

The following excerpts are from pages 751-755 of

Curriculum



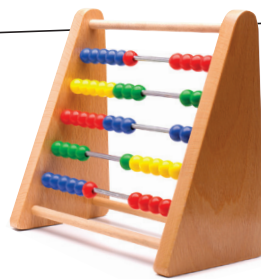
The Creative Curriculum[®] *for* Preschool



Volume 4



Mathematics



Juanita V. Copley, Candy Jones, Judith Dighe

The Teacher's Role in Promoting Understanding of Geometry

Geometry is a topic that young children naturally explore and enjoy. They build amazing constructions with blocks, create pictures with shapes, and view objects from a variety of perspectives as a result of their constant movement. The teacher's role is to encourage children to reflect on these activities, to use appropriate vocabulary to describe shapes or the orientation of objects, to scaffold children's understanding as they explore, and to encourage children who are not playing with geometry to investigate the ideas. Specific teaching strategies can be used to support young learners of geometry.

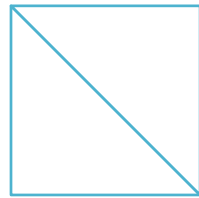
Provide opportunities for all children to use the Block area. The Block area is the perfect place for children to explore the attributes of three-dimensional shapes. For example, when children stack blocks, they naturally investigate the surface to see whether it is flat and can stack easily or whether it is curved and cannot stack. All children should have access to this important area, including children with disabilities.

Label shapes with correct names as the children use them. Use the correct names for shapes. This can be done by simply adding vocabulary to the child's descriptions or manipulations. For example, when a child says, "I got a round one," when describing a sphere, you can say, "Yes, it is round. It looks like a ball. I call it a *sphere*." When a child identifies a square correctly, you can say, "Yes, it is a square. I call it a *square-rectangle*, because it is a special kind of rectangle." Refer to the appendix of this volume for a list of common two- and three-dimensional shapes and their descriptions.

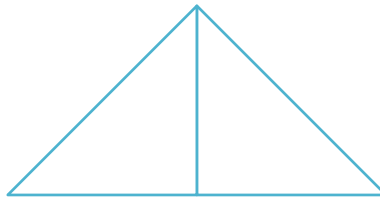
Provide a rich variety of shapes for investigation. Unit blocks are essential for teaching and learning geometric concepts. A variety of other three-dimensional shapes are important as well. Hemispheres, triangular prisms, triangular pyramids, rectangular prisms, square pyramids, and spheres provide many other contrasting experiences for children. The same is true for two-dimensional shapes. Often children are only introduced to shapes that have sides of equal lengths. To develop a real understanding of shape, children need to see *squashed* triangles, *really long* rectangles, *funny-shaped* pentagons, and other shapes with unusual configurations.

Ask children to predict and investigate what will happen when two shapes are combined. Introduce activities that require children to match sides or surfaces of two shapes. Asking children to make a tall, smooth tower out of unit blocks encourages them to predict and then investigate how to accomplish that task. Similarly, giving children a set of identical right triangles and asking them to match sides to create shapes encourages a discovery of new squares, triangles, or quadrilaterals.

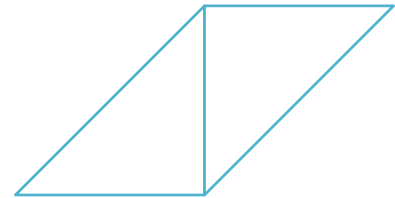
Shapes Made From Two Congruent Triangles



a square



a triangle



a quadrilateral

Model and describe how to make two- and three-dimensional shapes. Create a particular shape using clay, paper, or another flexible material and describe it as you work. For example, as you transform a clay ball unto a cylinder, you can say, “I am rolling the clay to make the sides smooth. Now I am patting it on the ends so that it will have flat circles on the top and bottom.” As you cut paper to make a triangle, you might say, “I need to cut off this corner so I have a straight side. Now I need two more straight sides to make a triangle.”

Guide children to act out stories that use positional and spatial words. Many familiar stories use positional words to describe the motions of a character or an object. *The Three Billy Goats Gruff* and *Goldilocks and the Three Bears* are just two favorites that provide opportunities for children to explore concepts such as *near, inside, outside, far, under, over, next to, between, and on top of.*

Begin with three-dimensional shapes. Children need to hold and manipulate objects before they work with paper representations of objects. The same is true as children explore geometric shapes. Building with three-dimensional shapes, rolling them down ramps, tossing them at targets, and modeling three-dimensional shapes with clay are all good beginning activities for children. Three-dimensional shapes should be used to introduce the two-dimensional shapes, for example, by making block prints in water, paint, or clay. The resulting prints can then be identified as the more common two-dimensional shapes (e.g., a cube makes six square prints, a square pyramid makes four triangle prints and one square print.)

Provide activities that ask children to visualize and represent particular shapes.

Show children photos, models, or sketches of particular shapes or combinations of shapes. Ask children to look and remember what they have seen; then hide the representation. Have children recreate the photo, model, or sketch by using their own shapes. As children develop this skill and have more frequent practice, the models and shape orientations can become more complex and more difficult to visualize and remember.

Use technology to help children visualize geometric ideas. Computer technology allows children to manipulate shapes and visualize the results quickly and frequently. Often, preschool children's less-developed fine-motor skills make it difficult for them to move particular blocks so that the others remain in place. Computer technology allows children easily to make the movements piece by piece, see errors, and then correct their actions.

Use the word *not* to introduce non-examples of specific shapes. To fully understand the attributes of particular shapes, it is critical that young children know what shapes are *not* classified as a particular shape. Create many opportunities for children to sort shapes into two groups, those that are the shape and those that are *not* the shape.

Make class maps and have children use them to find particular objects. Children love a mystery! Hide or select a particular classroom object. Give the children a map of the classroom with identifiable landmarks and specific clues about the object's location. Have the children search for the hidden object by using the map. For example, if the object is hidden *under* a box-like wastebasket, there could be a sketch of a rectangular prism with an arrow indicating *under*. With older preschoolers, try giving clues that involve relative distances, that is, clues that tell how far an object is from a landmark.

Suggest that children sketch their building plans so that they can be remembered.

Encourage children to represent their constructions in a variety of ways. They can create sketches or blueprints using black crayons on white or blue rolled paper or on newsprint. Take photos of the buildings and attach them to the representation. Do not forget to have the builders sign the representation. Then place it in the Block area for future architects and builders to use.

Encourage the discovery of shape attributes. Rather than telling children about a shape's attributes, plan experiences that allow them to experiment with shapes and discover them on their own. Ramps allow children to discover which three-dimensional shapes roll, slide, and stand; targets invite them to toss shapes; and feely bags allow children to discover the attributes through touch. Cutting and folding, collage, and printing activities are all vehicles for exploring the attributes of two-dimensional shapes. The discoveries children make on their own are much more important than anything you can tell them. You guide and extend learning when you label their discoveries by using their words and incorporating geometric terminology.

As children work puzzles, use words like turn, flip, or slide to explain how the pieces might fit. Transformational language for young children includes the words *turn*, *flip*, and *slide*. As teachers interact with children who are working puzzles, they can teach transformational words by stating how a child should manipulate a puzzle piece, by describing what the child does—turn, flip, or slide—or by helping to work a puzzle while describing their own movements. Both commercial and teacher-made puzzles can be used to help young children learn to transform shapes from one orientation to another. Teachers can also create other opportunities for children to fit shapes together by having them fill in a quilt square or a particular size piece of paper so that there is no space showing.

Have children clean up by placing shapes on a shelf or in a box so they can easily fit. Opportunities for cleanup abound in an early childhood classroom. When shelves in the Block area are labeled as described in *The Creative Curriculum for Preschool, Volume 2: Interest Areas*, children can match the blocks with their two-dimensional representations. In the Toys and Games area, containers can be labeled so that children can place all the triangles together, all the circles together, or all the squares together.

Assessing Children's Progress

To assess children's progress with geometry, observe students regularly. Observe children in interest areas and in other group settings as they

- manipulate shapes
- create structures or make pictures by using shapes
- name or label shapes during class activities and in their environments
- experiment with shape attributes
- describe the attributes of shapes
- work puzzles
- use geometric vocabulary appropriately
- work in the Block area
- move shapes to fit into a confined space

As children complete activities or work in small groups, ask the following questions about shapes:

How is this shape like this one? How is it different?

What would happen if I moved this shape here?

Why isn't this shape a _____? Why is it called a _____?

What if I turned this shape? What would it look like if I flipped it? What would happen if I slid it from your paper to mine?

Where have you seen this shape before?

Can you make a picture out of shapes?

Do you think this would roll?... slide?... stack?

How could you cut this paper to make another shape?

What shape could you make out of these two shapes?

What would happen if I dropped this block and it broke?

What would happen if I cut off an end of this shape? What would it look like?

Can you make a square? A triangle? A rectangle with pipe cleaners? How about a ball? A box? Or a cone?

Ask questions related to spatial sense:

How can I get to the cafeteria from here? To the office from our classroom?

Tell me about the city you have made in the Block area. Pretend I cannot see it. What does it look like?

Teaching Children to be Creative, Confident Thinkers.

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info@teachingstrategies.com
1.800.637.3652



www.TeachingStrategies.com

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