Roll With It

Sliding common objects, such as blocks, boxes, balls, empty containers, and even play foods, down a ramp is a fun way for kids to start exploring some physical science concepts related to the position and motion of objects (National Science Education Standards (NSES) Content Standard B, K–4) and to develop their abilities of technological design (NSES Content Standard E, K–4, National Research Council 1996). And, it's a great introduction to an exploration of the wheel, another familiar object that kids love and will be surprised to discover how it can be used to make work easier.

Sliders and Rollers

Let groups of students test a variety of small objects to see how they move. *Which objects can you blow across the table? How do they move—rolling or sliding? What shape moves (rolls) the easiest? Where do you see this shape in the world?* Students will discover that the small force of a breath of air will move only the lightest objects or those with a round cross-section.

Then, set up a simple ramp using a lightweight board or stiff cardboard with one end set on top of several books and have students continue testing. Assign each group member a job, such as "Recorder" to record predictions and results; "Tester" to test if an object is a roller or a slider; "Chaser" to retrieve objects; and "Turn Keeper" to say which student goes next.

Before putting the object on the ramp, have the children predict which objects will move by rolling and which ones will move by sliding down the ramp. To record the predictions, the Recorder lists (and traces around) the "Objects We Predict Will Roll" on one sheet of paper and the "Objects We Predict Will Slide" on another sheet of paper. Then the students can test their predictions by putting the objects, one at a time, at the top of the ramp and watching the result. The Recorder records the results by tracing the objects again on two new sheets of paper (one for "Rollers" and one for "Sliders"), so the group can compare the results with the predictions.

Afterwards, discuss these questions with the class: *Did the object do what you predicted? What shapes are the Objects That Rolled? What shapes are the Objects That Slid?* Students will discover that a round, or nearly round, profile is necessary for rolling. To assess for understanding of how shape can predict movement, ask the students to draw a picture of one object in the room that would roll down the ramp and one that would slide down.

Next, take students to the development of the wheel by doing the following activity. This activity is so much fun that all students will want to try it, working in small groups of 2–6. If materials are limited, have one group work at a time, out of sight of the others (if you have another adult to assist with supervision) to allow each group to make their own discoveries. The materials for exploring wheels take some time to prepare but can be used over and over again for many years.

Resource

National Research Council (NRC). 1996. *National science education standards*. Washington, DC: National Academy Press.

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Wheel Work

Objective:

To experience the way work is made easier with the use of wheels.

Materials:

- One 50-lb bag of sand, tied inside an old pillowcase
- Two 25-lb bags of sand, each tied inside an old pillowcase
- A plywood board (about 2'×3', sanded to reduce splintering) with a hole drilled through one end
- 10 feet of rope to loop through the hole in the board for the handle
- 8–14 tubes to use as "rollers," as wide as the board and between 8–12 cm in diameter (Flooring stores give away the cardboard tubes that carpet or linoleum come rolled on)
- Wagon or scooter used in physical education classes

Procedure:

1. Begin by telling students that you need help to move a heavy load (bags of sand) over a smooth surface (down the sidewalk or hall). As they volunteer, divide students into small groups of 2–6 students. Encourage the students to try moving the bags by pushing and dragging—first one at a time and then with the whole group working together.
2. Next, introduce the board as a tool to help move heavy loads. ⚠ **Warn students to keep their hands away from the front of the board and out from under it when it is being pulled to prevent pinched fingers.** Students will easily be able to push the bags onto the board and then drag the sand bags with the board by pulling the rope handle. Ask, "What takes less effort—dragging the bag by itself or moving it by pulling it on the board?" "How much of the board is touching the ground when you pull the bags?"
3. Now bring the large "rollers" into view, and if no student suggests it, introduce the idea of using rollers under the board. Again, warn students to keep their fingers away from under the board to prevent pinched fingers.
4. Demonstrate how to lift one end of the board by the handle and slide tubes underneath the board to act as rollers. After a few trials, students will discover that the length of the tube needs to be positioned perpendicular to the board to work with the direction of pull on the handle. As the board rolls across the first few tubes, help students quickly put additional tubes in the path of the board to extend its "roll." As tubes are passed over, students move them to the front of the board to keep it rolling. Repeat the question, "How much of the board is touching the ground, and how much of the rollers are touching the ground?" After all the groups have tried rolling the board over the tubes and experienced how difficult it is for them, ask for ideas on how to make it even easier to move the bags.
5. Some students may come up with the idea of a wheeled vehicle. If not, suggest the wagon or scooter. Ask, "Can this be moved by someone using just one finger?" The answer is usually yes! As each group moves the bags, repeat the question about the amount of contact between the wheels and the ground.

PHOTOGRAPH COURTESY OF THE AUTHOR

Discuss the various methods used to move the sandbags. *Which was easiest? Do you think the amount of touching between the bag or tool and the ground is related to how easy or hard it was to move the bags?* Have students draw pictures showing how much of the bag (and board, rollers, and wheels) touched the ground as they moved the bags. Comments such as, "I can move that bag all by myself, but wheels made it easy for me" and "We should have used the wagon first!" show that students know this simple machine is effective. Although they are not usually able to explain why until late elementary school, this activity gives the students an experience to build on.

The Early Years

What's happening at *http://science.nsta.org/earlyyearsblog.*

Kid & Computers

I am not a big advocate of young children using the computer. But many of my three- and four-year-old students enjoy the opportunity to use it. Identifying websites to expand the science concepts we investigate in class is not something I have done yet. However, the other day we were doing bubble experiments when one of the students ran to the computer saying there are bubbles in the software activity and "you pop 'em." I realized even more the computer can be a useful tool for instruction.

I began to understand in more depth the idea of social engagement at the computer when a college student from the local university sat with a student and talked about and pointed to the images on the screen as the student controlled the mouse. Taking their picture and later asking the student to tell me a story or what she sees sealed my belief that computer use can be beneficial.

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Read more at

http://science.nsta.org/earlyyearsblog/comments.aspx?blogid=1&articleid=50.

Online, your colleagues are also discussing ...

- Investigation Skills with Preschoolers
- PreReaders, Literacy Skills, and Science

Read more and join the conversation at *http://science.nsta.org/earlyyearsblog.*

Teacher's Picks

Juliana Texley

Juliana Texley, lead reviewer for NSTA Recommends, shares a few favorite resources about simple machines and design technology. Books for elementary physical science are hard to find, and those with accurate language and illustrations even harder. Here are a few that have been recognized as outstanding.

Books

I Fall Down. Vicki Cobb. 2004. HarperCollins.
This visually appealing and conceptually sound physical science book introduces young children to the concepts of gravity and weight. The concepts are reinforced through many real-life examples and fun activities that could easily be duplicated in class or at home.

What Does a Wheel Do? Jim Pipe. Copper Beech Books/Millbrook.
A series of questions about how and why things move are posed and then answered by simple investigations of shapes, surfaces, and slopes using ordinary materials. Investigations are extended in the "Solve the Puzzle" question that follows each explanation of "Why It Works."

"Early Bird Physics" series. 2001. Sally M. Walker and Roseanne Feldmann. Lerner.
These six books on simple machines not only have great photos of familiar objects to which children in grades K–4 can relate but also describe simple activities that can be replicated in the classroom.

Internet

Inventor's Toolbox: The Elements of Machines
www.mos.org/sln/Leonardo/InventorsToolbox.html
This photo glossary of simple machines is part of a site devoted to Leonardo da Vinci created by the Museum of Science in Boston.