One need not look far to discover a plethora of geometric shapes in the context of the world around us. Teachers have the opportunity to capitalize on a vast array of real-world, two- and three-dimensional objects as they guide students in developing a conceptual understanding of geometric shapes, including where we find them and how they are used to create other shapes. An important component of the NCTM Standards is to use teaching methodologies that engage children in making real-world connections to the mathematics concepts they are learning. This component of realizing the Standards became the foundation for the authentic geometry unit that first and second graders from Grace B. Luhrs Elementary School experienced, in which they became active participants in discovering geometric shapes.
that are part of their real-world surroundings. As stated by Clements, “Ideas about shapes do not come from passive looking. Instead, they come as children’s bodies, hands, eyes . . . and minds . . . engage in action” (1999, p. 67).

**Getting started**

The geometry unit was initiated in March with a review of two- and three-dimensional objects that the children had already been using, including squares, triangles, circles, rectangles, rhombi, cubes, spheres, cylinders, rectangular prisms, cones, and pyramids. Students connected their knowledge of these shapes to objects in the classroom and items that teachers were using to create some future projects. To extend and enrich these discoveries, the teachers introduced two children’s books by Tana Hoban: *Shapes*, *Shapes, Shapes* (1996) and *Cubes, Cones, Cylinders, and Spheres* (2000). The illustrations in the books supplied realistic transitions from classroom learning to visual geometry in the real world.

**Beyond the storybooks**

Once the children started connecting items in their classrooms to geometric shapes, their knowledge of real-world shapes extended to the playground. The children’s awareness of the attributes of shapes seemed to become keener as the project progressed. They began noticing designs on their clothing and on their footwear, labeling them as they discovered them. At one point, Sam said, “Look, Heidi’s dress has hexagons like my soccer ball.”

Priscilla chimed in, “My skirt has squares, lots of them!”

In addition, students identified circles, squares, and rectangles on buttons and game
pieces, as well as in the transforming shapes of clouds floating across the sky.

**Integrating the curriculum**

Each Friday afternoon at the school, the children engaged in what was referred to as creative activities during which time students were encouraged to work on projects of their own choosing. While the first and second graders studied this geometry unit, the first-grade class was also involved in a science unit in which students were planning, drawing graphic representations, and creating miniature house structures from discarded household items such as empty boxes, empty paper towel and bathroom tissue rolls, and other recyclables. Some of the children used their creativity time to continue working on their science structures. They began referring to the various items they were using in their construction projects with specific geometric terms, such as cones, cylinders, pyramids, rectangular prisms, and cubes.

One Friday afternoon, Lauren wanted to construct a doll. She was focused and on task while she drew her plan, which was a simple sketch that eventually transformed into a doll that had form and dimension. Digging through the “invention box,” she found her essential pieces, including a sphere for the head, a rectangular prism for the body, and cylinders for the arms and legs.

**The shape walk**

On a gorgeous day in April, forty first and second graders formed two mixed-age groups and went for a walk around different parts of the local university campus, each group accompanied by one of the teachers. Before leaving, the children were given brief but specific instructions from their teachers: Look out into the world and see how many geometric shapes you can see and identify.

Armed with clipboards, paper, and pencils, the students were off. Before taking the walk, the teachers had suspected that the children would see such things as traffic signs, windows, sidewalks, and flowerpots—and they did. Students pointed out the obvious, predictable two- and three-dimensional objects; however, the teachers were surprised and enlightened to see the extent to which the children made their discoveries. The common objects were only the surface. The children engaged in investigating geometry in a way that their teachers had never seen before, noticing geometry in abstract objects. They pointed out the moon sphere in the sky and rhombi shapes that hooked together to create a fence. They noticed how a series of triangles in the ceiling of a gazebo combined to form larger triangles and a large hexagon. “Look, a triangle!” said Jonah.

“See, it makes a rhombus when two triangles come together,” said Sam B. The boys discovered a circle embedded in a frosted, rectangular window. Upon closer inspection, they saw triangles on a miniature sailboat behind the circle.

At one point during the geometry walk, one group was asked to sit and draw any shapes they saw in the surrounding environment. The children chose various objects and structures to draw. Heidi was able to envision triangular shapes in a tree. She was also able to look at that tree and reconstruct it using geometrical shapes. The openness of the activity lent itself well to visual, kinesthetic, and tactile learning styles.
Some children chatted with friends, excitedly pointing out designs they had spotted, while others diligently scanned their surroundings, deep in concentration.

As students looked for specific geometric shapes, it quickly became evident that they were exploring high and low, near and far. They began finding items their teachers were unaware of or had not noticed. At one point, a group of children asked one of the teachers to take a picture of the triangle they found. As she approached the spot where the children were pointing, she was warned not to step on the triangle. Still unable to see what the children were referring to, she had to be shown the triangular shadow cast on the ground between two walls.

As students examined various objects, their teachers heard descriptions that spanned a continuum from the simple to the complex. For example, one student observed as he examined a leaf, “See, this has three sides, and the tippy-top is pointy, so it is a triangle leaf.” Another child made a more complex statement: “The rocket has a cylinder body and a cone nose to make it fly better.” The attributes of the shapes became important, necessary criteria for the students to classify the items they found.

Walking the perimeters
As the campus walk continued, the children essentially led the way. When they came upon a square of cement in the middle of a grassy area, a small group of them stopped to walk the perimeter of the square, making sudden, distinct turns at each corner as their entire bodies changed direction. Other children continued to explore on their own. Coming upon a large, circular manhole cover, a group again walked the perimeter, not really talking to one another. The children balanced themselves, arms out, one foot in front of the other, while moving around the manhole cover. The opportunity to experience these shape attributes in this way is impossible on an activity sheet or on the image cast by an overhead projector. Distinct attributes of the shapes are now imprinted in these children’s memories as a result of this added sensory experience. To most efficiently remember something, connecting it to sensory, emotional, or physical episodes works best (Hannaford 2005).

For the culminating activity in the geometry unit, students were asked to sit and use geometric templates to draw one of the buildings on the university campus (see fig. 1). The teachers were amazed watching the children take three-dimensional objects and reverse them into two-dimensional geometric sketches. Students demonstrated creativity in constructing their drawings of the buildings, and
many represented an understanding of scale and perspective, patterning, measurement, proportion, and symmetry.

In conclusion
Engaging children in this geometry unit resulted in many lasting benefits. Students were able to use what they found in their surroundings to compare and contrast two-dimensional shapes with shapes that have depth. The culminating Shape Walk activity opened up a whole new perspective for the children. They continued to delight in finding new shapes everywhere they looked. Many orientation words, such as over, under, above, and below, were used during and after the unit, and the unit experiences resulted in a new, shared level of understanding of geometric terminology among the children. Their conversations and comments took on a new level of comprehension. They began incorporating mathematical language and geometric terms into their everyday conversations: pointy like a cone, roll-y but not a sphere, more like a cylinder. Their problem-solving vocabulary was clearly tied to these experiences: That piece won’t work; it has to be a rectangle. See, ’cause this side is too short.

Students quickly classified their snacks or nibbled them into particular shapes, such as trapezoids and rhombi. They formed play dough into cubes, pyramids, and rectangular prisms; and they created projects that required items of particular sizes and geometric attributes.

The children began to see the world in a way that produced amazing results. The experiences yielded so much more depth than typical, workbook-style instruction could ever offer. We will never return to teaching geometry in traditional ways again, using only activity sheets and in-class, whole-group, direct instruction with a standardized curriculum. As teachers of reflective practice, we will always teach geometry in this hands-on way. We have since added art, music, and movement to further provide for all types of learners. We encourage other teachers to capitalize on the opportunities that are right outside their classroom doors. The children internalized the information because they experienced it and lived it.

Having such fun was not an objective the teachers had considered before they began the geometry unit that concluded with the Shape Walk activity. Observing the children engaging in such a detailed process, yet really having fun, was enjoyable. As teachers of the first and second graders who participated in the real-world geometry unit, we experientially learned that “what a child ‘knows’ in geometry is not just a list of mastered terms but a way of thinking in geometric contexts” (Van de Walle 2001, p. 349).

REFERENCES

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