

Tools for Physical Science Inquiry

By Cynthia Hoisington and Jeff Winokur

Physical science is a natural fit for active, curious young children. Early childhood settings generally include spaces and materials that invite children to explore phenomena connected to the big ideas in this discipline—properties of matter, motion, forces, and energy. As children build castles and homes in a block area, they have opportunities to observe how the properties of building materials influence their structures' strength and stability. At a water table, children can't help but notice how water responds as they splash and squirt it and how tipping a seemingly empty container under the water sometimes creates air bubbles that rise to the surface. Blocks, water tables, and other standard classroom materials lend

themselves to physical science exploration, and play with these materials allows children to observe immediately the results of their actions. Children can repeatedly investigate interesting physical science phenomena in a relatively short period of time by testing several different types of building materials in the foundation of a tower or by changing the steepness of an incline and observing how cars move on it differently, for example.

Despite the potential for physical science learning in early childhood settings, many teachers of young children seem to be less confident about this domain than they are about life science. By focusing on specific topics and materials that maximize children's opportunities to explore them, we hope to

help teachers become more confident and intentional about promoting physical science teaching and learning in their settings, all the while addressing a number of the science and engineering practices, crosscutting concepts, and disciplinary core ideas of the *Next Generation Science Standards* (NGSS Lead States 2013).

Exploring Building

A standard set of wooden blocks offers children many opportunities to experiment with different shapes, sizes, and weights and explore how these properties contribute to the strength and stability of the structures they build. Try adding building materials other than wood to the building center—foam and cardboard “blocks” of various densities, for example. These enable children to investigate different materials as well as other properties. Also think about providing children with building sets in which all of the pieces are identical, such as Kapla blocks and Dr. Drew's blocks (see Internet Resources). When children use these blocks, they are encouraged to focus on the design of their structures and the properties of the materials. They also encounter Structure and Function and Stability and Change, two of the crosscutting concepts of the NGSS.

Science learning in the early years has gained renewed importance in recent years, and NSTA has responded with an Early Childhood Science Position Statement. This column is designed to provide practitioners with guidance in selecting resources to inform their classroom teaching. We seek resources and materials that present relevant and appropriate science content and describe inquiry-based approaches to engage young children (ages 3 to 5) in the practices of science and engineering, as described in the NSTA position statement and the *Next Generation Science Standards*. We hope you find this column supports your work with children and/or teachers.

Please share your suggestions for resources or comments about the column with the column editor Rosemary Geiken at geiken@etsu.edu.

Exploring Ramps

Ramp explorations connect children to concepts of motion, inertia, and momentum as they investigate how objects roll, slide, or remain still on different surfaces and inclines, all of which address NGSS physical science disciplinary core ideas related to Forces and Interactions (K-PS2-1 and K-PS2-2). Consider a trip to a home-goods store to look for pine cove molding (see Internet Resources). Molding can be cut into two-, three-, and four-foot lengths and used for rolling toy vehicles and balls. Foam pipe insulation, also available at home-goods stores, can be cut lengthwise and provides an alternative, flexible surface for motion investigations. A variety of balls of different materials, sizes, weights, and textures, such as Ping-Pong balls, golf balls, tennis balls, and Wiffle balls, promotes children's inquiry into how the properties of objects influence movement. Visit the University of Northern Iowa's website to learn more about using ramps and pathways in your classroom (see Internet Resources).

Exploring Water

Water tables are frequently used in early childhood settings for dramatic play (washing baby dolls) or as a sensory area for calming active children. Take advantage of its physical science potential by removing other materials and adding a variety of clear plastic containers, clear plastic tubing of various sizes, funnels, basters, and clear squeeze and spray bottles. These materials promote children's investigations of how water moves and flows as they act on it; by creat-

ing water "systems," children experience how a change in one part of the system affects what goes on elsewhere (NGSS crosscutting concept Systems and System Models). Tubing can be found in the plumbing department of hardware and home-goods stores, and the other materials can be found in the kitchen section of any large department store. To promote children's close observations of water drops, consider providing wax paper, plastic plates, and plastic eye droppers (see Internet Resources).

Exploring Light and Shadow

Opportunities to investigate how light passes through some materials, is reflected by others, and can create shadows when blocked lay the foundation for children's later understanding of waves and energy and address NGSS performance expectation 1-PS4-3. Shadows can, of course, be explored outdoors, with the Sun as the light source and children's bodies as the shadow-making objects. Indoors, provide children with flashlights and a range of materials, including those that reflect light (aluminum foil, mirrors), those that allow light to pass through (clear plastic cups), and those with interesting shapes for indoor shadow-making (see Internet Resources). Consider adding theater lighting gels of various colors to the flashlights so that children can play with different light colors (see Internet Resources). ■

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Reference

NGSS Lead States. 2013. *Next Generation Science Standards: For states, by states*. Washington, DC: National Academies Press. www.nextgenscience.org/next-generation-science-standards.

Resources

Chalufour, I., and K. Worth. *The young scientist series*. St. Paul, MN: Redleaf.
DeVries, R., and C.R. Sales. 2011. *Ramps and pathways*. Washington, DC: NAEYC.

Internet Resources

Dr. Drew's Blocks
www.drdrewsblocks.com
Kapla Blocks
www.kaplaus.com
PEEP Science Curriculum
<http://peepandthebigwideworld.com/en/educators>
Pine Cove Molding (Item #10000683)
www.homedepot.com
Ranger Pipettes
www.scrapbooking-warehouse.com/302232.html
Safety Mirrors
www.sciplus.com/p/PLEXI-MIRROR_40222
Theatrical Gel Sheets
www.stagelightingstore.com/Stage-Lighting-Store/Theatrical-Gel-Sheets-Swatchbook-Order
University of Northern Iowa: Ramps and Pathways
www.uni.edu/rampsandpathways