with a yard stick and record the results in the number of yards measured. When I was confident that students and their parents understood the results, I gave them a real life situational problem to complete.

> The Problem: If a teacher wants to walk three miles inside of the school building after school was over in order to receive exercise, how many times would she have to walk that same hallway? (Answers would vary according to the length of your hallway). The lesson began with the students making a chart of standard lengths including inches, feet, yards, and miles. Under each category they were to list five things that they would measure using that unit. When they were finished, they shared their responses orally and told why they picked that unit of measure. Students were given Practice 2 as an assessment tool (Appendix A).

On day three, I introduced a lesson titled Metric Measurements (Length) that taught SOL 5.11a. The objective of the lesson was for students and their parents to be able to measure length to the nearest millimeter and centimeter. I introduced the lesson with a review activity entitled Customary Measurements for length. I introduced the history and need for the metric system. I told them that there are two systems of measurement used in the United States. The older system used in the United States is called the English Customary System. In lessons one and two we learned that the customary system of measurement for length use inches, feet, yards, and miles. The second system of measurement was called the International Metric System. As its name implied, this system was used throughout the world.

Scientists used the metric system so that information could be easily shared. Common metric units of lengths used millimeters, centimeters, meters, and kilometers. This day we learned how to measure length with the metric system. We also matched the nearest metric and customary units together. I instructed the students by giving them a metric ruler. I demonstrated on the overhead projector that a metric ruler had ten short marks before you reached a longer mark labeled number one. I explained that each of these ten short marks represented a millimeter. I demonstrated that each long numbered mark on the ruler equaled ten millimeters. Ten millimeters equaled one centimeter, ten centimeters equaled one decimeter, and ten decimeters equaled one meter. I gave the students and parents Practice 3 (Appendix A) for practice and assessment.

On day four I taught the class math SOL 5.8 titled Perimeter. The objective of this lesson was for the class to be able to measure the perimeter of a given polygon. I explained the definition of a polygon to be a closed figure formed by three or more line segments. I introduced the lesson with an activity that involved the students measuring the perimeter of a shoe. I gave students a piece of string and a ruler. I asked the students to measure the distance around their shoe with the string (I cautioned the students to keep the string close to each curve of their shoe). I also explained that they were to begin with one end of the string and work around the shoe until they reached that end again. Then, they were to hold that place on the string and cut it. I had the students measure the yarn on the ruler to determine the perimeter of their shoe. They recorded the perimeter in inches or centimeters. I asked them: Why did you first use a string to measure your shoe instead of using the ruler? They answered because the perimeter was not made in a straight line. I also asked which unit was more precise to use a millimeter, centimeter, or inch. I had them explain their reasons. I started the instruction process by explaining that the prefix, peri-meant "surrounding". Hence, the perimeter of an object is the distance around the object. I asked the students to measure the perimeter of a floor tile in the classroom. I asked them if there was an easy way

to find the perimeter of a square. I showed the students an overhead demonstration of how to find the perimeter of a square where P = (number of sides) and S = side length. Then I had the students measure the perimeter of a doorway. I asked them if they could use the sides times four formula to make the calculation easier. They replied no because all of the sides were not equal. I introduced the formula 2L + 2W. I explained how one could use the formula for a rectangle (Appendix A). The students were then asked to measure the perimeter of a pentagon, octagon, triangle, and polygon by completing Practice 4 (Appendix A).

Day five began with a lesson entitled Circumference. It taught the math SOL 5.9. The objective of the lesson was for students and their parents to be able to find the circumference, diameter, and radius of a circle. I introduced the lesson with a review of the perimeter of a polygon or unusual shape by reminding them that the perimeter of a polygon consists of the distance of each line segment added together. The perimeter of an unusual shape is measured by placing one end of a string on an object and holding the string close to the object until you reach the original starting place. Then, take the length of the used string and place it on a ruler to measure its length. I told them that we were going to learn about circumference of a circle. Circumference was also known as the perimeter around a circle. However, there was an easier way to measure it besides using the first mentioned method. I began instruction by giving each student a paper plate, string, and ruler. I had them measure the distance around the plate with the string. Then, they measured the used part of string on the ruler and recorded how long it was, thus revealing the circumference of the plate. I asked them what their plates' circumference was. I had each student draw a straight line or chord through the center of the plate from one edge to the other by demonstrating the task. Students measured the line or chord with their ruler and recorded the results. I told the students that the chord across the circular plate was the plate's diameter. I asked them what their plates' diameter was. Then, I had students compare the chord's length with the circumference length. I

asked them to record the ratio between the two. It was about one to three or ⅓. I explained that the ratio between the diameter and circumference of a circle is about 3.14 and is called pi. The symbol used for pi is π. The Ancient Chinese culture used three for the value of pi. The value of pi was more precisely determined by a Greek scientist named Archimedes in 200 B.C. He thought the value of pi was closer to the mixed number 3 ½. After the decimal system began to be used in the 1600s, mathematicians wanted to find an exact value for pi. This was impossible because pi is an irrational number in which the decimal continues forever without repeating or ending. Today, we use 3.14 as an approximation figure for pi. I continued by telling the students how to use the diameter of a circle to find its circumference. I demonstrated the formula (circumference = diameter × 3.14, or c ≈ d × 3.14) on the overhead projector. I asked if their plate's circumference equaled 3.14 × d.

I continued the lesson with the concept of radius. I explained that a radius was a line segment with one endpoint at the center of a circle and the other endpoint on the circle. I told them to notice that the radius of a circle was half of the circle's diameter. If they knew the diameter of the circle then they could divide it by two to find the radius. On the other hand if you know the radius you could multiply it by two to get the diameter. I asked the students to determine the radius of their plates and record the results. I gave the students Practice 5 (Appendix A) for practice and assessment. When the assignment was completed, I taught the class how to find the radius of a tree's root system by using its diameter. I explained to the students that the diameter of a tree trunk in inches were about equal to the radius of the root system in feet. Therefore, a tree whose trunk has a 12 inch diameter would have a root system with a radius of 12 feet. I had students to go outside and measure the root system of a local tree. This activity was preformed in order to make a conscious decision about which type of trees to plant in our project. We wanted to carefully follow tree planting and growth guidelines. We did not want to plant trees that would have a large root system that would break or crack our sidewalk.

Day six began with the lesson entitled Surface Area of Squares and Rectangles math SOL 5.8."
The objective was for students and their parents to be able to find the area of squares and rectangles. The lesson began with a class activity. I introduced the activity by presenting the scenario that a student's family was buying a new house. The house would have four bedrooms. Their parents would have the master bedroom. The baby would have the room closest to their parents' room, and they and their brother would have to decide which rooms they wanted, but there would be a problem. The two rooms that were left were not the same size. Of course they would want the larger room but which room is larger? Room number one has the dimensions of 13 feet by 12 feet. Room number two has the dimensions of 14 feet by 11 feet. Their parents had a plan to help them decide which room they would choose. They would have to make models of the rooms in order to find the areas of each room, thus revealing which room was bigger. After introducing the scenario, I gave students two pieces of grid paper. I told them that paper number one would be used for bedroom number one that had the dimension of 13 feet by 12 feet. Each square on the paper equals one square foot. I had the students place a point on the top left hand corner of a square. I told them to count down thirteen squares and make a point on the bottom left corner of that square. Next, they were to begin with their top point and count over twelve squares and place one point on the right upper corner. They were to count down thirteen squares and place a point on the bottom right corner. I instructed them to connect their points and count the number of squares inside of their room. They counted one hundred fifty-six squares which equaled one hundred fifty-six square feet. I asked them to repeat the process for the second sheet of grid paper and room number two by using the dimensions 14 feet by 11 feet. They ended up with a room of one hundred fifty-four square feet. They could then compare the shape and area of the two rooms to see which was more pleasing. Now they were faced with the problem that the two rooms were close to the same square footage but their shapes were different. They had to decide if the shape of the room was important in

their room decision. After the activity, I began the instruction by revealing an easier and quicker way to calculate area. On the overhead projector I drew a square. I labeled the top as 2.5 inches and the right side as 2.5 inches in length. I explained that they could use a formula that would help them to find the area of a square. I had the students copy the formula into their notebooks. Area (A) = side × side, A = 2.5 × 2.5, A = 6.25 square inches. In the same fashion, I demonstrated how to find the area of a rectangle (length × width). Area (A) = L × W, A = 8 × 4, A = 32 square feet. The students were given Practice 6 (Appendix A).

Day seven's lesson was entitled The Surface Area of a Triangle. The objective for this lesson was for students and their parents to be able to measure the area of a triangle. I introduced the lesson with a review activity for the area of a rectangle. I gave each student a piece of centimeter grid paper. For instruction, I had students draw a rectangle with length equal to five centimeters and width equal to ten centimeters. Next, I had the students calculate the area of the rectangle and record the results beside of it. I asked them to divide the rectangle into two triangles by drawing a line from the top left corner of the rectangle to the bottom right corner of the rectangle. I asked them to write the area of the two triangles on their papers. I explained that each triangle would be half the size of the rectangle. Therefore, the area of a triangle would be half the area of a rectangle that has the same base and height number. I began the instruction process by telling them we were going to calculate the area of a triangle. I reminded them that we already knew that a triangle was half of a rectangle. I had them look at their 5 × 10 rectangle and asked them to record the length or base of the rectangle. They replied it was five centimeters long. I asked what was the width or height of the rectangle. They answered that the height was ten centimeters tall. On the overhead I wrote the formula for the area of a rectangle. Area (A = length × width). Then I wrote the formula for the area of a triangle. (A = ½ × base × height). I asked what that meant. It meant that the area of a triangle was half the area of the rectangle, times the same

base times the same height of the rectangle. We could then simplify by saying A= ½ × base × height. Then, the students calculated half the area of the 5 × 10 rectangle. A = ½ × 5 × 10, A = ½ ×50, A = 25. Students were given Practice 7 for assessment (Appendix A).

Day eight began with the lesson titled Surface Area of a Circle SOL 5.9. The objective was for students and their parents to be able to find the area of a circle. I began the lesson with a review of the circumference, diameter, and radius of a circle. I demonstrated on the overhead the new formula for Area of a Circle. $A = \pi \times r^2$, $A \approx 3.14 \times (5)^2$, $A \approx 3.14 \times 25$, $A \approx 78.5$ in.^{2}. At this time the students should have understood each part of the formula from prior learning. I simply had the student plug in numbers for the radius and pi. I handed out Practice 8 for practice and assessment (Appendix A).

Day nine began with the lesson titled Volume of a Rectangle and Square SOL 5.8. The objective of this lesson was for students to be able to find the volume of a rectangle and square. I introduced the lesson by reviewing how to find the surface area of a rectangle and square. I explained that the surface area measures a two-dimensional figure and, therefore, is measured in square units. The instruction began when I gave the students a small box. They were asked to measure the length and width of the box. Next, I explained to them that if we wanted to find out how much the box would hold we needed to calculate its volume. Volume is a three-dimensional figure. I demonstrated on the overhead the formula (length × width × height). Therefore, the formula used to find the volume of a rectangle or square can be L × W × H. Students then calculated their box's volume by measuring its length × width × height in inches. I asked the students what they thought that the volume of their box was. I had my students place one inch cubes inside the box until it was full and no spaces were showing. I had them to take the cubes out of the box and count them. They should count the same number of cubes equal to the number of cubic inches they calculated with L × W × H. The students should now have a visual connection so that

they will have no problem calculating the volume of a rectangle or square. I gave the students Practice 9 for practice and assessment (Appendix A).

Science Pretest. I took the students into the computer lab and had them complete the fifth grade science Stuart Flanagan Mott Pretest. This test was designed exactly like the math test. It had numbered questions that correlated with the Virginia SOLs. The strand of interest was titled Living Systems SOL 5.5b,c. The strand stated that "The student will investigate and understand that organisms are made of cells and have distinguishing characteristics." Key concepts included kingdoms of living things and vascular and nonvascular plants. The fourth grade science SOLs were also incorporated into this testing session. I joined the fourth and fifth grade science questions because the true fifth grade science SOL is a combination of both grade levels. The fourth grade does not take a science SOL. The fourth grade SOL strand used was titled Life Processes 4.4a,c. This strand states that "The student will investigate and understand basic plant anatomy and life processes." Key concepts included the structures of typical plants (leaves, stems, roots, and flowers). Fourth grade science Living Systems strand 4.5a was also included. This strand states that "The student will investigate and understand how plants and animals in an ecosystem interact with one another and the nonliving environment." Key concepts included behavioral and structural adaptations. The Stuart Flanagan Mott test results were again ghastly. SOL 5.5 involved questions 35 and 36; the students scored a total of 38% on this section. SOL 5.5b, questions numbered 34 and 38 were scored at 31%. SOL 4.4a entailed questions numbered 36, 40, and 41 and scored a total of 30%. SOL 4.4c had one question numbered 38 which was scored at 38%. Lastly SOL 4.5a, question number 45 was scored at 15%. This was a composite score of 30% for the fifth grade science Stuart Flanagan Mott Test.

Science Workshops. I began by teaching a lesson titled Major Plant Structures that focused on science SOL 5.5c and 4.4a. The objective of the lesson was for students and their parents to describe the

major plant structures and their functions. I began the lesson with an activity titled What DO Plants Have In Common? I supplied students with a variety of plants (flowers, ferns, grass, weeds, tree seedlings, bean plants, etc.). I had the students examine various plants and describe and record what their leaves, roots, stems, and flowers looked like. When they were finished, we made a classroom chart of the plants and their differences. Next, we examined the plants under a microscope. I asked them what they could see differently in the cells of a moss, liverwort, or hornwort compared to a flower, tomato plant, or fern. I began instruction by telling the students that there were two divisions in the plant kingdom (vascular and nonvascular). I drew on the overhead and explained that the vascular division consisted of plants that had tubes running up and down the plant that carried water and nutrients throughout. These tubes were similar to the arteries and veins that run through a human body. The veins in a human body carry blood throughout the body. Other important characteristics of vascular plants were that the stems provided support for a strong tall plant. The stems support leaves, and they hold the transportation system in plants. I had the students cut a cross section in the stem of a vascular plant (celery is great for this). They could see the plant's xylem that made up the part of the transportation system that moved the water and minerals up from the roots. Pholem moved the food from the plant's leaves to its other parts. Many stems also had cambium (a layer of cells) that separated the xylem and phloem. This was a great time to start the class with the celery experiment. In this experiment you would give each group a long stalk of celery and a cup of water with red food coloring inside. I had the students stand the celery inside of the cup. They let it sit overnight. When they looked at it approximately twenty-four hours later, they could see that the colored water was sucked up into the celery's xylem. The celery's leaves were also red. A cross section of the celery made it visible to see the vascular system.

When we finished the celery experiment, I began science lesson number two. This lesson was entitled Plant Structures (Roots). The objective of this lesson was for students and their parents to be able to differentiate four types of roots. I introduced the lesson with an activity that supplied the students with various types of plants that had their roots available for inspection. I had carrots, beets, grass, rye, and corn stalks available for the students to view. I began instruction by telling the class that we were going to discover four types of roots. I drew on the overhead a picture of a tap root. I explained that the taproot was usually one big root that grew downward and had a few hairy branching roots from the main root. A tap root is often used as food. Carrots, beets, sweet potatoes are a few examples of tap roots. Next, I had the students and their parents divide a piece of vanilla construction paper into four sections and label it "Roots". I told them we were going to also talk about fibrous roots. I explained that fibrous roots were thin hairy branching roots that spread out near the soils surface. Grass and rye have fibrous roots. I had the students label and draw some examples of fibrous roots on their vanilla paper. The third type of roots we examined was prop roots. Prop roots grew like tiny fingers out of the bottom of the stem. These roots help prop up the plant. I drew an example on the overhead to show the students the corn stalk and its prop roots. The students drew a prop root section on their vanilla paper. The fourth type of root we studied was the aerial root. These roots never touch the ground. Examples are orchids that are usually found high in branches of rain forest trees. They get their moisture from the air. The students drew and labeled aerial roots on the vanilla paper.

A plant's leaves are also a major concern when designing a flower garden or landscaping project. I began discussing a plant's leaves with the students and their parents. The introductory activity used was titled What Does Light Do for a Plant? I began the class by giving each student /parent pair a potted plant and aluminum foil . I asked the students to partially cover five of the plant's leaves with the aluminum foil and place the plant near the window where it could receive direct sunlight. The next day,

I had the students uncover one of the leaves and record what they saw. After the recordings, they covered the leaf again and placed the plant back near the window. For the next few days the students uncovered different leaves and recorded their findings. Each day they replaced the plant in the sunshine. One week later the class uncovered the entire flower and recorded their results. When the flower was placed back near the window for a week, the students could understand how light and darkness affected the growth of the plant's leaves. At this time I began teaching science Sol 5.5 b,c concerning how plants respond and adapt to a stimulus. I began explaining the different tropisms that plants undergo. I described to the students that a tropism was a plant's movement toward or away from a stimulus. Gravitropism involved a plant's roots and how they responded to the earth's gravity to grow downward. Roots have a positive gravitropism because they always grow downward no matter how they are planted into the ground. At this time I took the class outside and we observed several plant roots and their positive gravitropism to the earth. We dug up several plants and examined the position of the plant's roots. Next, I explained the concept of negative gravitropism by showing the students that a plant's stem grows upwards towards the sunlight instead of into the ground. This was a new vocabulary term for the students but the idea was a well known concept. When we returned back to the classroom, I explained to the class the term phototropism. Photo- means light. I quickly asked the students to look at our classroom plant that had not been turned in several weeks. I asked them which direction the plant was growing towards. Of course it was growing towards the window in the direction that it receives most of its light. I told the class that this was an example of positive phototropism. I had the students experience phototropism by leaving their plant near the window in the same direction for two weeks. Next, I wrote the word hydrotropism on the board and asked the students what they thought that it meant. By this time they were guessing that it meant that a plant would grow toward water. We took a walk across the road

to a nearby river and observed that several trees' roots were branching out toward the water. I explained to the students that this was an example of positive hydrotropism.

The last science lesson was about plant adaptations. I explained to the students and their parents that plants compete for sunlight, water, and nutrients just as humans do. I asked the students if they ever have to compete against a sibling for the last cookie or favorite food. They all understood exactly what I meant. However, we all have different methods of getting what we want. I explained to them that plants have their own way of competing also. Sometimes plants climb trees or other objects in order to get closer to the sunlight. The taller trees soak up the sunshine and their leaves grow bigger in the process. However, the smaller trees can not get sunlight and may die. Not only will they not get sunlight but water may be scarce also.

Landscape Project. In order to combine the conceptual and applicable knowledge in the math and science program, I designed a school beautification project that would challenge the students and their parents to demonstrate new learning. I began with math SOL 5.11a in which students and their parents measured the designated space to be used for the garden. They used the most appropriate measuring tool, whether it was inches, feet, yards, miles, millimeters, centimeters, meters, or kilometers and recorded the results in their journal. (The required space was measured to be 10 ft. by 80 ft.) The customary units are used because the space measured to the exact footage. In order to incorporate the usage of the smaller units, students were asked in the science lab to measure the height and width of certain plants and their leaves. This information was used for students to decide the types of plants to plant and where they should be located for the best garden results. Next, students and their parents worked together to build a border using brick edgers along the front edge of the garden. The brick edgers measured 12 x 3 x 4. Students and their parents were required to calculate how many edgers were needed for the front of the landscape. This also required the class to use multiplication and division

skills. The edgers were put in place and the project took shape. Next, the class was given a landscape map and was assigned to divide the landscape area into various shapes for different flower bed sections. In this project students and parents were required to measure the perimeters for rectangles, triangles, and circles. In doing so the class demonstrated their knowledge of math SOL's 5.8 and 5.9 measuring perimeters of polygons and the circumference of circles. To begin with the class had to divide the area of 800 ft² into four equal sections. Each section had to have a perimeter of 10 ft. by 20 ft. with an area of 200 ft² each. The class had to take the two end quarters of the garden (which we located as the left and right sides) and divided them into two triangles with areas of 100 ft² each. Math SOL 5.8 (the area of a triangle) was addressed with the sub-activity of calculating the area of each of the four triangles. Two triangles were covered with 1½ inches of rubberific mulch. The students and parents had to decide how much mulch was needed for each triangle by calculating its volume because the mulch was sold by cubic foot. The class recorded all findings for future use. We abandoned the two end sections for a while and moved to the inner sections. The two inner sections were laid out identically except for the type of flowers and shrubs used. We still treated the two sections as separate but performed the same task on each. Students and parents performed SOL 5.9 demonstrating knowledge of radius, diameter, and circumference by finding the center of the rectangle and marking off a circle with a radius of 4 ft and a circumference of 12.56 ft. Next, the team decided how many 18 x 5 ½ x 1 ⅓ curved scalloped edgers were needed to outline the circular flower bed. After both sections were completed, they calculated the area and volume of the two sections for 1 ½ inches of rubberific mulch and recorded the results in their journal. In order to address science SOL 4.4a (plant structures) students carefully chose plants with varied plant height for plant survival needs. In sections 1 and 2 we planted a large leafy tree that was full of color in the spring, summer, and fall. Students were careful to choose a tree that would have an adult root system that would be no longer than 10 ft in diameter. Students were able to complete this task by

referring to the activity on the math SOL 5.9 circumference lesson. The team planted the desired trees and distributed mulch over the triangle areas 1 and 2.

Next, the teams concentrated on sections 3 and 4. Science SOL 5.5b & c, and LS 4 & 5 were taken into consideration. Students and their parents chose vascular flowers to plant along the brick edgers separating the tree section and the flower bed. They chose shorter height flowers for the closer section and then nonvascular flowers for the front edge. All flowers were planted in groups. Rubberific mulch was placed around the flowers. Various heights and colors of the flowers enhanced the garden's beauty.

Then, the circular flower beds were designed and planted. The teams started with a tall central point in the center of the flower beds working to low vascular plants on the outside perimeters. A planting plan was given as a guide, but the teams chose the flowers they wanted and what was needed for the best garden results.

When the flowers were planted, four shrubs were chosen and planted in the two inner sections along the back wall side of the building. Trees were centered between the triangle point and the circular flower bed. The tree was planted 2 ft from the wall. Then, greenery was chosen and planted evenly spaced throughout sections 5 and 6. Lastly, rubberific mulch was placed in sections 5 and 6. Students stepped back and gazed and what a beautiful project that they had made.

CHAPTER 5

CONCLUSION

Math Posttest

In conclusion, America's students are falling well behind students from other countries in the disciplines of math and science. Educational reform is in process. What will help our students increase their standardized test scores? Many projects are currently being used and tested for additional support. The proposed integration of fifth grade math and science curriculum accompanied by increased parental involvement has proven to be effective. My hypothesis was valid. A final assessment was given to all students and their parents. The students and parents took the fifth grade math and science Stuart Flanagan Mott Tests. We started with the fifth grade Stuart Flanagan Mott Math Simulation test. As a reminder this test is a predictor of the Virginia SOL Test. The students scored a total of 89% on SOL 5.8, an 88% on SOL 5.9, 90% on SOL 5.10, and 92% on SOL 5.11. This gave a total accumulation score of 89.75%. Consequently this was a gain of 57% on the tested math SOLs, reaching the intended educational math goal of 80%.

Science Posttest

The final assessment for fifth grade science SOLs 5.5b, c and 4.4a, c and 4.5a was somewhat inspiring. Students scored a 77% on SOL 5.5b, 87% on SOL 5.5c, 92% on Sol 4.4a, 85% on SOL 4.4c, and 77% on SOL 4.5a. This was a cumulative total of 84%. Consequently, students' scores between the fifth grade science pretest and simulation test advanced 47% reaching the intended educational science goal of 80%.

Student / Parental Evaluation. The students and parents also took a survey to grade the effectiveness and quality of the workshops. Seven questions were asked and graded on a scale from one to four, where one equals poor, two equals somewhat, three equals average, and four equals excellent.

The first question asked: Was the workshop worthy of your time? One-hundred percent of the students and parents selected excellent. Question number two asked: Was the workshop interesting and fun? One-hundred percent of the students and parents selected excellent. Question number three asked: Did your math scores increase between the pretest and simulation test? Sixty-two percent selected excellent, 30 % selected average, and 8 % selected somewhat. Question number four asked: Did your science scores increase between the pretest and simulation test? Seventy-six percent selected excellent, 15 % selected average, and 9 % selected somewhat. Questions number five asked: Did the instructor teach according to the SOL guides? One-hundred percent selected excellent. Question number six asked: Were the lessons clear and challenging? Ninety-two percent selected excellent, and 8 % selected average. Question number seven asked: Would you recommend this program for future use? One-hundred percent selected excellent. Question number eight asked: Did you enjoy learning about math and science while demonstrating your knowledge on a real life application? One-hundred percent of the students selected excellent. Question number nine asked: Did you enjoy working with your parent on this project? Ninety-two percent selected excellent.

In conclusion, 100% of the students and parents reported that the workshop was worthy of their time, interesting, and fun, the instructor taught according to the SOL guides, they recommended the program for future use, and they enjoyed learning math and science while demonstrating their knowledge in a real life application. The majority of students and parents reported that their math and science scores on the Stuart Flanagan Mott test increased. Ninety-two percent of the students reported that the lessons were clear and challenging and expressed joy of working with their parents. Statistics reveal that the integration of fifth grade math and science curriculum accompanied by increased parental involvement produced higher Virginia test scores.

WORKS CITED

"A Nation At Risk." <u>Virginia Department of Education.</u> Virginia Department of Education. Feb. 2006 <http://www.ed.gov/pubs/NatAtRisk/risk.html>

Blueford, J R. "History." <u>Math/Science Nucleus.</u> I.Science MaTe. 17 Nov. 2005 <http://www.msnucleus.org/membership/guide/History.html>.

Flanagan, Dr. S. S., comp. <u>Endorsements and Recommendations of Tests for Higher Standards</u>. College of William and Mary. 15 Nov. 2005 <http://www.tfhs.net/success.pdf>.

Flannery, Mary E. "Seeds of Learning." <u>NEA Today</u> Feb. 2006: 32-33.

Hulett, Laura D., Lisa L. Twitty, and Ronna C. Turner, comps. <u>Inquiry-Based Classrooms and Middle School Student Perceptions About Science and Math</u>. 15 Apr. 2004. University of Arkansas. 14 Nov. 2005 <gk12.uark.edu/programresults/AERA%202004%20science_mathLisa%20and%20LauraFINAL.pdf>.

"No Child Left Behind." <u>Virginia Department of Education</u>. Virginia Department of Education. Feb.2006 <http://www.pen.k12.va.us/VDOE/nclb/>.

"Parental Involvement Act." <u>Virginia Department of Education</u>. Virginia Department of Education. Feb. 2006 < http://www.pen.k12.va.us/VDOE/nclb/#parent>.

"School Report Card." <u>Virginia Department of Education</u>. Virginia Department of Education. Feb. 2006 <http://www.pen.k12.va.us?VDOE/src-mar06/spring_sol_grade5.xls>.

Shapiro, Debra. "National Science Board's S&E Indicators Point to Need for Science Ed Reform." <u>NSTA Reports</u> May 2006: 1+.

"Standards of Learning." <u>VDOE</u>. Virginia Department of Education. Feb. 2006 <http://www.pen.k12.va.us/VDOE/Superintendent?Sols/home.shtml>.

Weiss, Iris R., Daniel J. Heck, Barbara A. Miller, and Katherine Cress. "Handbook for Enhancing Strategic Leadership in the Math and Science Partnerships." June 2004. Horizon Research, Inc. 28 Oct. 2005 <www.horizonresearch.com>.

Math Lesson Plans and Practice Worksheets

Lesson Plan 1	**Customary Measurements (Length)**	SOL 5.11a

Objective: Students will be able to measure length to the nearest sixteenth of an inch. (This will be done in order to better understand millimeters when using metric measurements).

Introduction: <u>Activity:</u> Measure and compare lengths using nonstandard units.

- Use a paper-clip to measure the length of the classroom (record the results in number of paper-clips used).
- Use a 12 inch string to measure the length of the classroom (record results in the number of strings used).
- Use a yard stick to measure the length of the classroom (record results in the number of yard sticks used).

<u>Ask:</u>

- Which unit is shorter, a paper-clip, 12 inch string, or yardstick?
- Which unit would be more appropriate for measuring the length of your classroom? Why?
- Which unit would be the best for measuring your classroom-inches, feet, yards, or miles? Why?
- How do you choose the most appropriate standard unit or measuring tool?

Instruction:

- Give students a 12 inch standard ruler.
- Demonstrate on the overhead that each inch is made of 16 marks. Students should have prior knowledge of one-half and one inch.
- Have students count and number each mark in a one inch section of the ruler. (Students will count 16 marks)
- Discuss how one mark is 1/16 of an inch. Have students write below the marks as 1/16, 2/16, 3/16…16/16.
- Students can now write below the 4/16 as ¼ inch, 8/16 as ½ inch, 12/16 as ¾ inch, 16/16 as one inch. (It should look like fraction tiles).

- Give the students Practice Worksheet 1

Reteach: Reteach if necessary.

Practice 1   **Length**   SOL 5.11a
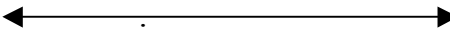
Measure length to the nearest 1/16 inch.
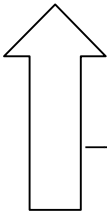
1. _____
   _____ in.

2. ----   ----
            _____ in.
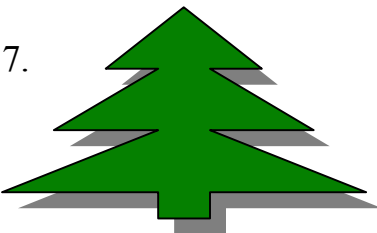
3.
   _____ in.

4.
   _____in.

Measure length to the nearest ¼ inch . (Simplify your measurement as ¼, ½, and ¾)

5.   _____ in.

6.   _____ in.

7.
   _____ in.

8.
   _____ in.

Appropriate Customary Measuring Tools (Length)

Lesson Plan 2   SOL 5.11a

Objective: Students will be able to measure length with the most appropriate
                        measuring tools.

Introduction: (Review on Overhead)
                        <u>Customary Units of Length</u>
                        12 inches (in.)   =   1 foot (ft.)
                        3 feet   =   1 yard (yd.)
                        5,280 feet   =   1 mile (mi.)
                        1,760 yards   =   1mile (mi.)

- Have students measure the length of a school hallway with a 12
  inch ruler. Record results in number of inches. Record results in
  number of feet.
- Have students measure the same hallway with a yard stick. Record
  results in number of yards.

<u>Activity</u>
If a teacher wanted to walk 3 miles inside of the school building after
school was over in order to receive exercise, how many times would
she have to walk that same hallway? (Answers will vary according to
the length of your hallway).

Instruction:

- Have students make a chart of standard lengths including inches,
  feet, yards, and miles. Under each category have them list 5 things
  that they would measure using that unit.
- Have students share responses orally and tell why they picked that
  unit of measure.

Application: Give students Practice Worksheet 2

Reteach: Reteach if necessary.

Practice 2   **Appropriate Measuring Tools**   SOL 5.11a

Choose the best unit and tool for measuring each.

1. Length of a pen.
2. Distance from Alaska to Florida.
3. Length of a school hallway.
4. Length of your desk top.
5. Distance from your school to the nearest museum.

How many inches in each?

6. 2 ft. = _____ in.   7. 1 ½ ft. = _____in.

8. 4 ft. = _____ in.   9. 1 yd.   = _____in.

How many feet in each?

10. _____ ft. = 2 yd.   11. _____ ft. = 3 yd.

12. _____ ft. = 2 mi.   13. _____ ft. = 1 ½ mi.

How many yards in each?

14. _____ yd. = 5 mi.
15. _____ yd. = 2 ½ mi.

Lesson Plan 3   **Metric Measurement (Length)**   SOL 5.11a

Objective: Students will be able to measure length to the nearest millimeter or centimeter.

Introduction: (Review) Customary Measurements for Length.
Introduce the history and need for the metric system.
Science Background: There are two systems of measurement used in the United States. The older system used in the United States is called the English Customary System. In Lessons one and two we learned that the customary system of measurements for length uses inches, feet, yards, and miles. The second system of measurements is called the International Metric System. As its name implies, this system is used throughout the world. Scientists use the metric system so that information can be easily shared. Common metric units of lengths use millimeters, centimeters, meters, and kilometers. Today we will learn how to measure length with the metric system. We will match metric and customary unit.

Instruction:

- Give students a metric ruler.
- Demonstrate on the overhead that a metric ruler has 10 marks before you reach a mark labeled #1. Explain that each mark represents a millimeter.
- Demonstrate that each numbered mark equals 10 millimeters. Ten millimeters equals 1 centimeter. Tell the students that ten centimeters equal 1decimeter and ten decimeters equal 1 meter.

Application: Give students Practice Worksheet 3

Reteach: Reteach if necessary.

Practice 3   **Metric lengths**

Directions: Measure to the nearest millimeter.

1. _____ ___mm   2. _____ ___mm

3. _____ ___mm   4. ___ ___mm

Directions: Measure to the nearest centimeter.

5. _____ ___cm   6. _____ ___cm

7. _____ ___cm   8. _____ ___cm

Directions: Convert Each.

9. 5cm = ____mm   10. 2 cm = ____mm

11. 10 mm = ____cm   12. 15 mm = ____cm

Directions: Draw a line from the metric unit to its approximate customary unit.

13. Centimeter   yard

14. Millimeter   inch

15. Meter   1/16 inch

| Lesson Plan 4 | **Perimeter** | SOL 5.8 |

Objective: Students will be able to measure the perimeter of a given polygon.

Introduction: Activity (Objective): To measure the perimeter of a shoe.
- Give students a piece of string and a ruler.
- Ask students to measure the distance around their shoe with the string. (Caution students to keep the string close to each curve of the shoe).
- Have students measure the yarn on the ruler to determine the perimeter of their shoe. (Can use either customary or metric units).
- Record the results.

Ask:
- Why did you use a string to measure your shoe instead of using the ruler? *(The perimeter was not made in straight lines)*
- Explain the definition of a polygon. (A closed figure formed by three or more line segments).
- Which unit was more precise to use?
  Millimeter or centimeter? Why?
  Centimeter or inches? Why?

Instruction:

Have students associate linear measure with perimeter. Explain that the prefix peri- means "surrounding." Hence, the perimeter of an object is the distance around the object.
- Have the students measure the perimeter of a floor tile. (Ask) Is there an easy way to find the perimeter of a square? Show students on the overhead how to use the formula to find the perimeter of a square.
  Perimeter = number of sides x side
  P = (number of sides) × length of sides
  P = 4 × 2
  P = 8
  <u>2 ft.</u>
- Have the students measure the perimeter of a doorway. (Ask) Can you use the (sides × four) formula to make the calculation easier? (No, because all sides are not equal).
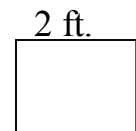
- Introduce the formula 2L + 2W. Explain how you can use this formula for a rectangle.

  L= length   W= Width   P= Perimeter

  $P = (2 \times L) + (2 \times W)$

  $P = (2 \times 12) + (2 \times 8)$

  $P = 24 + 16$

  $P = 40$

  8 cm

  12 cm
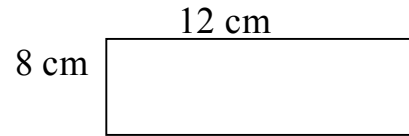
Assessment: Have students measure the perimeter of a pentagon, octagon, triangle, and polygon by completing Practice Worksheet 4.

Practice 4   **Perimeter**   SOL 5.8

Directions: Find the Perimeter of each figure with the given side lengths.

1.
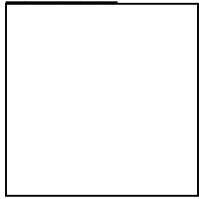
6 cm side lengths

2.
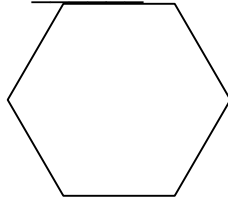
4 yd side lengths

3. _____

5 ft side lengths

4. _____
2 cm

6cm

5. _____
8m side lengths

6. _____

4 yd

10 yd

2 yd

7. 12 in

24 in

P =(2 × ___) + (2 × __)
P = _____ + _____
P = _____

8.   5cm

10 cm

P = (2 × __) + (2 × __)
P = _____ + _____
P = _____

Lesson Plan 5   **Circumference**   SOL 5.9
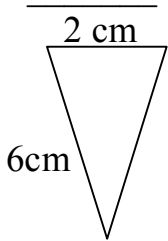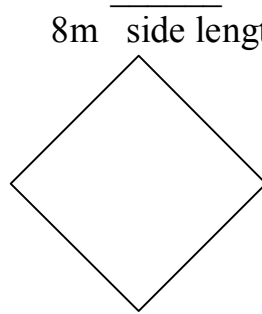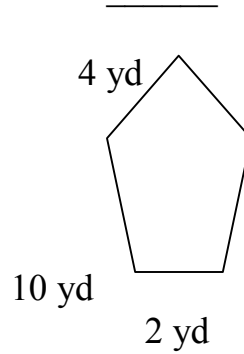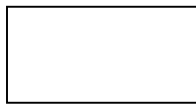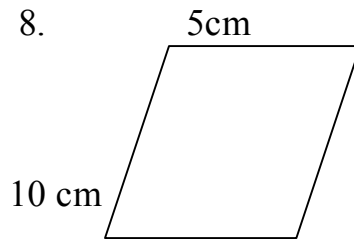
Objective: The student will be able to find the circumference, diameter, and radius of a circle.

Introduction: (Review) Perimeter of a polygon or unusual shape. The perimeter of a polygon consists of the distance of each line added together. The perimeter of an unusual shape is measured with a string and placed on a ruler to measure its length. Today we will learn about the circumference of a circle. Circumference is also known as the perimeter around a circle. However, there is an easier way to measure circumference.

Instruction:

- Give each student a paper plate, string, and ruler.
- Have each student measure the distance around the plate with the string. Then measure the string on the ruler and record the results.
- Tell students that the measurement they record is the plate's circumference. (Ask: What is your plate's circumference?)
- Have each student draw a straight line or chord through the center of the plate from one edge to the other. (Demonstrate how to do this)
- Students will measure the line or chord with their rulers and record the results.
- Tell students that the chord across the circular plate is called the plate's diameter.
- Ask: What is your plate's diameter?
- Now have the students compare the chord's length with the circumference length. Ask: What is the ratio? It should be about 1 to 3 or 1/3.
- Explain that the ratio between the diameter and circumference of a circle is about 3.14 and is called pi. The symbol used for pi is π. Pi is the approximation used throughout history. The Ancient Chinese culture used 3 for the value of pi. The value of pi was more precisely determined by a Greek scientist named Archimedes in 200 B.C. He thought the value of pi was closer to the mixed number 3 ½. After the decimal system began to be used in the 1600s, mathematicians wanted to find an exact

value for pi. This was impossible because pi was an irrational number in which the decimal went on forever without repeating or ending. Today we use 3.14 as an approximation figure for pi.

- If you know the diameter of a circle, you can find its circumference .

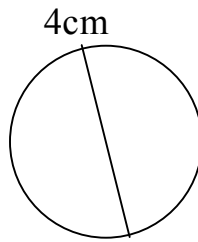   Circumference = diameter x 3.14, or $c \approx d \times 3.14$

    The circumference of this circle is:

    Diameter = 4 cm

    Circumference $\approx$ diameter x 3.14

    $\qquad\qquad\quad \approx$ 4 x 3.14

    $\qquad\qquad\quad \approx$ 12.56 circumference is approximately 12.56 cm.

4cm

- Introduce the concept radius.
- Radius is a line segment with one endpoint at the center of a circle and the other endpoint on the circle
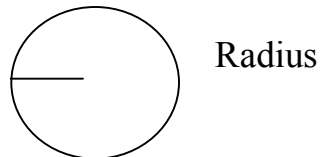
Radius

You will notice that the radius of a circle is half of the circle's diameter. Therefore, if you know the diameter you can divide it by 2 to find the radius. On the other hand, if you know the radius you can multiply it by 2 to get the diameter.

Radius x 2 = diameter

Diameter ÷ 2 = radius

- Have your students determine the radius of their plates and record the results.
- Have students complete Practice Worksheet 5.

Reteach: Reteach if necessary.

Circumference

Examples: c = π × d
             c ≈ 3.14 × 5 cm
              c ≈ 15.7 cm

| 5cm |

c = π × d
c ≈ 3.14 × 8.9
c ≈ 27.9 ft

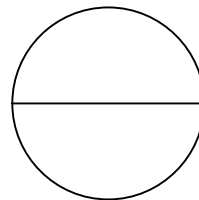| 8.9 ft |

c = π × 2г
c ≈ 3.14 × 4
c ≈ 12.6 cm
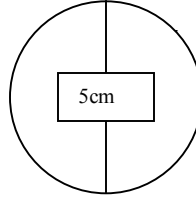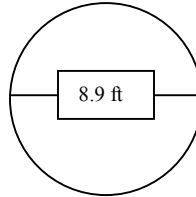
| 2cm |
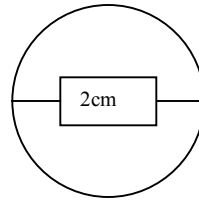
Directions: Find the circumference of each circle with the given diameter or radius.
Round to the nearest tenth.

1. d = 12cm
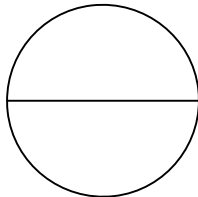
2. d = 5 cm

3. d = 10.5 cm

4. r = 6.8 cm

5. r = 7 cm

6. r = 15.6 cm

Directions: Complete the table.

c	d	c÷d	r
9.42 cm	3 cm		
5 ft		3.14	2 ft
6 ft		3.14	
	3 mi	3.14	1.5mi
	12.2 in	3.14	6.1 in

Activity   **Circumference, Diameter, Radius**   SOL 5.9

Have students find the radius of a tree's root system by using its diameter.

Tell Students: The diameter of a tree trunk in inches is about equal to the radius of the root system in feet. Therefore, a tree whose trunk has a 12 in. diameter would have a root system with a radius of 12 ft. Have students measure the root system of several local trees. Have them mark off the circumference of the tree's root system.

Objective: This activity is preformed in order to make a conscious decision about which type of trees to plant in our project. We do not want trees that will have a large root system that will burst our sidewalk.

Lesson Plan 6   **Surface Area of Squares and Rectangles**   SOL 5.8

Objective: The students will be able to find the area of squares and rectangles.

Introduction: (Activity) Suppose your family is buying a new house. The house will have four bedrooms. Your parents will have the master bedroom. The baby will have the room closest to your parents. You and your brother have to pick which rooms you want, but there is a problem. The two rooms that are left are not the same size. Of course you want the larger room but which one is the larger? Room #1 has the dimensions of 13 ft by 12 ft. Room #2 has the dimensions of 14 ft by 11ft. Your parents have a plan to help you decide which room you will choose. You will make models to find the areas of each room.

- Give students two pieces of grid paper.
- Paper #1 will be used for bedroom #1 that has the dimensions of 13 ft by 12 ft.
- Let each square on the grid equal 1 square foot.
- Have students place a point on the top left hand corner of a square. Have them count down 13 squares and make a point on the bottom left corner of that square.
- Next, begin with your top point and count over 12 squares and place one point on the right upper corner. Count down 13 squares and place a point on the bottom right corner.
- Connect your points and count the number of squares inside of your room. You will count 156 squares which will equal 156 sq. ft.
- Repeat the process for the second sheet of grid paper and room # 2 by using the dimensions 14 ft by 11 ft. (You will end up with 154 sq. ft.)
- You can now compare the shape and area of each room. Room #1 equals 156 sq. ft. while room #2 equals 154 sq. ft.
- Now you know which room is the larger but you also learned that they have different shapes. Is the shape important in your decision?

Instruction:

- Using grid paper is one method to find the area of a square or rectangle; however, there is an easier and quicker way to calculate area.

On the overhead draw a square. Label the top and bottom as 2.5 inches and the right and left sides as 2.5 in length. Explain that you can use a formula that will help you find the area of a square. Have students copy the formula in their notebook.

Area (A) = side × side
A = 2.5 × 2.5
A = 6.25 in²

2.5 in

2.5 in | | 2.5 in

2.5 in
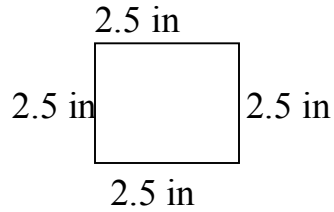
- In the same fashion demonstrate how to find the area of a rectangle. (length × width)

Area = Length × Width
A = 8 × 4
A = 32 ft²

4 ft

8 ft
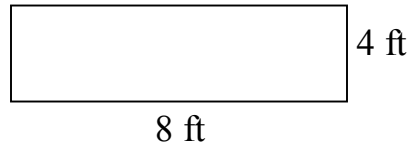
- Have students complete Practice Worksheet 6

Reteach: Reteach if necessary

Area of Squares and Rectangles

3 in
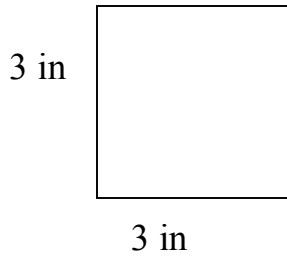
Area = side × side
A = 3 × 3
A = 9 in²

3 in

12 ft

2 ft
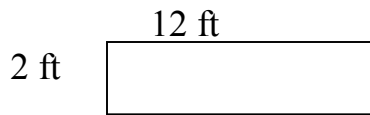
Area = Length × Width
A = 12 × 2
A = 24 ft²

You can use formulas to find the area of a square or rectangle

Directions: Find the area of each figure for problems 1-6.

7 in

1.   7 in
Area = __ × __
A   = _____ in²

9.2 ft

2.   9.2 ft
Area = __ × __
A = _____ ft ²

.5 cm

3.   .5 cm
Area = __ × __
A = _____

8.3 ft

4.   2 ft

Length __ × Width __
Area = _____

10 in

5.   3 in

(L) __ × (W) __
Area = _____

6 cm

6.   20 cm

(L) __ × (W) __
Area = _____

Directions: Find the Missing Measurements

3 m

7. L = 12 yd
   W = 3 yd
   A = _____

8. L = ____
   W = 3 in
   A = 27 in²

9. L = 9 ft
   W = ___
   A = 54 ft ²

10. L = ____
    W = ____
    A = ____

8 m

11. side = 8 ft
    Area = ___

12. s = _____
    A = 25 yd²

13. s = 4.7 cm
    A = _____

14. s = 3 in
    A = ____

Lesson Plan 7   **The Area of a Triangle**   SOL 5.8

Objective: The students will be able to measure the area of a triangle.

Introduction: Review the area of a rectangle.
                    Activity:
                    - Give each student a piece of centimeter grid paper.
                    - Have students draw a rectangle on their paper. (For instruction have them to draw the first one L = 5 cm and W = 10 cm)
                    - Next have students calculate the area of the rectangle and record the results beside of it.
                    - Then ask students to divide the rectangle into two triangles by drawing a line from the top left corner of the rectangle to the bottom right corner of the rectangle. Be sure to use a ruler for exactness.
                    - Have them write the area of the two triangles on their papers. What is the combined area of the two triangles in the 5 by 10 rectangle? (50 cm²) What is the area of 1 triangle in the 5 by 10 rectangle? (25 cm²) Hence: (50 ÷ 2 = 25)
                    - Ask: How would you find the area of a triangle?

Instruction: Today we are going to calculate the area of a triangle. We already know that a triangle is half of a rectangle.
                    - Have students look at their 5 by 10 rectangle. Ask; What is the length or base of the rectangle? (5cm). What is the width or height of the rectangle? (10 cm)
                    - Review: We already know that a triangle is half of a rectangle, and the length or base and width or height of a triangle is the same as its rectangle.
                    - On the overhead write the formula for the area of a rectangle. (Area = length × width)
                    - Write the formula for the area of a triangle. Area = ½ × base × height. What does that mean? It means that the area of a triangle is half of the rectangle × the same base × the same height of the rectangle.
                    - We can simplify by saying A = ½ × b × h
                    - Now calculate the area of half the 5 by 10 rectangle. A = ½ × 5 × 10 , A = ½ × 50, A = 25
                    - Have students practice by using Practice Worksheet 7

Reteach: Reteach if necessary

Practice 7   **Surface Area of Triangles**   SOL 5.8

Use what you know about the area of a rectangle to find the area of a triangle.
- The area of a rectangle equals Length × Width. (A = L × W)
- The area of a triangle is half the area of a rectangle with the same base and height.
  (A = ½ × bh)

Base (b) = 2 cm   Area (A) = ½ × b × h
Height (h) = 3 cm   A = ½ × 2 × 3
                                 A = ½ × 6
                                 A = 3
                                 Area is 3 cm³

Directions: Find the area of each triangle.

1. base (b)   = 5 in
   height (h) =10 in
   A = ½ × ____ × ____
   A = ½ × ____
   A = _____

2. base (b)   = 9 yd
   height (h) = 2 yd
   A = ½ × ____ × ____
   A = ½ × ____
   A = _____

3. base (b)   = 4 ft
   height (h) = 5 ft
   area = _____

4. base (b)   = 12 cm
   height (h) = 12 cm
   area = _____

5. b = 3.5 mi
   h = 2 mi
   a = _____

6. b = 21 yd
   h = 10 yd
   a = ____

7. b = 4.25
   h = 3.09
   a = ____

8. b = 1.67
   h = 4.37
   a = ____

Directions: Find the Missing Measurement:

9. b = 20
    h = __
    a = 310

10. b = 15
    h = 8
    a = ___

11. b = 4
    h = __
    a = 24

12. b = ____
    h = 5
    a = 25

13. b = 12.5
    h = 5
    a = ___

14. b = 13.6
    h = ___
    a = 47.6

15. b = 10.2
    h = ___
    a = 17.85

16. b = 43
    h = 2
    a = ___

17. b = 112
    h = 6
    a = ____

18. b = .034
    h = ____
    a = .85

19. b = ____
    h = 6
    a = 2,223

20. b = ____
    h = 67
    a = 1,072

21. b = 5.6
    h = 12.2
    a = ____

22. b = 18
    h = __
    a = 765

23. b = ____
    h = 18
    a = 3,105

24. b = 14.8
    h = 6
    a = ____

Lesson Plan 8   **Surface Area of a Circle**   SOL 5.9

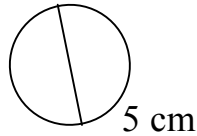Objective: The students will be able to find the area of a circle.

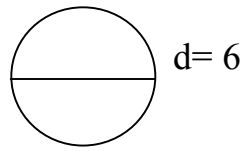Introduction: Review circumference, diameter, and radius of a circle.

C= $\pi \times$ d
C= 3.14 ×5
C= 15.7   5 cm

D= 2r
r = 3 × 2 = 6   d= 6

Instruction: On the overhead demonstrate the new formula for Area of a Circle.
A= $\pi \times r^2$
A≈ 3.14 × (5)²   r=5
A≈ 3.14 × 25
A ≈78.5 in
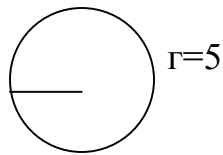
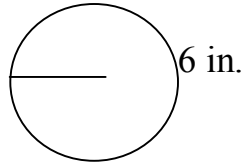   Students should understand each part of the formula from prior
                    learning. Have students plug in numbers for the radius and pi.

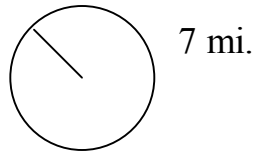Application: Give the students Practice Worksheet 8

Reteach: Reteach if necessary

Practice 8 **Surface Area of a Circle** SOL 5.9

Find the area of a circle with the given radius. Use $\pi = 3.14$.

1. $A = \pi \times r^2$
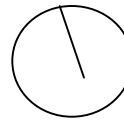 $A \approx \underline{\ \ } \times (\underline{\ \ })^2$
    $A \approx \underline{\ \ \ \ \ \ \ }$

    6 in.

2. $A = \pi \times r^2$
    $A \approx 3.14 \times (\underline{\ \ })^2$
    $A \approx \underline{\ \ \ \ \ \ \ }$

    7 mi.

3. $A = \underline{\ \ \ \ }$ 8cm

4. $A = \underline{\ \ \ \ }$ 15 in.

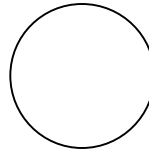Find the radius of the circle with the given area.

5. $A = \pi \times r^2$
$A \approx 3.14 \times (\underline{\ \ })^2$
$A \approx 314$ ft.^{2}

6. $A = \pi \times r^2$
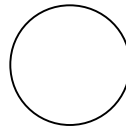$A \approx 3.14 \times (\underline{\ \ })^2$
$A \approx 50.24$ in.^{2}

7. R = $\underline{\ \ \ \ \ }$ Area = 452.16 in.^{2}

8. R = $\underline{\ \ \ \ \ }$ Area = 530.66 ft.^{2}

Lesson Plan 9   **Volume of a Rectangle and Square**   SOL 5.8

Objective: Students will be able to find the volume of a rectangle and square.

Introduction: Review how to find the surface area of a rectangle and square.
Area = Side × Side
A= 3 × 3   3 in.
A= 9 in.²

Area = Length × Width
A= 12 × 2   12 ft.

A = 24 ft.²   2 ft.

Explain that the surface area measures a 2-dimensional figure and is measured in square units.

Instruction: 1. Give students a small box.
2. Have the students measure the length and width of the box.
3. Next, explain to the students that if we want to find out how much the box will hold we need to calculate its volume.
4. Volume is a 3 dimensional figure (you measure 3 different sides or directions). Demonstrate on the overhead (length × width × height).
5. Next, calculate your box's volume by measuring its length × width × height in inches.
6. Have the student place one inch cubes inside the box until it is full with no spaces showing.
7. Take the cubes out of the box and count them. Are the number of cubes equal to the number of cubic inches you calculated with l × w × h?
8. Now that the students have a visual connection they will have no problem calculating the volume of a rectangle or square.

Application: Give students Practice Worksheet 9

Practice 9   **Volume of a Rectangle and Square**   Sol 5.8

8 in.

5 in.

4 in.
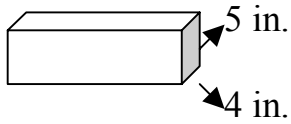
$v = l \times w \times h$
$v = (8 \times 4) \times 5$
$v = 32 \times 5 = 160$

Find the volume of each figure.

5.4 cm

1.

3.5 cm

2.2cm
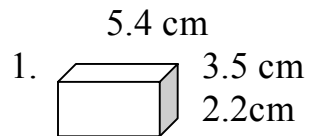
$v = l \times w \times h$
$v = 3.5 \times \underline{\hspace{1cm}} \times 5.4$
$v = \underline{\hspace{2cm}}$

3 cm

2.

10 cm $v = \underline{\hspace{2cm}}$
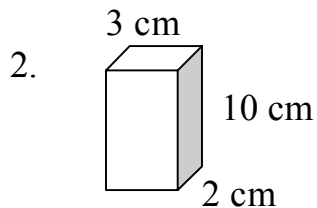
2 cm

Find the unknown dimension.

3.   L = 12 yd
      W = 3 yd
      H = 8 yd
      V = _____

4.   L = _____
      W = 4 in.
      H = 10 in.
      V = 240 in.³

5.   L = 3 cm
      W = _____
      H = 7 cm
      V = 84 cm³

6.   L = 7 m
      W = 13 m
      H = 3 m
      V = _____

VITA

KATHY D. PERKINS

Personal Data:	Date of Birth: November 30, 1961 Place of Birth: Richlands, Virginia Marital Status: Married

Education:	Public Schools: Prince William County, Virginia
	    Russell County, Virginia 1979
	A.A.S. Liberal Arts. Southwest Virginia Community College,
	    Richlands, Virginia. 1997
	A.A.S. Education. Southwest Virginia Community College,
	    Richlands, Virginia. 1997
	A.A.S. General Studies. Southwest Virginia Community College,
	    Richlands, Virginia. 1997
	B.A. Behavioral Science with concentration in Education K-8 with
	    Early Childhood Specialty. King College, Bristol,
	    Tennessee. 2000
	M.S. Mathematical Sciences. East Tennessee State University,
	    Johnson City, Tennessee. 2006

Professional Teacher:	Teacher. Greene County Schools. Greenville, Tennessee (2000- 2003) Teacher. Russell County Schools. Lebanon, Virginia (2003-)
Honors and Awards:	Phi Theta Kappa 1994- 1997 Who's Who Among Colleges 1997 -2000 Who's Who Among Teachers 2006 Phi Kappa Delta 2006