5-2007

Use of Web-Based Technology to Enhance Instruction of Virginia's Seventh and Eighth Grade Geometry Standards of Learning.

Lisa Ann Fields
East Tennessee State University

Recommended Citation

Fields, Lisa Ann, "Use of Web-Based Technology to Enhance Instruction of Virginia's Seventh and Eighth Grade Geometry Standards of Learning." (2007). *Electronic Theses and Dissertations.* Paper 2087. https://dc.etsu.edu/etd/2087

Use of Web-based Technology to Enhance Instruction of

Virginia's Seventh and Eighth Grade Geometry Standards of Learning

_____

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

Lisa Fields

May 2007

_____

Lyndell Kerley, Ph.D., Chair

Jeff Knisley, Ph.D., Committee Member

George Poole, Ph.D., Committee Member

ABSTRACT

Use of Web-based Technology to Enhance Instruction of

Virginia's Seventh and Eighth Grade Geometry Standards of Learning

by

Lisa Fields

The purpose of this thesis is to develop web-based modules for enhancing instruction of the geometry sections of the Virginia Standards of Learning in the seventh and eighth grades. While all of Virginia's seventh and eighth grade Standards of Learning strands are certainly worthy of these types of modules, geometry appeals to me most because of the vast amount of web-based resources that will be valuable when organized into modules. It is my hope that teachers of these grades will find this useful in their instruction of geometry.

DEDICATION

I would like to dedicate this thesis to my loving family for without their support I could not have achieved the dream of earning a masters degree. To my mother, Brenda, and my aunt, Vicki: Thank you for your support and for helping me with my children all those class nights. To Carrie, Seth, Nathan, and Jordan: Thank you for your understanding all those times I was no fun because I had to work on homework. I hope that you, too, will follow your dreams, and that I can be here to support you. To my friends and colleagues who encouraged me every step of the way: I appreciate you all immensely. Thank you for your support. Finally, to my wonderful husband, Lee: You make my life complete. I could not have made it this far without your love and encouragement. God truly blessed the road that led me straight to you. I love you all dearly.

CONTENTS

CHAPTER 1

INTRODUCTION

<u>Statement of the Problem</u>

Today's students are expected to become productive adults in an ever-changing world of technology. To live up to these expectations, students must be fluent in technology and the internet. One of the best ways to do this is to expose students to the technology on a daily basis. Integrating technology into the curriculum allows students the opportunity to gain traditional knowledge in a modern world.

The Virginia Department of Education has recognized that web-based technology is a vital tool in educating its students. For many years, they have sponsored the Web-based Standards of Learning Technology Initiative. The intent of the Web-based Standards of Learning Technology Initiative is to use Web-enabled systems to improve Standards of Learning instructional, remedial, and testing capabilities of high schools. Funding for this program is targeted to support three general goals in each high school. These goals are: providing student access to computers with a ratio of one computer for every five students, creating Internet-ready local area network capability in every school, and assuring adequate high speed, high bandwidth capability for high school instructional, remedial, and testing needs.

The Virginia Department of Education also recognizes the need for teacher competencies in computer technology. In the *Licensure Regulations for School Personnel,* all instructional personnel must meet technology standards by demonstrating proficiency during employment, or by completing course work in technology. Teachers must prove that they have the necessary skills to use computer technology in their instruction.

All Virginia teachers are required to be proficient in basic computer technology. However, they may not be comfortable using it to enhance their instruction, or they may find that the time it takes to incorporate web-based resources into their instruction is burdensome. For these reasons, I decided to research the available web-based resources and develop them into modules for use in the classroom.

Motivation

As a middle school special education teacher, I noticed the excitement and positive results that technology had on my students. As I began to incorporate more and more technology and web-based activities into my instruction, I realized that it would be beneficial to have an organized resource to use in the classroom. This resource needed to be organized with correlations to the Virginia Standards of Learning and to be easily used by busy teachers who may not have time to research all of the information themselves. The Virginia Standards of Learning were developed to inform teachers, students, and parents of the expectations for what should be taught and learned in each grade level.

I quickly realized, with the help of my thesis committee, that to incorporate the entire seventh and eighth grade math Standards of Learning into this thesis would be a massive task, and that perhaps I should concentrate on one particular strand. I chose the geometry strand because of the vast amount of resources available to incorporate into classroom instruction.

This thesis is organized into modules correlating to the specific Standard of Learning in order to make it simple for educators to use in their classroom instruction. It is intended to supplement textbooks and other classroom materials. The use of computer projectors and Smart

Boards will make using these modules easier in a large classroom; however, the use of a

computer lab would also suffice if those technologies are not available.

CHAPTER 2

SOL 7.9 COMPARE AND CONTRAST QUADRILATERALS

Math SOL 7.9 The student will compare and contrast the following quadrilaterals:

parallelogram, rectangle, square, rhombus, and trapezoid. Deductive reasoning and

inference will be used to classify quadrilaterals.

Review

This objective requires that students have prior knowledge of terms: right angle and

parallel.

right angle

,
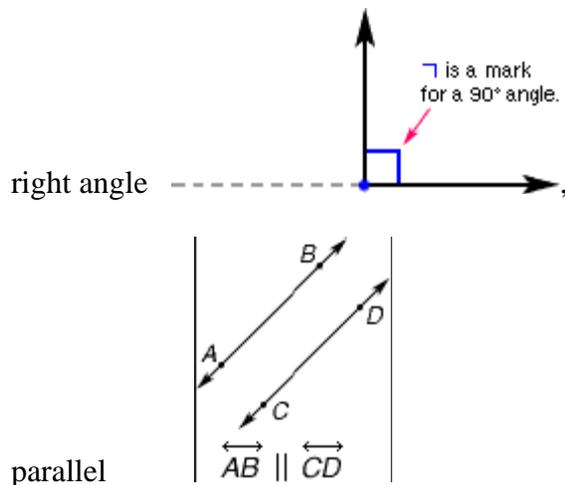
parallel

The teacher should review these terms with students. An introduction to the terms: quadrilateral,

rectangle, rhombus, square, trapezoid, parallelogram, and kite should be made. An introduction

to terms can be performed by accessing the Math is Fun website. It has many fun math activities

that give students math facts as well as incorporates fun and games. The link to the specific page

relevant to quadrilaterals is: http://www.mathsisfun.com/quadrilaterals.html. Teachers should

use this website in order to introduce the types of quadrilaterals and to introduce their images

 It is also important to point out the denotations on the figures.

After discussing this page with students, teachers should use the links at the bottom of the website to show more visuals of angles and parallel lines.

Instruction

Another website that will assist teachers in their instruction of quadrilaterals is Math.com - The World of Math Online. The link to the quadrilateral page is: http://math.com/school/subject3/lessons/S3U2L3GL.html. This resource is valuable in that it has four steps to the instruction. First Glance introduces the quadrilaterals and allows students to interact by moving their mouse on the figures for a text description to appear.

During the second step, In Depth, students are informed of how the quadrilaterals are alike and how they differ. It even uses graphic organizers that are used often in school settings such as the Venn Diagram. This satisfies the compare and contrasting portion of the Standard of Learning.

The third step of Math.com's site on quadrilaterals gives some examples for students to use to practice the deductive reasoning skills for classifying the quadrilaterals. It gives immediate feedback so the student can learn whether the answer is correct and if not, what the correct answer is and why that is so.

The final step of the site, Workout, gives an interactive true and false quiz to assess learning. The student chooses the answer, and then the site gives immediate feedback. To have that immediate feedback is very important to learning so that the student can obtain an immediate correct answer.

Discovery Education's United Streaming is a site that allows educators to access full videos, video clips, coordinating lesson plans, assignment builders, and many other tools useful for integrating technology into lessons. It is an educational digital video library. A subscription is required to use this site. However, users may sign up for a free thirty-day account. Many school districts subscribe to this service. So teachers should check with their technology department to find out if a pass code has been assigned. Independent research evaluated users of United Streaming in rural Virginia in 2002. The results showed improvements in 3rd and 8th grade science and social studies scores. To access the video segment on quadrilaterals, teachers and students should access the address: http://www.unitedstreaming.com. Next, they should type in their usernames as well as their password or pass code in the provided boxes. Then, in the search box, users can type in quadrilateral. When the search completes, users should click on Discovering Math: Concepts in Geometry. The page should then have a list of the video segments in that particular video. Depending on the intent of the teacher, students can either download the video to save it for viewing at a later time or watch the segment at that time without saving it. This short video clip integrates real-life uses of quadrilaterals in buildings to give the students an answer to the frequently heard question "How will this ever be used in real-life?"

Fun and Games

Almost all students love playing computer games. Students view gaming as something fun especially in comparison to the routine textbook and paper exercises. In order to assist learners in retaining information, it must have meaning to them. Practicing skills in a fun way adds to enjoyment and thus makes the experience more meaningful.

The Oswego School District Regents Exam Prep has a cute page that reinforces quadrilaterals. The link to this website is: http://regentsprep.org/Regents/math/quad/LQuad.htm Teachers can use this resource as a quick reinforcement of the figures. It is introduced as "the Quadrilateral Family", with each figure having human-like qualities. The figures are quoted with their characteristics. Teachers can use this resource as a quick reinforcement of the figures, perhaps at the beginning or end of a class period to lighten the environment.

Another site that has a fun quiz is: http://teams.lacoe.edu/documentation/classrooms/amy/geometry/5-6/activities/quad_quest/quad_quest.html. This site was developed by the Los Angeles Center for Distance and Online Learning TEAMS Educational Resources. The flash site quizzes students on properties of quadrilaterals and allows them to move the correct shape to match its definition.

Assessment

In order to determine how much that the student is gaining from the instruction, we must use assessments. Virginia uses online end-of-course assessments for cumulative measuring of the Standards of Learning. The high school versions of these assessments are performed via online testing in most school districts. Assessments on individual standards, however, also need to be performed in the classroom. Formal testing, informal testing, portfolios, rubrics, and curriculum based assessments are all valid ways of assessing knowledge. Informal assessment can be done using web-technology. One site that will assess knowledge of quadrilaterals is the Regents Preparation site: http://regentsprep.org/Regents/math/quad/PracQuad.htm This short quiz has twelve multiple-choice questions with immediate feedback. It would be beneficial for students to use as self-assessment.

CHAPTER 3

SOL 7.10 IDENTIFY POLYGONS

Math SOL 7.10: The student will identify and draw the following polygons: pentagon, hexagon,

heptagon, octagon, nonagon, and decagon.

Review

This objective requires a review of the terms: sides, angles, and vertex.

Sides -   Line segments of a figure   This rectangle has four sides.

Angle - The figure formed by two line segments or rays that extend from a given point.
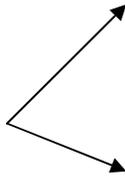
Vertices, Vertex

1) The vertex of an angle is the point where the two rays that form the angle intersect.
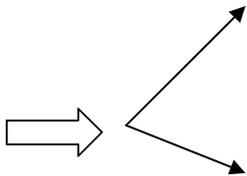
2) The vertices of a polygon are the points where its sides intersect.
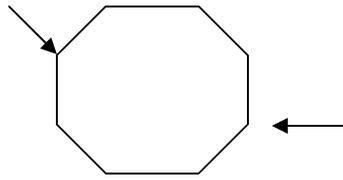
Instruction

To introduce these polygons, it would be beneficial to have eye-catching illustrations of the figures. Math League is a site that is dedicated to bringing challenging math material to students. The main focus of Math League is to sponsor math contests, books, and computer software to interest students in math concepts. Math League also has a help site for grades four through eight. This site offers definitions, examples, and explanations to many math topics for the middle grade levels. The page relevant to polygons is: http://www.mathleague.com/help/geometry/polygons.htm. This page offers colorful illustrations of the polygons as well as their definitions and angle measures. An example of one of the polygons, the pentagon is presented here:

Pentagon -

A pentagon is a five-sided polygon. The sum of the angles of a pentagon is 540 degrees.

Examples:
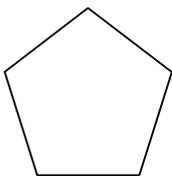
A regular pentagon: An irregular pentagon:
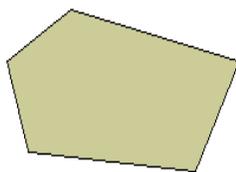
Teachers should go through these examples and definitions with the students. The students could also interact with this page when projected onto a SMART Board. Students could actually trace the shapes, or draw them beside their example. This would satisfy the drawing requirement of the Standard of Learning.

Math.com has a great web page on polygons. The link is:

http://www.math.com/school/subject3/lessons/S3U2L1GL.html#sm7.

As in the quadrilateral lesson discussed in Chapter 2, the page has four parts that are interactive. It also has a table listing the names of the polygons and the number of vertices, sides, angles and diagonals. Students can click on the name of the polygon to see the figure.

Fun and Games

Music is certainly something that most all students in this seventh grade age group tend to enjoy. Quite frequently, students will be able to recall almost all the words to a particular song but will struggle with mathematical concepts. There is a website that has determined how to combine the two things, music and learning. It is called Songs for Teaching: Using Music to Promote Learning. The song lyrics are printed on this site:

http://www.songsforteaching.com/raps/rapspolygon.htm. The songs are set to music and are contained on a CD that is available for ordering along with many other mathematical raps at this site: http://www.songsforteaching.com/store/product.php?productid=553&cat=403&page=1.

Assessment

A quick site for students to self-assess their knowledge on pentagons is:

http://www.mcwdn.org/Geometry/OtherPolygonsQuiz.html.

This site gives immediate feedback on whether or not the answer is correct. Students have the opportunity to correct their answer.

Another site that can be used both as a study-guide and for self-assessment is: http://www.sparknotes.com/math/geometry1/polygons/problems_1.html. This site is maintained by Spark Notes. It is somewhat different from the site described above. The questions are listed, but there is no place for the student to answer the question. Instead, the solution to the problem can be accessed by clicking on the solution link. The solution is given and explained so that the student can understand why the answer is correct or incorrect.

Another method of assessing knowledge of the names of polygons is to give students a copy of Table A from Math.com and have them fill in the names of the polygons. This could be done using an interactive whiteboard and have student interaction. The teacher could also eliminate some of the information such as some of the number of sides, angles, vertices, or diagonals in order to make it more difficult.

Polygons	No. of sides	No. of angles	No. of vertices	No. of diagonals
	3		3	0
	4	4	4	
	5		5	
		6	6	9
	7			14
	8	8		
		9		
			10	35

CHAPTER 4

SOL 7.11   SIMILAR FIGURES AND PROPORTIONS


Math SOL 7.11: The student will determine if geometric figures – quadrilaterals and triangles –

are similar and write proportions to express the relationships between corresponding parts of

similar figures.

Review

Before beginning instruction, the teacher should review concepts with students such as

quadrilaterals, triangles, proportions, and corresponding parts.

Quadrilaterals:
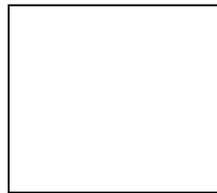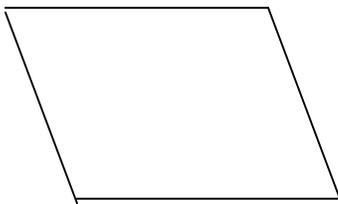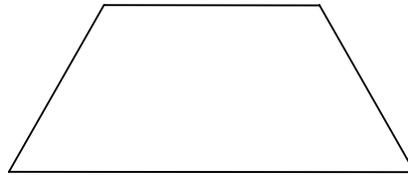
Quadrilaterals are any polygons with four sides. While quadrilaterals can have all sides unequal and all angles unequal, there are some special kinds of quadrilaterals: square, rectangle, rhombus, trapezoid, and parallelogram. A quick review of these quadrilaterals can be done at this site: http://www.kidsnewsroom.org/elmer/infocentral/geometry/Quadrilaterals.html.

Triangles: Triangles are three-sided polygons. The sum of the angles of a triangle is 180 degrees. There are six types of triangles: isosceles, scalene, obtuse, acute, right, equilateral. A quick review of the types of triangles can be performed at: http://www.mathleague.com/help/geometry/polygons.htm#equilateraltriangle. This site shows all the types of triangles and explains them to the students.

Proportions: A proportion is an equation with a ratio on each side. It is a statement that two ratios are equal.   An example of a proportion is $\frac{3}{4} = \frac{6}{8}$.

One site that will review the definition of proportions and give some fine examples is: http://www.mccc.edu/~kelld/propff.html.   This site explains proportions in general and it does use proportions to solve problems involving similarity of figures. It would best be used as a review tool for setting up proportions.

Another site that would reinforce proportions is: http://www.algebrahelp.com/lessons/proportionbasics/. Algebrahelp.com is a collection of lessons, calculators, and worksheets created to assist students and teachers of algebra.

Corresponding Parts: The angles or sides in a polygon that are in the same position as angles or sides in a congruent polygon.

<u>Instruction</u>

United Streaming has a very useful video clip that is an excellent tool for introducing similar figures. Registration is required for this site. To access this video, teachers should go to: <u>www.unitedstreaming.com</u>. Next, they should either register or use their existing username and passwords to login into the site. In the search bar, teachers should type in "ratios and proportions". The video entitled Discovering Math: Concepts in Algebra: Ratios and Proportions will load. Rather than watching the entire video which lasts approximately fifty-six minutes, teachers should simply click on the 12 video segments link. The titles of the segments will appear. Teachers should select the segment titled Similar Figures: Scaled Down. This video lasts approximately five minutes and can be paused in order to allow teacher input and student feedback.

Math for Morons like Us (Think Quest) is a great web resource for math. It has topics from Pre-Algebra to Calculus. It has message boards, formula pages, lessons, quizzes, and many more resources. One page is dedicated to similar polygons. The link is: <u>http://library.thinkquest.org/20991/geo/spoly.html</u>. It begins by introducing what similar polygons are. It expands into special similarity rules for triangles and parallel lines. It gives many examples and explains step by step how to perform the operations. This is a site that teachers could discuss with their class, or advanced students could access for self-study as well.

Regents Prep has a page that is useful for a quick review of similar triangles. It has an illustration of two cats that are similar, but different sizes, which reinforces the similarity

concept. It gives the definition of similar and shows that the symbol ~ is used to denote that things are similar. The link for this page is: http://regentsprep.org/Regents/math/similar/Lsimilar.htm. This site also gives strategies for dealing with similar triangles. The link for that page is: http://regentsprep.org/Regents/math/similar/Lstrategy.htm. On this page, there are many tips and hints for solving similarity problems.

Math.com's site is once again a great source for instruction. The link: http://www.math.com/school/subject3/lessons/S3U3L2GL.html, is a wonderful site for introducing similar figures. It has four steps to the process: First Glance, In Depth, Examples, and Workout. The students may self-study the material or participate in group instruction with the teacher commenting during the navigation of the site.

Fun and Games

An interactive site with an applet where students can move triangles so that they can actually see the similarity of the triangles is: http://www.cut-the-knot.org/Curriculum/Geometry/SimilarTriangles.shtml#explanation. It then has an explanation why triangles are or are not similar.

The National Library of Virtual Manipulatives is a National Science Foundation funded site. Its purpose is to provide online manipulatives for K-12 mathematics instruction. It uses Java applets to allow students to practice skills. One of these applets is a good way for students to practice similar triangles by manipulating sides of triangles. The link for this webpage is: http://nlvm.usu.edu/en/nav/frames_asid_165_g_3_t_3.html?open=instructions.

<u>Assessment</u>

Math for Morons like Us by Think Quest website that was cited in this chapter under Instruction also expands its site into a quick quiz for students. The link is: http://library.thinkquest.org/20991/quizzes/geo/q7/test.html. Students get immediate feedback regarding how many questions they have answered and the number of correct and incorrect answers. After the student has completed the quiz, the score is given. The student can then review the incorrect answers and are given the correct answers at that time.

The Regents Prep website has a review site where students can test their knowledge of corresponding sides of figures. The illustrations of two similar triangles represented, and then the student has to match up the corresponding sides by dragging the choices on the left to match with their corresponding sides and angles on the right. The student can check the answers at any time by clicking on the Check button. The percentages of correct answers are given, and the incorrect answers are removed so that the student may try those as many times as needed to obtain the correct answer. The link to this knowledge check site is: http://regentsprep.org/Regents/mathb/1b/matchingpartsgame.htm.

CHAPTER 5

SOL 7.12 GRAPHING ORDERED PAIRS IN A COORDINATE PLANE

Math SOL 7.12:   The student will identify and graph ordered pairs in the four quadrants of a

coordinate plane.

Review

A review of the following terms should be performed by the teacher: graph, ordered

pairs, quadrants, and coordinate plane.

Graph –Drawings or diagrams that show information.

Ordered pairs – (2,4), (-12,8) Set of two numbers in which the order has an agreed-upon

meaning, such as the Cartesian coordinates (x, y), where the first coordinate represents the

horizontal position, and the second coordinate represents the vertical position.
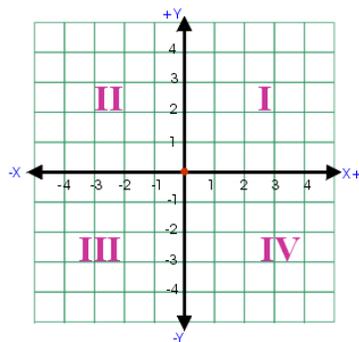
Quadrant -   The four regions of the plane bounded by the x

and y axes. Each of these quadrants has a number designation.

First quadrant (I) - contains all the points with positive x and positive y coordinates.

Second quadrant (II) - contains all the points with negative x and positive y coordinates.

Third quadrant (III) - contains all the points with negative x and negative y coordinates.

Fourth quadrant (IV) - contains all the points with positive x and negative y coordinates.

Coordinate plane -
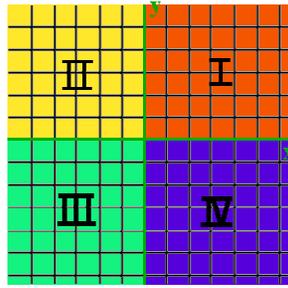
A coordinate plane has two axes and four quadrants. The two number lines form the axes. The horizontal number line is called the x-axis and the vertical number line is called the y-axis. The center of the coordinate plane is called the origin and has the coordinates of (0, 0). Locations of points on the plane can be plotted when one coordinate from each of the axes is used. This set of x and y values is called ordered pairs.

Instruction

A basic site to begin instruction of graphing in the coordinate plane is the St. Paul Lutheran School's site: http://www.stpaulgiants.com/cartesianwq.htm. This site is simple yet effective for basic instruction of this material. The teacher should introduce these topics to students using a projected image of this site that will allow teacher and student interaction.

Math.com again has a terrific lesson for this geometry standard. The link is: http://www.math.com/school/subject2/lessons/S2U4L1GL.html#. It has four steps to the lesson. First Glance introduces terms and an interactive coordinate plane tells students the terms as they move their mouse over it. In Depth begins by giving a brief history of graphing that explains how to make a coordinate plane and graph ordered pairs. Examples is the section where students

can observe examples of graphing of ordered pairs. Finally, Workout allows students to practice what they've learned by typing in the letter of the point that matches the given ordered pairs.

Purplemath has a site that introduces the graphing system in steps. It begins by giving a historical overview of the coordinate, or Cartesian plane. Next, it shows students how to plot ordered pairs. Finally, it ties it all together with a lesson on the four quadrants. This site certainly covers all aspects of this standard of learning and is a resource worthy of using with students. The page can be found at: http://www.purplemath.com/modules/plane.htm.

Fun and Games

Having fun while learning is as good as it gets. Whether it is video games, computer games, or internet games, playing any type of game is what our youngsters love to do. One game that will fool many students into thinking they are simply playing is: http://www.oswego.org/ocsd-web/games/BillyBug2/bug2.html. It is the Oswego School District game for graphing. The object of this game is to click on arrow keys to guide "Billy Bug" to the coordinates of the hidden bug. It asks how long it will take a student to feed Billy ten times. It keeps time as students graph the given ordered pairs and also keeps statistics of the best plays. This game is sure to be a hit with students.

Another interactive coordinates game can be found at: http://www.shodor.org/interactivate/activities/GeneralCoordinates/?version=1.5.0_06&browser= MSIE&vendor=Sun_Microsystems_Inc. This game presents students with a house on a coordinate plane. The student has to enter the values for x and y for the location of the house. The student checks his or her response and is immediately told if it is correct or not. A score is kept so that students can compete against one another.

EdHelper.com is a site that allows teachers to print worksheets for students to practice. Teachers must subscribe to the service to receive e-mail answers to the worksheets. Realizing that sometimes students also need the paper and pencil practice, this resource will be beneficial for those last few minutes of class, extra practice, or bonus points for students. The link to the specific page related to graphing is:

http://www.edhelper.com/math/coordinate_graphing402.htm.

Slider Math is a White Acres Media organization originally designed for home school math enhancement but has grown into a sophisticated site that can also be utilized in the classroom with projection equipment or class computer labs. It has a fun coordinate plane game at this address: http://www.slidermath.com/rpoly/Coord1.shtml. Their site is fairly simple. It shows a graph with a point and then asks students to choose the letter of the correct ordered pair for the point. It is formatted similar to a Virginia Standards of Learning test. So the familiarity will be a plus. It also gives immediate feedback to the students with information also given on the correct answers versus the number of tries. Students will find this game fun for a few minutes but may tire of the game quickly as it has little variability.

Assessment

Explore E Learning has created what it terms as gizmos. Gizmos are interactive simulations designed to "power inquiry and understanding". One such gizmo that is an excellent tool for student self-assessment is its graphing gizmo. The link to that page is: http://www.explorelearning.com/index.cfm?method=cResource.dspView&ResourceID=241. It contains an exploration guide to assist in exploring the activity. Here students plot four points anywhere they choose. Questions are automatically designed around those points and students

have four answer choices from which to choose similar in format to the SOL tests. One

drawback is that unless you subscribe to this site, you can only use it for five minutes per day.

The benefits would be worth it, though, as this is an excellent tool. Users can register for a free

thirty-day trial that allows access to all four hundred gizmos for thirty days.

CHAPTER 6

SOL 7.13 TRANSFORMATIONS, ROTATIONS, AND TRANSLATIONS

Math SOL 7.13:   The student, given a polygon in the coordinate plane, will represent

transformations – rotation and translation – by graphing the coordinates of the vertices of the

transformed polygon and sketching the resulting figure.

Review

This Standard of Learning will ideally be taught immediately after SOL 7.12. A

review of that standard can be performed by following the chapter five module of this thesis.

A review of terms such as coordinate plane, ordered pairs, quadrants, symmetry, and graph

should be performed. Students can then practice graphing points by going to

http://www.funbrain.com/cgi-bin/co.cgi. This would be a good activity for a quick warm-up

before class or to begin class.

Instruction

Teachers should introduce the terms: transformation, rotation, and translation.   Definitions

and examples are included below.

A transformation occurs when a figure is reflected across a line.
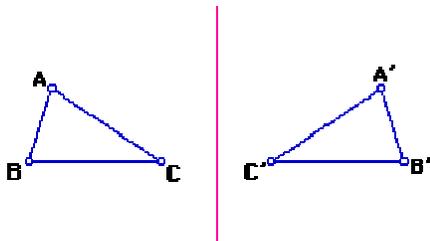
A rotation occurs when a figure is rotated about a point.
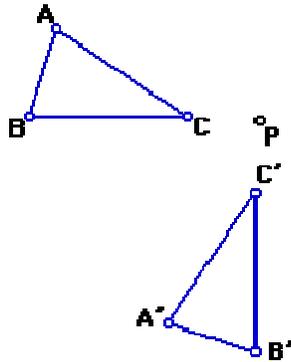
A translation occurs when a figure is slid in a straight line
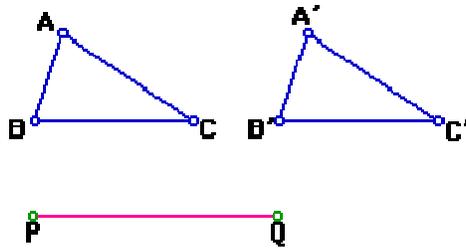
Henrico County Schools has a site devoted to this subject. To access the PowerPoint slideshow

for transformations, go to:

http://teachers.henrico.k12.va.us/math/igo/10SpecialTopics/10-5Transformations/LECTURE10-

5.ppt#256,1,Lesson 1 Transformations.   Next, teachers should allow students to

practice transformations by accessing Henrico County School's website for IGO - Investigating

Geometry Online. At the site:

http://teachers.henrico.k12.va.us/math/igo/10SpecialTopics/10_5.html, students can

click and drag items to show how movement affects the rotation of the figure.

Teachers should direct students to The National Library of Virtual Manipulatives site at:

http://nlvm.usu.edu/en/nav/frames_asid_301_g_3_t_3.html?open=activities . Here, students can

interact with translations and see the effect that moving one figure has on its translation. This NLVM site allows students to rotate images as well as to change the degree of the rotations.

Fun and Games

United Kingdom has a television corporation called British Broadcasting Corporation (BBC). BBC's goal is to inform, entertain and educate without advertisers. It also has a web site that has the same goals. One area of their web site has a Math Files game that allows students to interact with translations and rotations. The site address for that site is: http://www.bbc.co.uk/education/mathsfile/shockwave/games/bathroom.html . To view and play the game, computers must have the Shockwave 7 plug-in. Students and teachers will know that the Shockwave 7 plug-in is installed properly if an animation on the first page of the game can be viewed. If it is not installed, there is a link for a free download that can be installed, provided installing privileges are allowed on the computers used. The BBC site also has pintables and additional games that may be accessed.

Explore E Learning has a gizmo that allows students to apply translations and rotations to the figures of their choice. The students can then compare the resulting figure to the original. The gizmos on this site can be accessed for free for five minutes per day, or students can register for a free thirty-day trial, or teachers may choose to subscribe to the site to access these gizmos for various concepts. The site for transformations is: http://www.explorelearning.com/index.cfm?method=cResource.dspView&ResourceID=269 . There is a link to an explore-learning guide for the subject, which basically walks students through step-by-step.

<u>Assessment</u>

The Explore E Learning site mentioned in the Fun and Games section above is also a useful assessment tool for transformations. The link for the site is: http://www.explorelearning.com/index.cfm?method=cResource.dspView&ResourceID=269 . After students explore the gizmo and the explore-learning guide, they can answer assessment questions located at the bottom of the page. Students can then click on the button labeled "Check your answers" to see how they did on the problems. This is a great self assessment tool, or it can be used by teachers as an informal assessment of the students' understanding of the concept.

CHAPTER 7

SOL 8.8 APPLYING TRANSFORMATIONS

Math SOL 8.8: The student will apply transformations (rotate or turn, reflect or flip, translate or

slide, and dilate or scale) to geometric figures represented on graph paper. The student will

identify application of transformations, such as tiling, fabric design, art, and scaling.

Review

A review of transformations is necessary for this standard. A brief overview of SOL 7.13

can be performed by using the lessons on pages twenty-nine through thirty-one of this thesis.

Students can also access Math Forum website to review these definitions of rotations and

translations: http://www.mathforum.org/sum95/suzanne/symsusan.html.

Rotation occurs when a figure is rotated around a point.

Translation moves an object without its size or orientation being changed.

Instruction

To review and expand upon transformation terms, access Math Forum's website:

http://mathforum.org/sum95/suzanne/symsusan.html .

After reviewing rotations and translations, students should be introduced to the concepts of

reflection and dilation. To do this, one can access Cut-the-knot website, which is authored by

Alex Bogomolny and is an interactive column using java applets. The site addresses are:

http://www.cut-the-knot.org/Curriculum/Geometry/GlideReflection.shtml and

http://www.cut-the-knot.org/Curriculum/Geometry/Reflection.shtml. Each individual page

consists of a description of the concept, a java applet to practice using it, and several noteworthy

observations. The content of this site is actually geared toward high school and college students;

however these pages in particular are useful for middle school students as well.

Math is Fun has a site that also explains transformations. At:

http://www.mathsisfun.com/geometry/transformations.html, students can learn about the

concepts as well as see their illustrations. The page explains each term and illustrates each on

graph paper, as this standard suggests. From the bottom of the page, students can access

individual pages with animated illustrations of each concept to expand upon their knowledge of

the terms. Computers need to be equipped with Flash Player in order to interact with the

illustrations.

The application of transformations can be seen in quilting patterns. A site where students

can be directed to make their own quilting pattern using transformations of triangles is:

http://www.aghines.com/Quilt/interactive/grid/grid.htm. Teachers will want to give directions as

to what type of transformation should be performed and then look at each students' work to see

how they are progressing.

Fun and Games

Utah State University has links to a website, eNLVM. This site has a tremendous amount

of math lessons and applet games. One area on the site is a terrific resource for practicing

transformations:

http://enlvm.usu.edu/ma/nav/activity.jsp?sid=__shared&cid=emready@transformations&lid=43

&aid=1248059222. Here, students can play Transformation Golf, a game that requires

manipulation of the golf ball by using rotations, reflections, and translations. This is actually a

very entertaining game for which teachers may need to allow a little extra time so that the

students can enjoy it.

Assessment

The eNLVM site from Utah State University also has a great resource for assessment of

transformations.   It has an interactive site with questions covering reflections, symmetry,

rotations, and translations. The site can be accessed at:

http://enlvm.usu.edu/ma/nav/activity.jsp?sid=__shared&cid=emready@transformations&lid=1.

CHAPTER 8

SOL 8.9 CONSTRUCTING A THREE-DIMENSIONAL MODEL

SOL 8.9: The student will construct a three-dimensional model, given the top, side, and/or

bottom views.

General Resources

This Standard of Learning requires a three-dimensional view. The review, instruction,

and assessment is best done with hands-on materials. However, there are some sites that can be

used to enhance learning.

Mathinscience.info is the online educational component of the Mathematics and Science

Center, a regional consortium of K-12 school divisions in Central Virginia. It contains a wealth

of information, lesson plans, and instructional resources designed to assist teachers in

implementing the Virginia Standards of Learning. One resource that pertains to SOL 8.9 is a

PowerPoint presentation that can be found at:

http://mathinscience.info/teach/612_math/math68/cube-n-ometry/cube-n-

ometry.ppt#256,1,Cube-n-ometry.

Explore Learning has gizmos, which are visual, interactive applications that encourage

students to explore. Explore Learning boasts the largest collection of interactive applications in

math and science that are designed to develop a conceptual understanding of the concepts. There

are two such gizmos that will add to the instruction of three-dimensional views. They can be

accessed at:

http://www.explorelearning.com/index.cfm?method=cResource.dspView&ResourceID=281 and

at http://www.explorelearning.com/index.cfm?method=cResource.dspView&ResourceID=170.

On these sites, students can practice placing blocks in the correct position according to the given

top, side, and front views. There is a detailed exploration guide to assist with the concept. After

using the gizmo and placing the blocks where they belong, students may then check their

answers by clicking on the check box. After students have finished the gizmos, they can

complete a short assessment on the topic. Upon submitting their answers on the assessment,

students are provided with instant feedback of their results as well as detailed explanations of the

correct answers. If teachers are registered users, they will receive reports on the assessment

results of students in their class.   The gizmos are free for use for five minutes per day, or a

thirty-day free trial is also available. To obtain the most benefit from the gizmos, it is

recommended that teachers purchase users rights to the site by contacting E-Learning.

CHAPTER 9

SOL 8.10 PYTHAGOREAN THEOREM

SOL 8.10:   The student will

a)   verify the Pythagorean Theorem using diagrams, concrete materials, and

measurement; and

b)   apply the Pythagorean Theorem to find the missing length of a side of a

right triangle when given the lengths of the other two sides.

Review

A review of right triangles, hypotenuse, and legs is necessary.

A right triangle is a triangle that contains a right angle (90 degrees).

A hypotenuse is the side of the triangle opposite the right angle. It is also the

longest side.

The legs are the two sides adjacent to the right angle.

A site that briefly explains the right triangle and the hypotenuse can be accessed at:

http://www.geom.uiuc.edu/~demo5337/Group3/rttri.html. This site is a repository of The

Geometry Center, a mathematics research and education center at the University of Minnesota.

Instruction

Math.com has a four step resource for the Pythagorean Theorem. The first step, First

Glance, begins by explaining what a right triangle is and the history of the Pythagorean

Theorem. The second step, In Depth, expands on these concepts and shows examples of how the

Theorem works. The third step, Examples, provides additional examples for determining the

lengths of missing sides as well as determining if triangles are right triangles by using the

Pythagorean Theorem. The last step, Workout, provides students with an opportunity to answer

questions using the Pythagorean Theorem. The students can then submit answers to see how

many they answered correctly. Access this site at:

http://www.math.com/school/subject3/lessons/S3U3L4GL.html.

Oswego City School District has an excellent resource for introducing the Pythagorean

Theorem: http://regentsprep.org/Regents/math/math-topic.cfm?TopicCode=fpyth. Teachers can

project this page on the whiteboard to share with the entire class. It is very eye-catching as it has

many animated characters to emphasize important points. It also has several examples, one of

which is a real-life example of a truck's loading ramp.

Fun and Games

A site that has a wealth of applets dedicated to exploring the Pythagorean Theorem can

be found at: http://www.ies.co.jp/math/java/geo/pythagoras.html. This site has interactive

applets with many interactive illustrations of the Pythagorean Theorem. Students can interact

with the illustrations to solve problems and thus develop a better understanding of the theorem.

The site owner, IES, Inc. allows free use of this and some other applets but does require a user

license for others.

Henrico County sponsors a website called IGO, Investigating Geometry Online. One

mathematical concept taught there is the Pythagorean Theorem. A Pythagorean Theorem Puzzle

can be accessed at: http://teachers.henrico.k12.va.us/math/igo/07RightTriangles/7-

2PythagoreanThm/7_2pythaPuzzle.html. The instructions for the puzzle are listed on the left,

and students can click the show solution button to access the solution.

<u>Assessment</u>

Henrico County's IGO website has a wonderful Self-Check page for problems involving the Pythagorean Theorem. It can be accessed at: http://teachers.henrico.k12.va.us/math/igo/07RightTriangles/7-2PythagoreanThm/7-2t.htm. Students must have an ID number for access. However, this can still be a useful tool if the teacher has students answer the questions individually and then review with the entire class.

Another quiz involving right triangles and the Pythagorean Theorem can be found at: http://www.thatquiz.com/tq/practice.html?triangle. Teachers or students can make choices involving the quiz. Up to one hundred questions can be chosen, the level of difficulty can be from one to ten, and a timer can be added to the quiz. That particular quiz is a free resource for teachers, who can register for free access to assign quizzes to students and receive test results for all students on their class roll.

CHAPTER 10

ADDITIONAL RESOURCES

The Virginia Department of Education does a superb job in providing teachers with resources to enhance instruction of the Standards of Learning. A few of these resources are now listed. Although these resources are not specific to grades seven and eight geometry standards, they do encompass the mathematics standards of learning and are thus beneficial to educators.

The Virginia Department of Education has an Electronic Practice Assessment Tool, e-PAT. It simulates Web-Based Standards of Learning Assessments using released test items. E-PAT must be downloaded onto individual computers before use. Students may then take the practice assessment in a setting as if they were actually taking an authentic assessment. Scores are not recorded. However, a student tracking sheet can be used so they can self-score their test. The links for access to e-PAT is:

http://www.pearsonaccess.com/va/training-center.htm. Teachers must select the assessment(s) that they wish to download from the list.

The Virginia Department of Education also makes available released test items for download. These released tests can be printed and reviewed in order to prepare for the assessments. Released test items from the year 2000 until 2006 can be accessed at:

http://www.pen.k12.va.us/VDOE/Assessment/releasedtests.html.

The Virginia Standards of Learning Test Blueprints can be found at:

http://www.pen.k12.va.us/VDOE/Assessment/soltests/home.html. The Standards of Learning test blueprints serve as a guide to teachers, parents, and students in that they show Standards of

Learning covered by a test, reporting categories of test items, number of test items, and general

information about how the test questions are constructed.

BIBLIOGRAPHY

Addington, Susan. *The Four Types of Symmetry in the Plane*.

http://mathforum.org/sum95/suzanne/symsusan.html. (October, 2006)

Avraham Kadar, M.D. and Salort, Michael. *BrainPop.* http://www.brainpop.com

(January, 2007).

BBC. *The Math Files Games Show*. http://www.bbc.co.uk/education/mathsfile/index.shtml.

(December, 2006).

Bobomolny, Alex. *Cut the Knot: an interactive column using Java applets*. http://www.cut-the-

knot.org/index.shtml. (January, 2007).

Conrad, Steve and Flegler, Dan. *Math League.* http://www.mathleague.com/. (October, 2006).

Discovery Education. *United Streaming*. http://www.unitedstreaming.com (December,

2006).

Edhelper.com. *Coordinate graphing*.

http://www.edhelper.com/math/coordinate_graphing402.htm. (September, 2006).

Explore Learning. *Points in the Coordinate Plane*. http://www.explorelearning.com.

 (September, 2006).

Henrico County Public School Mathematics Teachers. *Mathematics Course Pages*.

http://teachers.henrico.k12.va.us/math. (February, 2007).

Hines, Anna Grossnickle. *Make a Quilt.* http://www.aghines.com/Quilt/interactive/grid/grid.htm.

(February, 2007).

IES, Inc. *Manipula Math Applet Collections*. http://www.ies.co.jp/math/products.

(February, 2007).

Kell, Debbie and Mercer County Community College. *Proportions Fast Facts.*

http://www.mccc.edu/~kelld/propff.html (October, 2006).

Kidsnewsroom.org. *Quadrilaterals.* http://www.kidsnewsroom.org. (December, 2006).

Los Angles Center for Distance and Online Learning. *Quadrilateral Quest.*

http://teams.lacoe.edu/documentation/classrooms/amy/geometry/3-

4/activities/quad_quest/quad_quest.html. (March, 2007).

Lyczak, Andrew. *That Quiz.* http://www.thatquiz.com. (March, 2007).

Math.com: World of Math Online. *Pythagorean Theorem.*

http://www.math.com/school/subject3/lessons/S3U3L4GL.html. (March, 2007).

Math.com: World of Math Online. *Quadrilaterals*.

http://math.com/school/subject3/lessons/S3U2L3GL.html (July, 2006).

Mathematics and Science Center. *Cube-n-ometry*.

http://mathinscience.info/teach/612_math/math68/cube-n-ometry/cube-n-ometry.ppt.

(March, 2007).

Mishanski, John R, Jr. *Algebra.help*. http://www.algebrahelp.com. (November, 2006).

Ohio State University. *The National Library of Virtual Manipulatives*.

http://nlvm.usu.edu/en/nav/vlibrary.html. (October, 2006).

Pearson Education, Inc. *Funbrain*. http://www.funbrain.com. (September, 2006).

Perrine, Mary. *Believers and Acheivers*. http://www.songsforteaching.com. (October, 2006).

Pierce, Rod. *Quadrilaterals - Square, Rectangle, Rhombus, Trapezoid, Parallelogram*.

http://www.mathsisfun.com/quadrilaterals.html (July, 2006).

Pierce, Rod. *Transformations*. http://www.mathsisfun.com/geometry/transformations.html.

(January, 2007).

Purplemath.com. *Introduction to the x,y-Plane.*

 http://www.purplemath.com/modules/plane.htm. (October, 2006).

Roberts, Donna. *Regents Exam Prep Center Oswego City School District*.

 http://regentsprep.org (August 2006).

Shirley, Kenny. *SparkNote on Polygons*.

 http://www.sparknotes.com/math/geometry1/polygons (October, 2006).

Shodor Education Foundation, Inc. *Curriculum Materials*. http://www.shodor.org/curriculum.

 (February, 2007).

Smullyan, Raymond. *Similar Triangles.* http://www.cut-the-knot.org. (September,

 2006).

St. Paul Lutheran School. Cartesian Coordinate Plane Graphing.

 http://www.stpaulgiants.com/cartesianwq.htm . (December, 2006).

Thinkquest.org. *Math for Morons like us*. http://library.thinkquest.org/20991/intro.html.

 (December, 2006).

University of Minnesota: The Geometry Center. *Parts of a Right Triangle*.

 http://www.geom.uiuc.edu/~demo5337/Group3/rttri.html. (February, 2007).

Virginia Department of Education. *Licensure Regulations for School Personnel*. 1998.

 http://www.pen.k12.va.us/VDOE/Compliance/TeacherED/nulicvr.pdf. (March 2007).

Virginia Department of Education. *Virginia Standards of Learning*.

 http://www.pen.k12.va.us (March, 2007).

White Acres Media. *Slider Math*. http://www.slidermath.com/rpoly/Coord1.shtml

 (October, 2006).

APPENDICES

APPENDIX A

Grade 7 Virginia Mathematics Standards of Learning

The seventh-grade standards place emphasis on solving problems involving consumer applications, using proportional reasoning, and gaining proficiency in computations with integers. The students will gain an understanding of the properties of real numbers, solve one-step linear equations and inequalities, and use data analysis techniques to make inferences, conjectures, and predictions. Two- and three-dimensional representations, graphing transformations in the coordinate plane, and probability will be extended.

While learning mathematics, students will be actively engaged, using concrete materials and appropriate technologies such as fraction calculators, computers, spreadsheets, laser discs, and videos. However, facility in the use of technology shall not be regarded as a substitute for a student's understanding of quantitative concepts and relationships or for proficiency in basic computations. Students will also identify real-life applications of the mathematical principles they are learning and apply these to science and other disciplines they are studying.

Mathematics has its own language, and the acquisition of specialized vocabulary and language patterns is crucial to a student's understanding and appreciation of the subject. Students should be encouraged to use correctly the concepts, skills, symbols, and vocabulary identified in the following set of standards.

Problem solving has been integrated throughout the six content strands. The development of problem-solving skills should be a major goal of the mathematics program at every grade level. Instruction in the process of problem solving will need to be integrated early and continuously into each student's mathematics education. Students must be helped to develop a wide range of skills and strategies for solving a variety of problem types.

Number and Number Sense

7.1   The student will compare, order, and determine equivalent relationships between fractions, decimals, and percents, including use of scientific notation for numbers greater than 10.

7.2   The student will simplify expressions that contain rational numbers (whole numbers, fractions, and decimals) and positive exponents, using order of operations, mental mathematics, and appropriate tools.

7.3   The student will identify and apply the following properties of operations with real numbers:

a) the commutative and associative properties for addition and multiplication;

b) the distributive property;

c) the additive and multiplicative identity properties;

d) the additive and multiplicative inverse properties; and

e) the multiplicative property of zero.

Computation and Estimation

7.4   The student will

a) solve practical problems using rational numbers (whole numbers, fractions, decimals) and percents; and

b) solve consumer-application problems involving tips, discounts, sales tax, and simple interest.

7.5   The student will formulate rules for and solve practical problems involving basic operations (addition, subtraction, multiplication, and division) with integers.

7.6   The student will use proportions to solve practical problems, which may include scaled drawings that contain rational numbers (whole numbers, fractions, and decimals) and percents.

Measurement

7.7   The student, given appropriate dimensions, will

a) estimate and find the area of polygons by subdividing them into rectangles and right triangles; and

b) apply perimeter and area formulas in practical situations.

7.8   The student will investigate and solve problems involving the volume and surface area of rectangular prisms and cylinders, using concrete materials and practical situations to develop formulas.

Geometry

7.9 The student will compare and contrast the following quadrilaterals: parallelogram, rectangle, square, rhombus, and trapezoid. Deductive reasoning and inference will be used to classify quadrilaterals.

7.10 The student will identify and draw the following polygons: pentagon, hexagon, heptagon, octagon, nonagon, and decagon.

7.11 The student will determine if geometric figures — quadrilaterals and triangles — are similar and write proportions to express the relationships between corresponding parts of similar figures.

7.12 The student will identify and graph ordered pairs in the four quadrants of a coordinate plane.

7.13 The student, given a polygon in the coordinate plane, will represent transformations — rotation and translation — by graphing the coordinates of the vertices of the transformed polygon and sketching the resulting figure.

Probability and Statistics

7.14 The student will investigate and describe the difference between the probability of an event found through simulation versus the theoretical probability of that same event.

7.15 The student will identify and describe the number of possible arrangements of several objects, using a tree diagram or the Fundamental (Basic) Counting Principle.

7.16 The student will create and solve problems involving the measures of central tendency (mean, median, mode) and the range of a set of data.

7.17   The student, given a problem situation, will collect, analyze, display, and interpret

data, using a variety of graphical methods, including

a) frequency distributions;

b) line plots;

c) histograms;

d) stem-and-leaf plots;

e) box-and-whisker plots; and

f) scattergrams.

7.18   The student will make inferences, conjectures, and predictions based on analysis of a

set of data.

Patterns, Functions, and Algebra

7.19   The student will represent, analyze, and generalize a variety of patterns, including

arithmetic sequences and geometric sequences, with tables, graphs, rules, and words

in order to investigate and describe functional relationships.

7.20   The student will write verbal expressions as algebraic expressions and sentences as

equations.

7.21   The student will use the following algebraic terms appropriately: *equation, inequality,*

and *expression.*

7.22   The student will

a) solve one-step linear equations and inequalities in one variable with strategies

involving inverse operations and integers, using concrete materials, pictorial

representations, and paper and pencil; and

b) solve practical problems requiring the solution of a one-step linear equation.

APPENDIX B

Grade 8 Virginia Mathematics Standards of Learning

The eighth-grade standards contain both content that reviews or extends concepts and skills learned in previous grades and new content that prepares students for more abstract concepts in algebra and geometry. Students will gain proficiency in computation with rational numbers (positive and negative fractions, positive and negative decimals, whole numbers, and integers) and use proportions to solve a variety of problems. New concepts include solving two-step equations and inequalities, graphing linear equations, visualizing three-dimensional shapes represented in two-dimensional drawings, applying transformations to geometric shapes in the coordinate plane, and using matrices to organize and interpret data. Students will verify and apply the Pythagorean Theorem and represent relations and functions using tables, graphs, and rules.

While learning mathematics, students will be actively engaged, using concrete materials and appropriate technologies such as fraction calculators, computers, spreadsheets, laser discs, and videos. However, facility in the use of technology shall not be regarded as a substitute for a student's understanding of quantitative concepts and relationships or for proficiency in basic computations. Students will also identify real-life applications of the mathematical principles they are learning that can be applied to science and other disciplines they are studying.

Mathematics has its own language, and the acquisition of specialized vocabulary and language patterns is crucial to a student's understanding and appreciation of the subject. Students should be encouraged to use correctly the concepts, skills, symbols, and vocabulary identified in the following set of standards.

Problem solving has been integrated throughout the six content strands. The development of problem-solving skills should be a major goal of the mathematics program at every grade level. Instruction in the process of problem solving will need to be integrated early and continuously into each student's mathematics education. Students must be helped to develop a wide range of skills and strategies for solving a variety of problem types.

Number and Number Sense

8.1   The student will

a)   simplify numerical expressions involving positive exponents, using rational numbers, order of operations, and properties of operations with real numbers;

b)   recognize, represent, compare, and order numbers expressed in scientific notation; and

c)   compare and order decimals, fractions, percents, and numbers written in scientific notation.

8.2   The student will describe orally and in writing the relationship between the subsets of the real number system.

Computation and Estimation

8.3   The student will solve practical problems involving rational numbers, percents, ratios, and proportions. Problems will be of varying complexities and will involve real-life data, such as finding a discount and discount prices and balancing a checkbook.

8.4   The student will apply the order of operations to evaluate algebraic expressions for given replacement values of the variables. Problems will be limited to positive exponents.

8.5   The student, given a whole number from 0 to 100, will identify it as a perfect square or find the two consecutive whole numbers between which the square root lies.

Measurement

8.6   The student will verify by measuring and describe the relationships among vertical angles, supplementary angles, and complementary angles and will measure and draw angles of less than 360°.

8.7   The student will investigate and solve practical problems involving volume and surface area of rectangular solids (prisms), cylinders, cones, and pyramids.

Geometry

8.8   The student will apply transformations (rotate or turn, reflect or flip, translate or slide, and dilate or scale) to geometric figures represented on graph paper. The student will identify applications of transformations, such as tiling, fabric design, art, and scaling.

8.9   The student will construct a three-dimensional model, given the top, side, and/or bottom views.

8.10   The student will

a)   verify the Pythagorean Theorem, using diagrams, concrete materials, and measurement; and

b)   apply the Pythagorean Theorem to find the missing length of a side of a right triangle when given the lengths of the other two sides.

Probability and Statistics

8.11   The student will analyze problem situations, including games of chance, board games, or grading scales, and make predictions, using knowledge of probability.

8.12   The student will make comparisons, predictions, and inferences, using information

        displayed in frequency distributions; box-and-whisker plots; scatter grams; line, bar,

        circle, and picture graphs; and histograms.

8.13   The student will use a matrix to organize and describe data.

Patterns, Functions, and Algebra

8.14   The student will

        a)   describe and represent relations and functions, using tables, graphs, and rules; and

        b)   relate and compare tables, graphs, and rules as different forms of representation

                for relationships.

8.15   The student will solve two-step equations and inequalities in one variable, using concrete

        materials, pictorial representations, and paper and pencil.

8.16   The student will graph a linear equation in two variables, in the coordinate plane, using a

        table of ordered pairs.

8.17   The student will create and solve problems, using proportions, formulas, and functions.

8.18   The student will use the following algebraic terms appropriately: *domain, range*,

        independent variable, and *dependent variable*.

VITA

LISA A. FIELDS

Personal Data: Date of Birth: July, 16, 1972

                        Place of Birth: Norton, Virginia

                        Martial Status: Married

Education: Haysi High School; Haysi, Virginia, GED 1989

                        B.A. Psychology/Sociology, University of Virginia's College at

                            Wise; Wise, Virginia, 1994

                        M.S. Mathematics, East Tennessee State University; Johnson

                            City, Tennessee, 2007

Professional Experience: Special Education Teacher, Dickenson County Public Schools;

                            Clintwood, Virginia, 1995 - 2006

                          Special Education Teacher, Regional Learning Academy, Wise

                            County Public Schools; Wise, Virginia, 2006-2007