

Problem Solvers Activity SE 16: So Slow

CHILDREN ARE LEARNING...¹

Science Content:

- A simple definition of friction
- The properties of objects affect how they function.
- Interactions between two rough surfaces produce more friction.
- Interactions between two smooth surfaces produce less friction.

CHILDREN ARE DOING...

Science Practices:

- Explore cause and effect
- Make predictions
- Collect and analyze data
- Plan and carry out investigations

MATERIALS NEEDED:

1 ramp for every 2 children to share—**see Unit 15 for suggestions on ramp options.**

12 rectangular blocks

Aluminum foil (enough to wrap 2 blocks)

Felt or fabric (enough to wrap 2 blocks)

Bubble wrap (enough to wrap 2 blocks)

Sand paper (enough to wrap 2 blocks)

Gift wrap (enough to wrap 2 blocks)

Chart paper

Marker

OPTIONAL: Extra child-size socks for the **ENGAGE** activity, if needed

¹ Adapted from the Next Generation Science Standards (kindergarten): <https://www.nextgenscience.org/>

PREPARATION:

- **For the ENGAGE activity:**
 - Find a space in the classroom where children have space to slide in socks/bare feet. Keep the extra socks handy in case some children are not wearing socks.
- **For the EXPAND activity:**
 - Wrap 2 blocks in aluminum foil, 2 in felt/fabric, 2 in bubble wrap, 2 in gift wrap, 2 in sand paper, and leave 2 with the wood/plastic exposed.
 - Prepare the chart paper by cutting a small square of each material and taping each to the chart paper in 6 rows. To represent the wood block, draw a small brown square. Keep the chart paper and marker handy.
- **For the EXPLORE activity:**
 - Build 2 ramps. See **Unit 15: Ramp and Roll** for options for building ramps. Make sure there is about 4 feet of space in between the ramps so children have space to play.

Activity Instructions

ENGAGE

Gather a group of 4 children at a table or in a circle on the floor. (Note: Groups of 6 children work well if you are teaching 4-year-olds. Adjust materials as needed.)

EXPLAIN: Today we're going to be Problem Solvers and discover what makes something slippery. Have you any of you heard the word *slippery* before? Can you share what you know about the word slippery?

Take children's responses. They may share that ice is slippery, or a wet floor may be slippery.

- Is a slide slippery? *(Sometimes it depends—on what the slide is made of, or what the child is wearing.)*
- Have you ever slipped and fallen? What were you doing?
- What is slippery to you? Are there certain floors that are slippery?
- What about ice? Has anyone ever walked on ice? Is ice slippery? How do you know?
- What does it feel like to walk on something slippery?
- Do you have any questions about slippery things? What are you curious about?

Summarize children's knowledge of what is slippery, and what it feels like when something is slippery.

EXPLAIN: Today we are going to explore what is slippery and what is not by using *ramps*. A ramp is like a slide. We will discover how there is something called *friction* that happens when two things rub against each other—like when our feet touch the floor. Friction slows down or stops the movement between two objects that are touching. Friction stops us from slipping.

TRY IT: Let's try an experiment, Problem Solvers. First, let's take off our shoes. I see we're all wearing socks. Let's slide along the floor wearing our socks. *(Give children a chance to try this, along with you.)* Does the floor feel slippery when we're in our socks? Yes, it does!

TRY IT: Now, let's take off our socks. We are going to try sliding on the floor again in our bare feet. Before we start, what do you predict will happen, Problem Solvers? Do you think there will be more friction, and we'll go slower? Or do you think there will be less friction, and we'll go faster? *(Take children's predictions.)* Let's see. *(Allow children to try sliding in their bare feet.)*

OBSERVE: If you have carpeting in the room, children may notice that they slide faster in socks on a smooth floor surface (like tile) rather than a highly textured surface like carpet. This is, again, due to friction. The interaction between our sock feet and the carpeted surface produces more friction than the interaction between our sock feet and a flat/tile surface.

SUMMARIZE: What happened? Did we go faster in our socks? Or did we go faster in our bare feet? Yes, we went faster in our socks. There was less friction when we were wearing our socks. Our bare feet had more friction, so it slowed us down.

TRANSITION: Now we're going to do some experiments with friction using our ramps. Who remembers what a ramp is? (*Take several children's responses.*) Yes, a ramp is an incline, like a slide. Last time, we rolled balls down our ramps. Today we're going to do something a little different!

A QUESTION FOR OLDER CHILDREN

Why do you think our bare feet had more friction when we were sliding, compared to sliding with socks?

Answer: Our socks are smoother than our bare feet so they produce less friction, and we can slide more easily.

EXPAND

Take out the prepared blocks.

EXPLAIN: Look at my blocks. There are some that still show the wood (*point these out*). But all the rest of these blocks are covered in different materials. Let's take some time to explore these blocks—you can touch them and pick them up.

ASK: As children explore, use questions like the ones below to elicit their observations:

- What do the blocks feel like? (*Give children time to explore the blocks before moving on.*)
- Which surface do you like the best? Why is that?
- Which blocks feel smooth to you?
- Are there any that feel bumpy? Which ones?
- Are there any blocks that feel slippery? Can you show me?

TRY IT: Now let's choose two different blocks and rub them together. Is it easy or hard to rub your blocks against each other? (*Give children time to explore pairs of blocks in this new way.*)

- *If it's harder to rub the two blocks together, you can observe:* The blocks are making more friction so it's harder to rub them against each other.
- *If it's easier to rub the two blocks together, you can observe:* The blocks are producing less friction, so it's easier for us to rub them against each other.

EXPLAIN: Now we're going to be Problem Solvers and we are going to test how quickly these different blocks slide down our ramps. Let's predict which blocks might slide down the ramp the fastest. When we make a prediction, we use our knowledge to make a good guess. (*Use questions like the ones below to guide children's predictions.*)

- What block do you think will slide down the ramp quickly? What makes you think that?
- What block do you think will slide down the ramp slowly? What makes you think that?
- Do you think there are any blocks that won't slide at all? Which one(s)?

DOCUMENT: Document children's predictions on the prepared chart paper. If children predict that some blocks will move more slowly (or not at all), you can add: *So you're saying you think these blocks will produce a lot of friction so they'll move slowly!*

TRANSITION: Are you ready to test our predictions? Let's do it!

EXPLORE

Transition children to the place where you have set up the two ramps. Set up pairs of children (or two groups of 3).

Select two pairs of blocks—like the smooth wooden one and the one covered in felt/fabric. Give each pair of children one of each block.

ASK: Now you and your partner can place each of these blocks at the top of your ramp and watch what happens. Which block might slide quickly? Is there one that might slide slowly? Or maybe one won't move at all? Let's see!

OBSERVE: Observe with children what happened when the blocks are placed at the top of the ramp. On the chart paper, using a different color marker, ask children to describe what happened and write their words on the appropriate line.

REPEAT with each of the remaining block pairs. Ensure each child has a turn to test a block. Each time, record what children discovered on the chart paper.

TRY IT: Suggest that children try block races where they release two different blocks at the top of each ramp and try to find the ones that get to the bottom fastest. Allow 5-10 minutes of free play and exploration before moving to the **SUMMARIZE** step below.

SUMMARIZE: Help children process what they are discovering using questions like the ones below:

- What do you notice about the blocks that don't move/move slowly down the ramp? What is their surface like? What do they feel like? What do you think is making them go slowly?
- **Key Message:** When blocks aren't smooth—if they're bumpy or covered with a lot of texture like the fabric blocks—there is a lot of friction between the block and the ramp. The friction slows the block down so it can't move as fast.
- What do you notice about the blocks that move easily down the ramp? What is their texture like? What do they feel like? What do you think is making them go more quickly?
- **Key Message:** Because these blocks are smooth, there is less friction between the block and the ramp, so they don't get slowed down. The smooth blocks move faster because there is less friction.
- If we were going to build a slide, would you want there to be a lot of friction to slow people down or a little friction to make people slide quickly? Why?
- The slide on our playground is made of plastic. Why do you think plastic might be a good material for a slide? *(It's smooth so there is less friction, and children can slide down more quickly.)*
- What do you think would happen if we tried to use a slide covered in a carpet? *(There would be a lot of friction and we would slide down slowly or maybe not at all!)*

REFLECT

To close the activity, bring the children back together. Use a reflective question/s - like those below - to prompt children's thinking about ramps.

- What did you learn about surfaces when you were sliding blocks down the ramp?
- We discovered that when there is more friction between two objects, they get slowed down. Which blocks did you see create a lot of friction with the ramp?
- Did you prefer the blocks that slid fast or slow down the ramp? Why?
- We also learned that our bodies produce friction when they touch the floor. Tell me about our experiment with our socks and our bare feet—what did you discover?
- Tell me what you have discovered about friction today.

SUMMARIZE: Today we learned about friction. We learned that when an object is textured, like bumpy or soft, it produces more friction when you push it along the ramp—and it goes slowly. Sometimes it doesn't move down the ramp at all! But objects that are smooth and flat, move more quickly down the ramp because they don't produce as much friction. Friction can slow down objects and people—like when we tried sliding in our bare feet!

Individualizing the Activity

Make it more challenging:

- Allow children to test the blocks independently, rather than as a group. Give each of the two pairs of children a set of blocks to test on the ramp. As they work, check in to capture their observations and discoveries.
- Encourage children to find other items in the classroom to test on the ramp (like a plastic animal figurine, stuffed animal, spoon, etc.). Can they predict how these items will behave on the ramp?

Make it less challenging:

- Provide limited materials for exploration—prepare only 3 pairs of blocks. Allow for more repetition in pushing these blocks down the ramp.
- Omit the chart paper section of the activity. Focus more on eliciting children's thoughts as they explore and discover.

MAKING CONNECTIONS ACROSS THE DAY:

- Add the prepared blocks and ramp to the block area and encourage children to repeat the experiment during free play.
- Let children use the playground slide outside for friction experiments. Cover a portion of the slide with different textures—some ideas include: bubble wrap, wrapping paper, cardboard, aluminum foil, a blanket, etc. Have children predict whether each texture will produce a lot of friction or a little friction. Then have children take turns releasing a wheeled vehicle down the slide and observe whether it goes quickly or slowly with each covering.
- Point out when friction is apparent in the classroom—for example, something rolls off the lunch table, it's icy outside (less friction), or when we're walking (our feet produce friction against the ground or floor).

Song: *Sock Skating*

Materials Needed: smooth floor surface (like tile or laminate) and rough floor surface (like carpet) to slide in socks.

Directions: Model sliding/gliding in sock feet side to side and around the room on various surfaces in the room. Model free, easy, flowing movement on smooth surfaces. Model slower, restricted movement on rough surfaces (i.e., pretend like it's very difficult to move – use lots of muscle force). Encourage children to move like you move!

Lyrics:

Let's explore friction in the house today;

(Get ready to move!)

Slide in our socks the old-fashioned way.

I wonder which floors make it easy to glide

(Shrug shoulders as if asking a question)

And which will be harder to move as we slide.

Chorus

Sock skating, sock skating, slipping and sliding.

(Slide around on the smooth surface)

The smoother the floor, the faster we're gliding.

The rougher the floor, the slower we move.

It's fun to explore when we move without shoes.

Sock skating on hardwood can be very nice;

(Slide freely and easily,

There's not too much friction; like skating on ice.

little friction)

Chorus

Sock skating, sock skating, slipping and sliding.

(Move to the rough surface and slide)

The smoother the floor, the faster we're gliding.

The rougher the floor, the slower we move.

It's fun to explore when we move without shoes.

Sock skating on carpet can be pretty tough,

(Slide slowly, modeling lots of

Like skating on grass or through thick, sticky mud.

muscle force and friction)

Chorus

Sock skating, sock skating slipping and sliding.

(Slide anywhere in the room)

The smoother the floor, the faster we're gliding.

The rougher the floor, the slower we move.

It's fun to explore when we move without shoes.

And it's fun to test friction from room to room.

Making Literacy Connections

Share the following book with children as an opportunity to reflect on slides (ramps) and friction.

Suggested Book: *The Big Slide* by Daniel Kirk

AS YOU READ:

- At the beginning of the story, ask children why they think Little Pup doesn't want to go down the big slide. Have children ever been a little worried about trying something new?
- Do children think that Little Pup and his friends will go down the slide quickly or slowly? What makes them think that?
- Sometimes Little Pup feels brave and sometimes he doesn't. What does it mean to feel *brave*? (Being brave means doing something even though we feel scared. Nobody feels brave all the time. Sometimes we need time to get used to the idea of trying something new.)
- Why do you think Little Pup didn't want to try the baby slide?
- When they get home, mom suggests that Little Pup slide down the concrete railing outside their apartment building. Concrete is a little bumpy. Do you think Little Pup will go slowly or quickly down the railing? (Bumpy surfaces create more friction, so Little Pup will probably go slowly.)
- Little Pup made a ramp out of cardboard just like we did in our class. What do you think he's doing with his ramp? Do you think he's having fun? Why?
- Do you think Little Pup went quickly or slowly down the slide? What do you think Little Pup felt afterward?

BUILD ON THE BOOK: LITTLE PUP RACE

Materials: Book, slide or ramp, stuffed dog/bear, covered blocks from today's activity

1. Show children Little Pup (the stuffed animal you've chosen.) Tell children that today they will be testing the blocks from today's activity to see if they slide down the slide faster than Little Pup.
2. Let pairs of children choose a prepared block. Have the pair observe/explore their block and Little Pup, and decide which they think will "win" the race and why.
3. The pair can sit at the top of the slide. One child can release Little Pup and, at the same time, the other child can release the block. (You can count to three as a prompt to release, if this helps.)
4. Have the rest of the children wait at the bottom of the slide to observe whether Little Pup or the block reaches the bottom of the slide the fastest.
5. Continue taking turns "racing" the blocks and Little Pup until all children have had a turn.



Discovering Friction

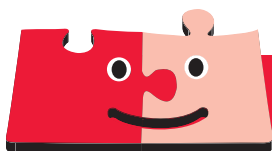
This week, children learned how more friction between two objects can slow them down. When there's less friction, things move faster. Use the activities below to explore friction at home.

- **Go Sock Skating.** Slide around your home in sock feet—on both smooth floor surfaces and carpeted surfaces. (Supervise carefully.) Ask your child which surfaces are easier to slide on. Explain that smooth surfaces produce less friction, so you can slide more quickly. Carpeted surfaces, because they have a lot of texture, produce lots of friction. These surfaces slow us down!



- **Explore Surfaces.** Tie a length of string to the short edge of a shoebox. Have your child pull the shoebox along a smooth floor, then a carpeted floor. Then put a towel down and pull it along that surface. Have them pull it over a flat piece of cardboard. Notice how easy or difficult it is to pull the box over these different surfaces. The rougher a surface is, the more friction is created and the harder it is to pull.
- **Add Some Weight.** Put a can of food inside the shoebox and see if that changes how hard it is to pull the box over the different surfaces. If you increase the weight of an object pressing against another surface, it increases the amount of friction.

Safety Note: Be sure to carefully supervise this activity. When you're done, remove the pull-string from the box.



Solo para familias

Descubrimiento de la fricción

Esta semana los niños aprendieron cómo un aumento de la fricción entre dos objetos puede frenarlos. Cuando hay menos fricción, las cosas se mueven más rápido. Utilice las siguientes actividades para estudiar la fricción en casa.

- **Patinar con medias.** Deslícese por su casa sin quitarse las medias, tanto por superficies lisas como alfombradas. (Supervise cuidadosamente.) Pregúntele a su niño en qué superficie es más fácil deslizarse. Explíquelo que las superficies lisas producen menos fricción, por lo que es más fácil deslizarse. Las superficies alfombradas, al tener mucha textura, producen mucha fricción. Estas superficies nos hacen más lentos.
- **Explorar superficies.** Amarre un trozo de cuerda al borde más corto de una caja de zapatos. Haga que su niño arrastre la caja de zapatos por un piso liso y, después, por un piso alfombrado. A continuación, coloque una toalla en el suelo y hálala a lo largo de esa superficie. Pídale al niño que la hale sobre un cartón plano. Observe lo fácil o difícil que resulta arrastrar la caja por las distintas superficies. Cuanto más rugosa sea una superficie, más fricción se creará y más difícil será halar un objeto.
- **Agregue algo de peso.** Coloque una lata de algún alimento dentro de la caja de zapatos y vea si eso cambia la dificultad de halar la caja sobre las diferentes superficies. Si aumenta el peso de un objeto que presiona contra otra superficie, aumenta la fricción



Nota de seguridad: Asegúrese de supervisar cuidadosamente esta actividad. Cuando terminen, retire la cuerda para halar la caja.