Mathematics
Basic Concept

Lesson Objective:
Student will expand their knowledge of two-dimensional shapes, and learn how they can be changed into three dimensions. They will learn to build and draw models of two-dimensional and three-dimensional geometric figures.

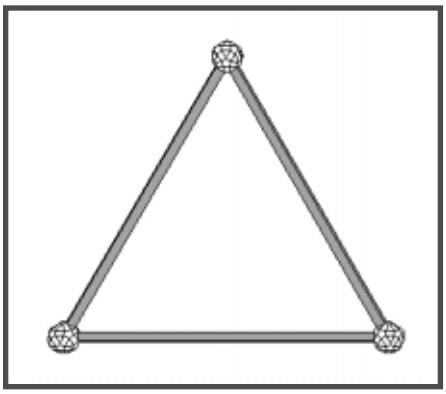
Prerequisite Skills:
Familiarity with simple polygon shapes ("Geometric Shapes").

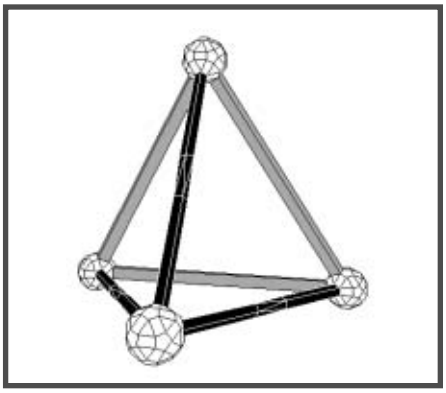
Time Needed:
One or two class periods of 45-60 minutes.

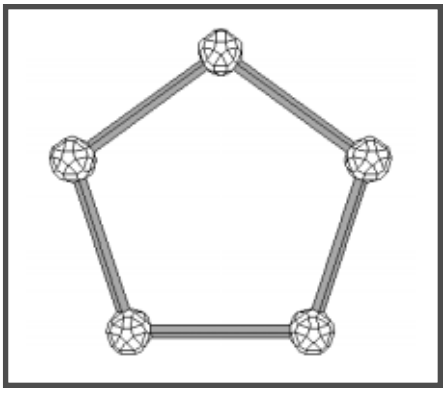
Materials Needed:
Two Zome System Creator Kits for 25 - 30 students

Procedure:
Start the class with a discussion about geometry. *Which geometrical shapes do you know the name of? How do you know that, for instance, a triangle is a triangle?*

Distribute a variety of Zome System elements to the students. Their challenge is to build two-dimensional shapes, for example triangles, rectangles, squares, pentagons, and rhombi. *How do we know that a shape is "two-dimensional"?* Discuss this concept until the class has determined that a two-dimensional shape must lie flat on the table so that all the nodes touch the table surface. Allow 10-15 minutes building time. Assess students' ability to build a two-dimensional shape and identify the properties of that shape by having students present their shape to the class. *How can some of the triangles vary so much in appearance and still be triangles? How about the rectangles, squares, pentagons, rhombi, and other shapes?* Continue the

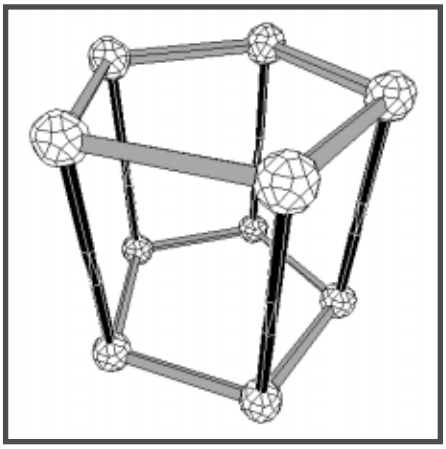






questioning until your class has agreed on definitions for the shapes they are working with. They should copy these definitions into their math journals.

Introduce any needed new vocabulary and concepts that will aid students in discussing their own constructions. New words may include; Parallel Line, Perpendicular Line, Face, Edge, Vertex and Surface Area.



Using the information learned from two-dimensional shapes, have students begin building three-dimensional shapes such as cubes, pyramids, and prisms using Zome System. The structures should be made up of combinations of the earlier identified 2-dimensional shapes. Have students compare their constructions with others from their group. Ask them to identify the faces, edges, and vertices of their structures.

Have the students draw their two-dimensional and three-dimensional shapes. Make a chart on the board or the overhead comparing the similarities and differences the students find in the two-dimensional shapes. Make another chart about the three-dimensional figures. *How and why do the shapes differ from each other? Why could certain shapes only be constructed with certain colored struts or combinations of struts?*

Finally, have students expand their knowledge of two-dimensional and three-dimensional shapes by constructing more complex three-dimensional figures. Identify the differences between the pyramids, prisms, and polyhedra. Have them identify what two-dimensional shape initially helped them to construct the shape. If possible, have students identify where they may have seen a shape like theirs. American students may, for example, identify the geometrical sphere at Epcot Center in Florida.

Assessment:

Observe students while they work. Question them while they present their structures to the class. Study student drawings.

To meet the standard students must build and name 4-5 basic polygons. To exceed the standard they must verbalize definitions for their polygons.

Standards Addressed:

* Mathematics standards addressing geometry and spatial sense (NCTM Standard 9).
* Mathematics standards addressing measurement (NCTM Standard 10).

Transfer Possibilities:

More work with polygons (“What is Perimeter?,” “What is Area?,” “Attention!...Angles,” and “Try the Triangles”). Further exploration of geometric shapes in architecture (“Tallest Tower in the World,” and Bridge Building Unit”).