GETTING TO KNOW...GEOMETER'S SKETCHPAD

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Introduction

For many years, the National Council of Teachers of Mathematics (NCTM) has recommended the use of technology in teaching mathematics (NCTM, 1989 and 2000). In an age where technology is commonplace, computers can be used in an interactive manner for teaching and learning mathematics. In particular, Geometer's Sketchpad is a dynamic program that enables the students to explore and create meaning of geometric concepts. The interactivity involves the construction of geometric shapes and the opportunity to move points to explore geometric relationships. Through these explorations, students can make conjectures based on the observations. These conjectures can lead to proofs.

For the instructor, Geometer's Sketchpad (GSP) is a flexible tool that can be used for a teacher-led discussions, peer-grouping projects or individual assignments. The results from GSP activities can be cut and pasted into word processors, spreadsheets, other drawing programs, and the Web for various modes of communication and purpose (Key Curriculum Press, 2001).

Many researchers have studied Geometer's Sketchpad and its effect in student understanding of geometry. In 1999, a study conducted by Weaver and Quinn analyzed student exploration and discovery of geometric concepts when using *Geometer's Sketchpad*. In an eighth grade study, the students work independently with GSP tasks to improve reasoning skills and learning geometric properties and relationships (Sinclair, 2002). Students liked the opportunity to be in charge of their own learning.

While most studies found that students are comfortable in the GSP environment, other studies express concern about the teacher's level of comfort (Manouchehri, Enderson, & Pugnucco, 1998). With secondary geometry teachers, Sanders found the teachers to be eager but overwhelmed (1995). Other studies found that teachers had difficulty giving up control of learning and felt uncomfortable teaching in the "what if" environment of interactive software.

Because of student excitement and gains in understanding when using GSP, teachers need to prepare to use this software through workshops and mini-courses. Teachers need these experiences to adapt the existing software and resource materials to better fit their curricular goals and textbooks.

The GSP software is an excellent teaching and learning tool that develops students' mathematical reasoning especially in geometry. Through experimentation and reflection, students narrow the gap between concrete objects and geometric relationships. Geometry-sketching software serves as a dynamic motivational tool to help students learn for understanding while decreasing math anxiety or reluctance to do mathematics.

Triangles

GENERAL TRIANGLES
1. Draw any triangle using the segment tool.
2. Label the vertices A, B, and C.
3. Find the lengths, distances, angle measures, area, and perimeter of various objects using the MEASURE feature.

RIGHT TRIANGLES
1. Construct a right triangle using the CONSTRUCT/PERPENDICULAR LINE feature.
2. Make conjectures and use the MEASURE/CALCULATE feature to prove your conjectures.

ISOSCELES TRIANGLES
1. Construct a circle using the COMPASS tool.
2. Construct 2 radii.
3. Use these 2 radii as legs of an isosceles triangle. Create the rest of the triangle.

EQUILATERAL TRIANGLES
1. Thinking about the GSP tools, how can you make an equilateral triangle?
2. HINT: Construct 2 intersecting circles with the same radius.

Quadrilaterals

PARALLELOGRAMS
1. Use CONSTRUCT/PARALLEL LINE tool to make a parallelogram.
2. Use the MEASURE/AREA feature to prove "A diagonal of a parallelogram creates 2 triangles of equal area."

RECTANGLES
1. Use CONSTRUCT/PERPENDICULAR LINE tool to make a rectangle.
2. Use the MEASURE/DISTANCE tool to prove "Diagonals of a rectangle are congruent."

SQUARES
1. Construct a circle.
2. Create 2 radii perpendicular to each other.
3. Complete the square using these 2 radii.
4. Use the MEASURE/ANGLE feature to prove "Diagonals of a square meet to form right angles."

TRAPEZOIDS
1. Construct a trapezoid using the CONSTRUCT/PARALLEL LINE feature.
2. Move the points around to see that it remains a trapezoid. Can you make a parallelogram? Can you make a Rectangle? How about a Square?

References

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Web Sites Related to Dynamic Geometry Activities

Carol A. Marinas	http://mcs-cmarinas.barry.edu/net/gsp/index.htm
Cool Math	http://www.coolmath.com
Fun Brain	http://www.funbrain.com
Fun Math Lessons	http://math.rice.edu/~lanius/Lessons/index.html
Fun School	http://www.funschool.com
Key Curriculum Press	http://www.keypress.com/sketchpad/
GSP Tutorial	http://members.aol.com/markwestbr/GSPtutorial/home.html
Lesson Plans Using GSP	http://www.math.byu.edu/~lfrancis/readings302/GSP/GSPLessonPl.html
Math Forum	http://mathforum.org/sketchpad/sketchpad.html
Tessellation Exploration	http://www.tomsnyder.com/products/product.asp?SKU=TESEXP
Triangle Circles	http://faculty.evansville.edu/ck6/tcenters/index.html
Virtual Institute	http://www.ettc.net/techfellow/sketch.htm
Virtual Manipulatives	http://matti.usu.edu/nlvm/nav/vlibrary.html