

Problem Solvers Activity SE 1: Shadows and Sunlight

CHILDREN ARE LEARNING...¹

Science Content:

- Make the connection between sunlight and shadow.
- Discover that shadows are the dark shapes that form when an object or person blocks light.
- Observe the effect of sunlight on Earth's surface (ground).

CHILDREN ARE DOING...

Science Practices:

- Explore cause and effect
- Observe patterns
- Make predictions

MATERIALS NEEDED:

One flashlight for every 2 children

Teddy bear or other familiar object

Low stool

Roll of butcher paper (enough to trace each child's shadow), or space to trace children's shadows outside with sidewalk chalk

Child-safe markers

Child-safe scissors

4-6 Balls, buckets, etc. (a mix of safe objects children can use to create shadows outside)

PREPARATION:

- For the **EXPAND** activity: Place flashlights in a bin or basket and have ready.
- For the **EXPLORE** activity: Keep the teddy bear and low stool close by.
- Have the butcher paper, markers and scissors ready to use outdoors to trace children's shadows.

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

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.)

ASK: Let's talk about shadows. *Use questions like those following to engage children's current knowledge of and experience with shadows:*

- Have you seen a shadow?
- What do you think makes a shadow?
- Can you tell me what you think a shadow is?
- What do you know about shadows?

Facilitate a short discussion of children's experience with shadows.

EXPLAIN: Today we're going to explore shadows. A shadow is the dark shape we see when something blocks light. Would you like to make some shadows with me?

EXPAND

Note: The following activity gives children the opportunity to create shadows using flashlights. It helps to have a darkened room—either turning off some, most, or all of the lights in the classroom. You may want to implement this activity as a large-group activity so all children can participate or take the "Shadows" group to a separate nearby space to try this activity.

PREPARE: We are going to explore shadows today, so I'm going to turn off our lights. Are you ready? 1, 2, 3: Lights are turning off.

Have the flashlights close by.

ASK: What do you think will happen if I shine this flashlight on my hand? Will it make a shadow? What do you think the shadow might look like? *(Take several responses. Then, making sure you have a open wall behind you, hold your hand up and shine the flashlight on it.)* Does anyone see my hand's shadow? Where is it?

ASK: What should I do with my hand? Should I wave, or point, or wiggle my fingers? *(Let the children suggest what actions you should perform. Encourage them to predict what will happen to your shadow.)* When I wave my hand to say hello, what do you think my shadow will do? Why does that happen?

EXPLAIN: Do you see how my hand is blocking the light from the flashlight? My shadow is the dark shape of my hand when it blocks the light. The shape of my shadow will change if the shape of my hand changes. *(Demonstrate.)* Now I am waving. Look at my shadow. Now I am making a fist. What happened to my shadow? Is it the same or different? Now I am holding up one finger. How did my shadow change? My shadow will change if my hand blocks the light in a different way.

ASK: Who would like to hold the flashlight and shine it on my hand to make a shadow? *(Give several children a chance to hold the flashlight. Let children discover how and where they need to hold the flashlight in order to see the shadow. For each child, hold your hand in a different position and notice together how your shadow changes.)*

TRY IT: Create pairs of children and give each pair a flashlight. Position each pair so they are in front of a section of open wall (with no posters or pictures).

EXPLAIN: Together with your partner, I'd like you to make shadows with the flashlight. Ask your partner to hold the flashlight while you hold up your hand. Then it's your turn to hold the flashlight while you give your partner a turn to make a shadow.

It may be helpful to ask children to remind you of some of the community rules for using tools like flashlights—like no hitting or throwing.

Let children discover shadows together for a few minutes. Check in with each group and have a short conversation about their discoveries.. You might ask questions like, "What are you learning about your shadows? What happens when you block the light with your hand? Where is your shadow now? What can you do to make your shadow look different?"

When both partners have had a turn, you can transition to the next part of the activity. While children are playing, set up a low table with an object on it (a stuffed animal, small figurine, toy truck or car). The table and object should be placed in front of an open wall. Hang a large piece of white paper on the wall opposite the object on the table. Have a red, blue, and green marker handy.

SAY: Now, let's try something different. We're going to see how shadows change if we change where we shine our light.

ASK: Each of you will take turns shining your light on our teddy bear. But each of you is going to shine your light standing in a different place. Let's see what happens to Teddy's shadow.

- Our first partners will shine a light on the teddy standing very close by (*about 12 inches away*). What do you see? Let's mark how big the shadow is. I'm going to put a line at the top and the bottom of the shadow in red marker.
- Our next partners will shine a light on the teddy standing a little farther away (*about 2 feet away*). What is different about our shadow now? Do you see any changes? I'm going to put a line at the top and bottom of the shadow in blue marker.
- Our next partners will shine a light on the teddy standing far away (*about 3-5 feet*). What happened to the shadow? I'm going to put a line at the top and bottom of the shadow in green marker.

SUMMARIZE: What did we discover together, Problem Solvers? (*Let children share their observations.*) When the light was close to Teddy, the shadow was bigger. That's because when the light is close by, Teddy blocked more of the light. When we move the light farther away, the shadow got smaller. (*Demonstrate a final time yourself.*)

TRY IT: Give children an opportunity for free play with the flashlights/shadows using stuffed animals or other familiar objects, switching partners if you wish, before moving on to the **Explore** portion of the activity.

NOTE: *You can stop here and rotate groups to give all children an opportunity to participate in the shadows activity before moving on to the EXPLORE activity described below.*

EXPLORE

On a sunny day, take children outside to an area where there is a wall or cement/blacktop—both ideal places to see one's shadow!

ASK: Ask children to notice their shadow. Can they point to their shadow on the ground or nearby wall?

EXPLORE: Play a game where you ask children to make their shadow dance; jump; wave with both hands; kick; etc. Give each child a turn to shout out some action for children to make their shadows perform.

ASK: Do children see any other shadows outside? (For example, the shadow of a tree, branch, slide, or tricycle. Notice these shadows together. If you wish, document them with photos you can post in the classroom. You can also walk around with children outside and do a "shadow count," counting all the shadows they see.)

ASK: Ask children: When we were inside, we used a flashlight to make a shadow. What do you think is making our shadows *outside*? (Make the connection that *a shadow is formed when a person or object is blocking light. The sun is producing light. Their bodies are blocking some of the sun's light. Their shadow shows the part of their body that is blocking the sunlight.*)

DO: Explore creating shadows. Offer children a variety of objects (bucket/shovels, balls of different sizes, leaves or other found objects on the playground) and ask them to make shadows of those objects. As children explore in groups, teachers may observe and ask questions like:

- Where is the [object's] shadow?
- Which things have the biggest shadows? Smallest shadow?
- I see you moving the bucket up and down. How does that change the bucket's shadow?
- Can you figure out a way to make the size of the shadow change?

TRY IT: Give children large pieces of paper and markers or crayons so they can trace the shadows of familiar objects outside (teddy bears, tricycles, sand pails, etc.).

REPEAT: For older children (3-4 years), you may choose to come outside in the morning, at noontime, and again toward the end of the day (late afternoon). Each time, invite children to discover their shadows: Where are they? How big are they? If time allows, you can trace children's shadows at different times of day and compare them. When the sun is high in the sky (noontime), our shadows are much shorter. When the sky is low on the horizon (morning and late afternoon/evening), our shadows are longer.

REFLECT

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

- What did you learn about shadows today?
- What do you think is important to know about shadows?
- When you see a shadow, what ideas come into your mind?
- Tell me about how light helps to make shadows.

SUMMARIZE: Today we learned about shadows. Shadows happen when something—like our bodies—blocks light. The light can come from a flashlight or from sunlight when we're outside. We made shadows with our own bodies, with our Teddy Bear, and outside with buckets and balls.

Individualizing the Activity

Make it more challenging:

- Have children trace their shadows at different points across the day. Put the pictures in order of time (morning, noon, afternoon).
- Discuss how the sun rises in the morning, is overhead at noontime, and then sets in the afternoon/evening (when it becomes dark). Go outside with children and notice how the position of the sun changes across the day. Take photos if possible. Notice where the shadows begin and end—and point out how they form the outline of the person or object blocking the light. (The shadow ends where the person/object ends.) Look at a shadow outside with the children and see if they can find the object/person forming the shadow.
- *If you want to extend the shadows exploration:* Hang or place butcher paper so that partners can trace one another's shadows. Or provide each pair with sidewalk chalk to trace their partner's shadow on a paved area.

Make it less challenging:

- *If you want to extend the shadow exploration:* Hang/place butcher paper so that you can trace each child's shadow, or trace their shadows outside on a paved area using chalk.
- For toddlers (2 ½–3 years), provide a variety of familiar objects that they can use inside or outside to discover shadows. This could include toys (trucks, tricycles, buckets, dolls, etc.) or objects like a chair, a wastepaper basket, a broom, etc. Notice together how the shadow matches the object producing the shadow.
- For younger children, teachers will need to reinforce norms around using tools like flashlights and provide close supervision.

MAKING CONNECTIONS ACROSS THE DAY:

- When you take community walks, notice shadows of people and objects you see.
- Notice the sun in the sky. Point out how the sun's position in the sky is changing across the day.
- Discover the shadows of people or objects on the playground. For older children, notice together how these shadows change (getting longer or shorter) based on where the sun is in the sky (or what time of day it is).
- During free play, let children explore the flashlights (supervised) to create shadows. Show children how they can make shadows of their hands against the wall. Do a silly shadow puppet show using your hands. See if the children can join in and make their shadow hands talk and move.

Song: *My Shadow and Me*

On a sunny day my shadow can be found.

(Make a circle with arms above your head)

When I look behind me, I see it on the ground.

(Look behind and point to shadow)

No matter where I go, shadow follows me around,

(March in place)

Just a quiet little friend who doesn't make a sound.

(Put fingers up to lips)

In the early morning, my shadow is so long;

(Spread arms wide)

We clap, clap, clap as I sing a song.

(Clap three times)

When the sun shines high, my shadow's very small;

(Bring hands close together)

We jump, jump, jump like a big, bouncy ball!

(Jump three times)

There's so many things that I can do;

(Point to self)

I wiggle my fingers, my shadow wiggles too.

(Wiggle fingers)

We stomp, stomp, stomp, and we kick our feet.

(Stomp three times, kick feet)

Playing with my shadow is really neat.

(High five with a partner)

And as the evening comes and the sun goes down

When I look around, I don't see it on the ground.

(Look around at the ground)

No matter where I look, my shadow can't be found...

(Shrug shoulders)

My shadow disappears without a single sound.

(Put finger up to lips)

So as the stars come out to welcome the night,

(Open/close hands like stars twinkling)

Until tomorrow, I wave goodbye.

(Wave goodbye)

Goodbye, goodbye, ...Goodnight.

BUILD ON THE SONG:

- Model the actions suggested in the song and encourage children to do what you do!
- If you wish, use a flashlight to produce long and short shadows, and clapping, jumping, wiggling, stomping, and kicking shadows during the song.

Making Literacy Connections

Share the following book with children as an opportunity to deepen their understanding of shadows. The literacy extension activity below suggests another play-based experience to explore how shadows are formed when a person blocks light.

Suggested Book: *Moonbear's Shadow* by Frank Asch

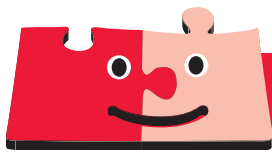
AS YOU READ:

- On the page where Bear's shadow scares the fish, ask children if *they* can see the shadow in the water. Ask them to point to the shadow on the page.
- When Bear runs to the other side of the hill, pause to ask children if they can see Bear's shadow. Ask them to point to the shadow. Ask, "Do you think Bear can run away from his shadow?" For older children (3 and up), follow up with: "Why can/can't Bear run away from his shadow? What do you think?" As you move through the story, pause on pages where Bear's shadow is visible and ask children to find it.
- Later in the story, Bear gets "very annoyed." Wonder with children about what "annoyed" means. Do they know that word? What do they think it means? When do they feel annoyed? Why is Bear feeling "annoyed"? (*Annoyed* means feeling a little angry.)
- When Bear is trying to bury his shadow, ask children to find Bear's shadow and the shovel's shadow. How do they know which shadow is which?
- On the page where children can see the sun moving across the sky while Bear sleeps, notice together: What is happening to the shovel's shadow? (It's getting longer. When the sun is lower in the sky—mornings and afternoons/early evenings—shadows are longest.)
- When Bear nodded his head, his shadow nodded too. Ask children: "Does your shadow make the same movements as you? Why do you think that is?"

BUILD ON THE BOOK: CREATING OUR CLASSROOM "MOONBEAR'S SHADOW" BOOK

Materials: Camera, paper (one page per child), printer, photocopier, stapler, three-hole punch, small binder

1. While you are outside with children on a sunny day, take a photo of each child with their shadow. (Alternatively, for older children, you can ask them to draw a picture of themselves with their shadow.)
2. Create a classroom book by placing a photo of each child on a different piece of paper. Ask each child to tell you about their photo and type or write their words on their page.
3. Photocopy the book so each child has a copy to take home and share with parents.
4. Print the book and use the three-hole punch so you can place the pages in a small binder. Place the book in the class library/bookshelf.
5. Read the book to the children. Or, ask each child to "read"/tell the class about their page.



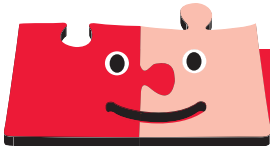
Shadow Play

This week, children learned how shadows are formed. At home, you can look for ways to notice and make shadows with your child.

Here are some ideas to try:

- Notice your own and your child's shadow when you are outside. Can you make your shadows dance, wave, jump, or kick? Can your two shadows do a "high five"? Talk about how shadows are the dark shapes that form when something solid (like a person's body) blocks light.
- Notice a shadow you see outside and ask your child to find what object is making the shadow.
- At bedtime, use a soft light to make shadows of your hands against the wall. Do a silly shadow puppet show using your hands. See if your child can join in and make his shadow hands talk and move.





Solo para familias

Juego de sombras

Esta semana, busque maneras de observar y crear sombras con su hijo.

Estas son algunas ideas que puede probar:

- Fíjese en su sombra y en la de su hijo cuando estén al aire libre. ¿Pueden hacer que las sombras bailen, saluden, salten o den patadas? ¿Pueden chocar los cinco? Hablen de cómo las sombras son las formas oscuras que se crean cuando algo sólido (como el cuerpo de una persona) bloquea la luz.
- Fíjese en una sombra que vea en el exterior y pídale a su hijo que encuentre qué objeto está creando la sombra.
- A la hora de dormir, utilice una luz suave para crear sombras de sus manos contra la pared. Haga un espectáculo de sombras divertidas con sus manos. Trate de que su hijo participe y haga que las sombras de sus manos hablen y se muevan.

