OBJECTIVES

After reading this unit, you should be able to:

- Explain the NCTM expectations for shape as the foundation of beginning geometry.
- Describe naturalistic, informal, and structured shape activities for young children.
- Assess and evaluate a child's knowledge of shape.
- Help children learn shape through haptic, visual, and visual-motor experiences.

During the preprimary years, children should be able to reach the first expectation for geometry (NCTM, 2000): recognize, name, build, draw, compare, and sort two- and three-dimensional shapes. This beginning knowledge of geometry can be integrated with other content areas as illustrated in Figure 12–1. Geometry for young children is more than naming shapes; it is understanding the attributes of shape and applying them to problem solving. Geometry also includes spatial sense, which is the focus of Unit 13.

Identifying shapes and describing spatial relationships is a focal point for prekindergarten. This unit examines identification of shapes, and Unit 13 examines spatial relations. The focal point for kindergarten focuses on further shape identification, including three-dimensional shapes and verbalization of shape characteristics.

Each object in the environment has its own shape. Much of the play and activity of the infant during the sensorimotor stage centers on learning about shape. The infant learns through looking and through feeling with hands and mouth. Babies learn that some shapes are easier to hold than others. They learn that things of one type of shape will roll. They learn that some things have the same shape as others. Young children see and feel shape differences long before they can describe these differences in words. In the late sensorimotor and early preoperational stages, the child spends a lot of time matching and classifying things. Shape is often used as the basis for these activities.

Children also enjoy experimenting with creating shapes. Three-dimensional shapes grow out of their exploration of malleable substances such as Play-Doh and clay. When they draw and paint, children create many kinds of two-dimensional shapes from the stage of controlled scribbles to representational drawing and painting. Their first representative drawings usually consist of circles and lines. Young children enjoy drawing blob shapes, cutting them out, and gluing them onto another piece of paper.
Figure 12-1 Integrating shape across the curriculum.

**Mathematics**
- Feel shapes, match shapes, invent shapes using a variety of materials (i.e., attribute blocks, puzzles, clay, etc.)

**Music/Movement**
- Listening to and responding to music; children move their bodies into a variety of shapes

**Science**
- Compare the shapes of the leaves from several trees
- Relate the shapes of tools to the work they do

**Art**
- Draw and cut out shapes
- Investigate inventing shapes with plastic materials (i.e., play dough, clay, slime, etc.)

**Social Studies**
- In dramatic play use objects of similar shape (such as a plastic banana for a telephone) to represent real things
- Put map puzzles together

**Language Arts**
- Read *Shapes, Shapes* by Tana Hoban
- Children describe shapes they feel and those they see
As children move into the middle of the preoperational period, they begin to learn that some shapes have specific names such as circle, triangle, square, cylinder, and sphere. Children first learn to describe the basic characteristics of each shape in their own words, such as “four straight sides” or “curved line” or “it has points.” Gradually, the conventional geometry vocabulary is introduced. Children need opportunities to freely explore both two- and three-dimensional shapes. Examples of two-dimensional shapes are illustrated in Figure 12.2, and examples of three-dimensional shapes (cylinder, sphere, triangular prism, and rectangular prism) are illustrated in Figure 12.3. Children need time to freely explore the properties of shapes. Manipulatives such as unit blocks, attribute blocks, and LEGO provide opportunities for exploration. Preschoolers are just beginning to develop definitions of shapes, which probably are not solidified until after age 6 (Hannibal, 1999). When working with shapes it is important to use a variety of models of each category of shape so children generalize and perceive that there is not just one definition. For example, triangles with three equal sides are the most common models so children frequently do not perceive right triangles, isosceles triangles, and so forth as real triangles (Figure 12.4). Many preschoolers do not see that squares are a type of rectangle. After experience with many shape examples and discussion of attributes, children begin to see beyond the obvious and can generalize to related shapes.

**ASSESSMENT**

Observational assessment can be done by noticing whether the child uses shape to organize his world. As the child plays with materials, the adult should note whether he groups things together because the shape is the same or similar. For example, a child plays with a set of plastic shape blocks. There are triangles, squares, and circles that are red, blue, green, yellow, or orange. Sometimes he groups them by color, sometimes by
shape. A child is playing with pop beads of different colors and shapes. Sometimes he makes strings of the same shape and sometimes of the same color. The child may use certain shape names in everyday conversation.

The individual interview tasks for shape will center on discrimination, labeling, matching, and sorting. Discrimination tasks assess whether the child can see that one form has a different shape from another form. Labeling tasks assess whether the child can find a shape when the name is given and whether he can name a shape when a picture is shown to him. At a higher level, he finds shapes in pictures and in his environment. Matching would require the child to find a shape like one shown to him. A sorting task would be one in which the child must separate a mixed group of shapes into groups (see Unit 10). Two sample tasks follow.

**SAMPLE ASSESSMENT TASK**

**4E**

**Preoperational Ages 3-4**

**Shape, Identification: Unit 12**

**METHOD:** Interview.

**SKILL:** When provided with shapes of varying types, size, and colors, the child will be able to label and describe them using his or her current knowledge.

**MATERIALS:** A variety of shapes, both two- and three-dimensional. Select items from small unit blocks, cube block sets, tangrams, and/or attribute blocks; you can also make cardboard cutouts or cover cylindrical containers and small boxes with contact paper. Have 15 to 20 different objects.

**PROCEDURE:** Lay out the materials in front of the child. TELL ME ABOUT THESE SHAPES. DO YOU HAVE ANY NAMES FOR ANY OF THESE SHAPES? WHAT MAKES THE SHAPE A (name of shape)? ARE ANY OF THE SHAPES THE SAME IN ANY WAY? HAVE YOU SEEN ANYTHING ELSE WITH THIS SHAPE? (Either one the child selected or one you selected.) AT SCHOOL? OUTSIDE? AT HOME? WHAT KIND OF A PICTURE CAN YOU MAKE WITH THESE SHAPES?

**EVALUATION:** Note if the child has labels for any of the shapes, if she makes any connections to familiar items in the environment, if she can make a picture with them that is logical, and, in general, if she appears to have noticed the attributes of shape in the environment. Whether or not she uses conventional labels at this point is not important.


**SAMPLE ASSESSMENT TASK**

**5E**

**Preoperational Ages 5-6**

**Shape, Geometric Shape Recognition: Unit 12**

**METHOD:** Interview.

**SKILL:** The child can identify shapes in the environment.

(continued)
**MATERIALS:** The natural environment.

**PROCEDURE:** Once a child has had experience with a variety of two- and three-dimensional shapes, the following question can be used to assess his ability to recognize and generalize. 

LOOK AROUND THE ROOM. FIND AS MANY SHAPES AS YOU CAN. CAN YOU FIND A (square, triangle, rectangle, cylinder, sphere, circle, rectangular prism)?

**EVALUATION:** Note how observant the child is. Does he note the obvious shapes such as windows, doors, and tables? Does he look beyond the obvious? How many shapes and which shapes is the child able to find?


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Children learn about shape as they sort and match pattern blocks in their naturalistic play.

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**NATURALISTIC ACTIVITIES**

Naturalistic activities are most important in the learning of shape. The child perceives the idea of shape through sight and touch. The infant needs objects to look at, to grasp, and to touch and taste. The toddler needs different things of many shapes to use as she sorts and matches. She needs many containers (bowls, boxes, coffee cans) and many objects (e.g., pop beads, table tennis balls, poker chips, empty thread spools). She needs time to fill containers with these objects of different shapes and to dump the objects out and begin again. As she holds each thing, she examines it with her eyes, hands, and mouth.

The older preoperational child enjoys a junk box filled with things such as buttons, checkers, bottle caps, pegs, small boxes, and plastic bottles that she can ex-
INFORMAL ACTIVITIES

The teacher can let the child know that he notices her use of shape ideas in activities through comments and attention. He can also supply her with ideas and objects that will fit her needs. He can suggest or give the child a box to be used for a bed or a house, some blocks or other small objects for her pretend food, or green rectangles and gray and brown circles for play money.

Labels can be used during normal activities. The child’s knowledge of shape can be used, too.

- “The forks have sharp points; the spoons are round and smooth.”
- “Put square place mats on the square tables and rectangular place mats on the rectangular tables.”
- “Today we’ll have some crackers that are shaped like triangles.”
- As a child works on a hard puzzle, the teacher takes her hand and has her feel the empty space with her index finger. “Feel this shape and look at it. Now find the puzzle piece that fits here.”
- As the children use clay or Play-Doh, the teacher remarks: “You are making lots of shapes. Kate has made a ball, which is a sphere shape; Jose, a snake, which is a cylinder shape; and Kato, a pancake, which is a circle shape.”
- During cleanup time, the teacher says: “Put the square rectangular prism blocks here and the other rectangular prism blocks over there.”

The teacher should respond when the child calls attention to shapes in the environment. The following examples show that children can generalize: they can use what they know about shape in new situations.

- “Ms. Moore, the door is shaped like a rectangle.” Ms. Moore smiles and looks over at George. “Yes, it is. How many rectangles can you find on the door?” “There are big wide rectangles on the sides and thin rectangles on the ends and the top and bottom.”
- “The plate and the hamburger look round like circles.” “They do, don’t they?” agrees Mr. Brown.
- “Where I put the purple paint, it looks like a butterfly.” Mr. Flores looks over and nods.
- “The roof is shaped like a witch’s hat.” Miss Conn smiles.
- Watching a variety show on TV, the child asks: “What are those things that are shaped like bananas?” (Some curtains over the stage are yellow and do look just like big bananas) Dad comments laughingly, “That is funny. Those curtains look like bananas.”

STRUCTURED ACTIVITIES

Structured activities are designed to help children see the attributes that are critical to each type of shape. These activities should provide more than learning the
Puzzles provide informal shape experiences.

names of a limited number of models. Models should vary. For example, not every figure should have a horizontal base. Some examples should be rotated, as in Figure 12–4. Some non-examples should be provided for comparison. Preoperational children need to learn that orientation, color, and size are irrelevant to the identification of shape. Clements and Sarama (2000, p. 487) suggest that children can be helped to learn what is relevant and what is irrelevant through the following kinds of activities:

- identifying shapes in the classroom, school, and community;
- sorting shapes and describing why they believe a shape belongs to a group;
- copying and building with shapes using a wide range of materials.

Children need both haptic and visual experiences to learn discrimination and labeling. These experiences can be described as follows.

- **Haptic activities** use the sense of touch to match and identify shapes. These activities involve experiences where the child cannot see to solve a problem but must use only his sense of touch. The items to be touched are hidden from view. The things may be put in a bag or a box or wrapped in cloth or paper. Sometimes a clue is given. The child can feel one thing and then find another that is the same shape. The child can be shown a shape and then asked to find one that is the same. Finally, the child can be given just a name (or label) as a clue.

- **Visual activities** use the sense of sight. The child may be given a visual or a verbal clue and asked to choose, from several things, the one that is the same shape. Real objects or pictures may be used.

- **Visual-motor activities** use the sense of sight and motor coordination at the same time. This type of experience includes the use of puzzles, formboards, attribute blocks, flannelboards, magnet boards, Colorforms, and paper cutouts, all of which the child can manipulate by herself. She may sort the things into sets or arrange them into a pattern or picture. Sorting was described in Unit 10; examples of making patterns or pictures are shown in Figure 12–6.

The National Library of Virtual Manipulatives (2007) includes a variety of shape activities. For example, the selection includes activities with attribute blocks, triangles, geoboards, pattern blocks, and tangrams.

![Figure 12-6: Shapes can be sorted into groups, placed into a pattern, or made into figures.](image-url)
As the child engages in haptic, visual, and visual-motor activities, the teacher can provide labels (words such as round, circle, square, triangle, rectangle, shape, corners, points, cone, cylinder, rectangular prism). The following activities are some examples of basic types of shape experiences for the young child.

**ACTIVITIES**

Shape: Feeling Box

**OBJECTIVE:** To provide children with experiences that will enable them to use their sense of touch to label and discriminate shapes.

**MATERIALS:** A medium-sized cardboard box with a hole cut in the top that is big enough for the child to put his hand in but small enough that he cannot see inside; some familiar objects such as a toy car, a small wooden block, a spoon, a small coin purse, a baby shoe, a pencil, and a rock.

**NATURALISTIC AND INFORMAL ACTIVITIES:** During daily center time, the children should have opportunities to become acquainted with the objects just listed during their play activities. During their play, the teacher should comment on the objects and supply the appropriate names: "You have used the rectangular square prism blocks to build a garage for your car."

**STRUCTURED ACTIVITIES:**

1. Show the children each of the objects. Be sure they know the name of each one. Have them pick up each object and name it.
2. Out of their sight, put the objects in the box.
3. Then do the following:
   - Have another set of identical objects. Hold them up one at a time: PUT YOUR HAND IN THE BOX. FIND ONE LIKE THIS.
   - Have yet another set of identical objects. Put each one in its own bag: FEEL WHAT IS IN HERE. FIND ONE JUST LIKE IT IN THE BIG BOX.
   - Use just a verbal clue: PUT YOUR HAND IN THE BOX. FIND THE ROCK (CAR, BLOCK).
   - PUT YOUR HAND IN THE BOX. TELL ME THE NAME OF WHAT YOU FEEL. BRING IT OUT. AND WE'LL SEE IF YOU GUessed IT.

**FOLLOW-UP:** Once the children understand the idea of the "feeling box," a "mystery box" can be introduced. In this case, familiar objects are placed in the box but the children do not know what they are. They must feel them and guess. Children can take turns. Before a child takes the object out, encourage her to describe it (smooth, rough, round, straight, bumpy; it has wheels, and so on). After the child learns about geometric shapes, the box can be filled with cardboard cutouts, attribute blocks, or three-dimensional models.

Shape: Discrimination of Geometric Shapes

**OBJECTIVE:** To see that geometric shapes may be the same or different from each other.

**MATERIALS:** Any or all of the following may be used:

- Magnet board with magnet shapes of various types, sizes, and colors
- Flannelboard with felt shapes of various types, shapes, and colors

(continued)
 Attribute blocks (blocks of various shapes, sizes, and colors)
- Cards with pictures of various geometric shapes in several sizes (they can be all outlines or solids of the same or different colors)
- Three-dimensional models

**NATURALISTIC AND INFORMAL ACTIVITIES:** During the daily center time, provide opportunities for the children to explore the materials. Observe whether they use any shape words, sort the shapes, match the shapes, make patterns, or make constructions. Ask them to describe what they have done. Comment, using shape words.

**STRUCTURED ACTIVITIES:** The activities are matching, classifying, and labeling.
- **Matching.** Put out several different shapes. Show the child one shape: FIND ALL THE SHAPES LIKE THIS ONE, TELL ME WHY THOSE BELONG TOGETHER.
- **Classifying.** Put out several different kinds of shapes: PUT ALL THE SHAPES THAT ARE THE SAME KIND TOGETHER, TELL ME HOW YOU KNOW THOSE SHAPES ARE ALL THE SAME KIND.
- **Labeling.** Put out several kinds of shapes: FIND ALL THE TRIANGLES (SQUARES, CIRCLES) OR TELL ME THE NAME OF THIS SHAPE (point to one at random).

**FOLLOW-UP:** Do individual and small group activities. Do the same basic activities with different materials.

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**Shape: Discrimination and Matching Game**

**OBJECTIVE:** To practice matching and discrimination skills (for the child who has already had experience with the various shapes).

**MATERIALS:** Cut out some shapes from cardboard. The game can be made harder by increasing the number of shapes used and/or by varying the size of the shapes and the number of colors. Make six bingo-type cards (each one should be different) as well as a spinner card that includes all the shapes used.

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**ACTIVITIES:**
1. Give each child a bingo card.
2. Have the children take turns spinning the spinner. Anyone whose card has the shape that the spinner points to can cover the shape with a paper square or put a marker on it.

**FOLLOW-UP:** Once the rules of the game are learned, the children can play it on their own.
Shape: Environmental Geometry

OBJECTIVE: To see that there are geometric shapes all around in the environment.

MATERIALS: The classroom, the school building, the playground, the home, and the neighborhood.

ACTIVITIES: 1. Look for shapes on the floor, the ceiling, doors, windows, materials, clothing, trees, flowers, vehicles, walls, fences, sidewalks, etc.
2. Make a shape table. Cover the top, and divide it into sections. Mark each section with a sample shape. Have the children bring things from home and put them on the place on the table that matches the shape of what they brought.
3. Make "Find the Shape" posters (see Figure 12-7).

IDEAS FOR CHILDREN WITH SPECIAL NEEDS

| Addressing Perceptual-Motor Challenges |

Children who are challenged by perceptual-motor tasks can learn to identify shapes by practicing their perceptual-motor skills with shape templates. Large shape templates can be used on the chalkboard or whiteboard. Students should start with a circle and then try reproducing the square, the triangle, the rectangle, and the diamond. After completing the large templates, they can work with desktop templates on paper. Once they have mastered drawing with the templates, they can move on to tracing and then to free drawing.

| Bilingual Geometry |

was taught in Spanish in order to develop higher-order thinking skills in the children's primary language. Kindergartners did five activities. The students used five templates: one square, one equilateral triangle, and four right triangles. They were given problems that required them to compare the template shapes with shapes on paper in different positions.

**Multicultural Geometry**

Zaslavsky (1996) presents a focus on comparing the shapes of homes in a variety of cultures. When asked to draw a floor plan, most children in Western culture start with a rectangle. They can then move on to study the shapes of homes in other cultures. Some Native Americans believed that the circle had great power and thus built their tepees on a circular base. The Kamba people in Africa also built on a circular base. The Yoruba of Nigeria and the Egyptians built rectangular homes. Students can learn how cultural beliefs and lifestyles influence the shapes of houses. Zaslavsky describes how art is a reflection of shape. Art is evident in items such as decorative pieces, household items, architecture, clothing, and religious artifacts. Art may have symbolic meaning, and art patterns are frequently based on geometric shapes. In Unit 13 we will see how art can reflect spatial concepts.

**EVALUATION**

Through observing during center time and during structured experiences, the teacher can see whether the child shows advances in ideas regarding shape. She observes whether the child uses the word shape and other shape words as he goes about his daily activities. When he sorts and groups materials, the teacher notices whether he sometimes uses shape as the basis for organizing. The adult gives the child informal tasks such as “Put the box on the square table.” “Fold the napkins so they are rectangle shapes.” “Find two boxes that are the same shape.” “Look carefully at the shapes of your puzzle pieces,” and “Make a design with these different shaped tiles.”

After a period of instruction, the teacher may use interview tasks such as those described in Appendix A.

**SUMMARY**

Each thing the child meets in the environment has shape. The child explores his world and learns in a naturalistic way about the shape of each object in it. Adults help by giving the child things to view, hold, and feel. Adults also teach the child words that describe shapes and the names of geometric shapes: square, circle, triangle, cylinder, triangular prism, and so on. It is through exploration of shapes and spatial relations (see Unit 13) that the foundation of geometry is laid. Concepts of shape can be applied to developing perceptual-motor integration, bilingual lessons, and comparisons of the meaning of shape across cultures.

**KEY TERMS**

- circle
- cylinder
- rectangular prism
- sphere
- square
- triangle
- triangular prism

**SUGGESTED ACTIVITIES**

1. Perform an assessment of a child’s concept of shape. Plan and do some activities with the child that will enhance her shape understanding. Report on your evaluation of the results.

2. Make or assemble some materials for a haptic activity. Have the child use the materials and give you feedback. Make any needed changes, and add the activity to your file or notebook.
3. Maria Montessori created some haptic activities. Research her method in the library and by visiting a Montessori school. Write an evaluation of her materials.

4. In a preprimary classroom, place some shape materials out where the children can explore them informally. Record what the children do and share the results with the class.

5. Using one of the guidelines suggested in Activity 3 of Unit 2, evaluate one or more of the following computer programs designed to reinforce shape concepts.
   - Little Raven and Friends. Includes application of many problem-solving skills including shape recognition. (New York: Tirola)
   - Arthur's Math Games. Children use many math skills including geometry. (San Francisco: Broderbund at Riverdeep)
   - Millie's Math House. Includes exploration of shapes. (San Francisco: Riverdeep-Edmark)
   - Geometry Bundle (Tenth Planet). This bundle includes: Spatial Relationships. Combining Shapes. Introduction to Patterns. Creating Patterns from Shapes. Mirror Symmetry. and Shapes within Shapes. (Hazelton, PA: K-12 Software)
   - Shape up! A variety of shape activities. (Hazelton, PA: K-12 Software)
   - Baby Einstein Discovering Shapes (http://www.disneysshopping.go.com), DVD

**REVIEW**

A. What follows is a description of 4-year-old Maria's activities on a school day. Identify the shape activities she experiences and decide whether each is naturalistic, informal, or structured.

Maria's mother wakes her up at 7:00 a.m. "Time to get up." Maria snuggles her teddy bear, Beady. His soft body feels very comforting. Mom comes in and gets her up and into the bathroom to wash her face and brush her teeth. "What kind of cereal do you want this morning?" Maria responds. "Those round ones, Cheerios." Maria rubs her hands over the slippery surface of the soap before she rubs it on her face.

Maria goes into the kitchen, where she eats her cereal out of a round bowl. Occasionally, she looks out the window through its square panes. After breakfast, Maria gets dressed, and then she and her mother drive to school. Along the way, Maria notices a stop sign, a railroad crossing sign, a school zone sign, buildings with many windows, and other cars and buses.

At the child development center, Maria is greeted by her teacher. She hangs her coat in her cubby and runs over to where several of her friends are building with unit blocks. Maria builds using combinations of long blocks, short blocks, rectangular blocks, square blocks, and curved blocks. She makes a rectangular enclosure and places some miniature animals in it.

Next, Maria goes to the art center. She cuts out a large and a small circle as well as four rectangles. She glues them on a larger sheet of paper. "Look," she says to her teacher, "I made a little person."

The children gather around Miss Collins for a group activity. "Today we will see what kinds of shapes we can make with our bodies." Individually and in small groups, the children form a variety of shapes with their bodies.

For snack, the children have cheese cut into cubes and elliptical crackers. Following snack, Maria goes to a table of puzzles and formboards and selects a geometric shape formboard. After successfully completing the formboard, Maria
selects the shape blocks. She sorts and stacks them according to shape. “Look, I made a stack of triangles and a stack of squares.”

B. Give an example of shape discrimination, shape labeling, shape matching, and shape sorting.

C. Decide whether each of the following is an example of discrimination, labeling, matching, or sorting.

1. The child is shown an ellipse. “Tell me the name of this kind of shape.”
2. The children are told to see how many rectangular objects they can find in the classroom.

3. The teacher passes around a bag with an unknown object inside. Each child feels the bag and makes a guess about what is inside.

4. The teacher holds up a cylinder block and tells the children to find something that is the same shape.

5. A child is fitting shapes into a shape matrix board.

6. A small group of children is playing shape lotto.

REFERENCES


FURTHER READING AND RESOURCES


