Working with Geoboards

I. Basic Geometric Concepts and Spatial Visualization

A. Out of sight, Out of mind

Make a figure on an overhead geoboard. Flash the overhead on for a few seconds. Students have to try to reproduce the figure on their geoboards.

B. Introduce terminology from a student viewpoint

Have the students build a figure on their geoboards using just one rubber band. Look around the room for examples of ***polygons*** as well as non-examples. Pick several of each and then tell students "These are polygons. These are non-polygons." Have students attempt to develop the appropriate definitions of a polygon. Use other examples around the room to test the definitions.

Using only examples of polygons, sort them into those that are ***convex*** and those that are ***concave***. Again, have students generate the meanings of these terms.

C. Building specific figures

Have students build different triangles. Have students classify the triangles according to their angle measures (right, acute, or obtuse) or according to the lengths of their sides (isosceles, equilateral, or scalene). Have students record the different figures they construct on dot paper. This is an important skill as sometimes students have some initial difficulty at placing their figure in the proper place on their dot paper.

Have students build a hexagon, a parallelogram, an obtuse triangle, etc. Emphasize the vocabulary that you know students are having trouble using. The nice thing about building the figures on the geoboard is that you have an immediate means of assessing the students' understanding.

D. Communication

Have one student build a figure out of sight of a second student using a specified number of rubber bands. Then have the student provide oral directions so that the second student builds an exact duplicate copy. Use an answering machine analogy when describing the activity to solve the issue of questions being asked and answered.

In journals, draw a sketch of a figure on dot paper. On another page, write a set of directions so that someone in your class can build your figure. Have students read written directions and then check their answers with the "student generator" of the picture.

II. Perimeter and Area Relationships

A. Finding perimeters and areas

Identify the unit of length as the horizontal or vertical distance between two consecutive pegs. Identify the unit of area as one square unit enclosed by four pegs.

Have students build a figure consisting of only right angles and find its perimeter. Find the area of the figure you created.

Have students build a figure of a specified area. Suppose you restrict the figures to those with only right angles. Find the perimeters of the figures built. Can two figures have the same area but different perimeters? How do you know?

Now have the students build a figure of a specified area but with no other restrictions. (You have to be careful about asking for perimeters. The diagonal distance from one peg to another is not an integer but is irrational.) Have students share their solutions and explain how they know that the area is the specified number.

Have students reproduce some figure you have created and find its area. Include odd aspects of figures as well as triangular regions.

B. Deriving area formulas

Have students build rectangles with the specified lengths and widths. Find the area and perimeter of the rectangles. Have the students observe the data in their tables and attempt to derive their own formulas for finding the area and perimeter of a rectangle.

Have students build a parallelogram and find its area. Move the rubber band to change the parallelogram into a related rectangle. Use this transformation to help derive the formula for the area of a parallelogram.

Build a parallelogram on the geoboard. Have the students use another rubber band to create one of the diagonals. Use this transformation to help derive the formula for the area of a triangle.

Have students build a trapezoid on the geoboard. Use another rubber band to draw in one of the diagonals. How does this transformation help you derive the formula for the area of a trapezoid?

length	**width**	**area**	**perimeter**
1	2		
2	2		
2	3		

III. Miscellaneous

A. <u>Derive the formula for the sum of the angle measures in a convex polygon</u>

Build a quadrilateral, pentagon, hexagon, octagon, etc. Construct all the diagonals from one vertex. Use this to develop a formula for finding the sum of the angle measures of the interior angles.

<u>References</u>

Charles, Linda Holden and Micaelia Randolph Brummett. ***Connections: Linking Mathematics with Manipulatives***. Sunnyvale, CA: Creative Publications, 1989.

Marilyn Burns Manipulative Videos (Geoboards)

Addenda books from NCTM (There is one book for each grade K-6, as well as books by strand: ***Patterns***, ***Making Sense of Data***, ***Number Sense and Operations***, ***Geometry and Spatial Sense***.)