

**Guiding Explanations and Solutions:
Conducting an Interview with Children about
Sound and/or Light**

Before beginning this activity, you should read the article about interviewing children (Extension C). In this extension, you will be conducting a teaching interview. It would probably be best if two members of your group conduct the interview together with the same child or children: one person can conduct the interview and the other person can take notes.

The goal is to engage children in constructing explanations or designing solutions. You will have two options for this interview. You may select to engage a student in constructing explanations or engage a student in designing a solution.

On the next several pages is the *Interview Protocol Form*. This is what you will fill out and use to guide you as you conduct the interview. At the end of the protocol are some optional worksheets that you can have children write and draw on.

You will need to make observation notes during your interview on the *Interview Protocol Form* (IPF) to keep track of the child's responses and actions. You will also need to protect each child's identity, so do not use her/his real name. Assign a pseudonym and list the child's age and grade on the IPF.

Interview Protocol Form:

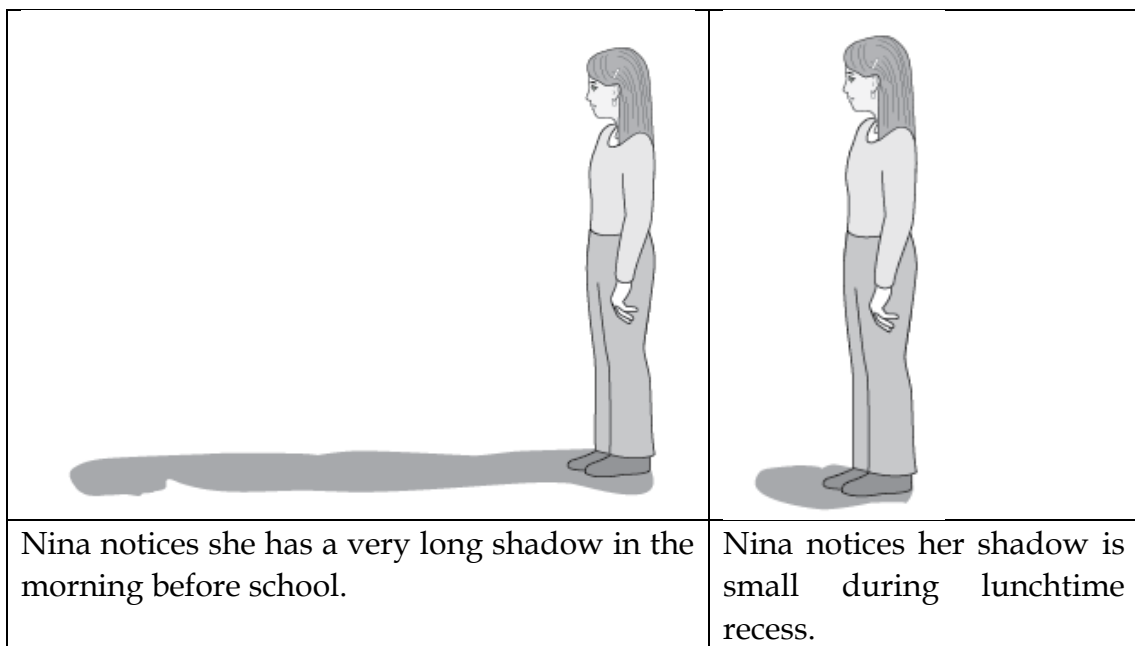
Your name _____ Group # _____

Pseudonym of child _____; Age _____; Grade _____

Interview Option 1: Constructing Explanations

Planning the Interview (You may have begun to think about these ideas in Teaching and Learning Lesson 7)

In this interview, you will be asking children to explain Nina’s observation that her shadow was very long in the morning and shorter during lunchtime as shown in the figure below.



First consider the ideas that a child might need to know to answer this question. Some things she or he may need to know are:

- The sun appears near the horizon in the morning and evening and overhead around noon.
- Shadows are formed when an object (in this case, Nina) blocks the sunlight.
- Light travels in a straight line.

Choose one of these ideas. Your teaching goal will be for the child you are interviewing to make a claim and support that idea with evidence she collected.

Write down the idea you selected.


Now consider what evidence the child (or children) could collect and what materials you might need to have available for use.

For example, if you want the child to notice that the angle of the sun is important, you may want to bring in an object to represent a person and a flashlight. Ask the child to hold the flashlight at different angles (keeping the distance the same) and measure the length of the object's shadow. You may want to involve the child in determining what kinds of observations to make. As another example, if you want the child to notice that the sun is in different positions throughout the day, you may decide to find photos that show the sun in different positions in the sky. (**Caution:** you should never ask a child to look directly at the sun.)

Write down any observations you plan to have your student make.

Conducting the Interview

In the interview you should first present the scenario of Nina noticing that her shadow looked different at two different times of the day and ask the child how she or he would explain to Nina why her shadow changed shape.

 Record the child's response and take a photo of any drawing that the child makes. You may have the child use the form at the end of this extension activity.

Ask the child to support his/her statements with evidence. If the child does not know what evidence means, you should explain that evidence could be anything the child has seen that makes him/her think this. You may provide the sentence frame.

I think that _____. I think this because _____.

 Record the child's response.

Present the child with the activity you planned in the planning section.


 Record any observations the child makes.

Ask the child if she/he can use the evidence collected to support any new ideas about Nina's observations. Again, you may provide a sentence frame such as

I think that _____. I think this because _____.

 Record the child's response.

Ask the child how she/he would now explain to Nina why the shadow changes.

 Record the child's response and take a photo of any drawing that the child makes. You may have the child use the form at the end of this extension activity.

Interview Option 2: Designing Solutions

The NGSS includes performance expectations that require students to use their understanding of sound and light to design a solution to an engineering problem at both first grade (1-PS4-4) and fourth grade (4-PS4-3). These expectations are listed here.

1-PS4-4. Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance. (Examples could include a light source to send signals, paper cup and string “telephones,” and a pattern of drumbeats.)

4-PS4-3. Generate and compare multiple solutions that use patterns to transfer information. (Examples of solutions could include drums sending coded information through sound waves, using a grid of 1’s and 0’s representing black and white to send information about a picture, and using Morse code to send text.)

In this part of the interview, you will present the child you are interviewing with the following challenge

Tell the child that you have a problem. You are going to go camping next weekend with friends and will be in a remote location and will not be able to use phones. Your friends want to go on a short hike, but you want to find a way to communicate with them. Some messages you may want to send them include “Come back to the camp” “Dinner is ready” and “Where are you?”

At the campsite you have the following materials:

Flashlight, mirror, metal cooking pot, wooden spoon, 4 plastic plates and 4 metal forks.

Your friends have the following materials:

Flashlight, mirror, whistle

Tell the child that his or her job is to use any of the materials above to design a way for you to communicate with your friends using either sound or light. You can assume that the friends are always within hearing distance (but not so close that they could understand words people are saying) and that they will be camping in a meadow or a desert so that there will not be large trees to block their view.

They should draw a picture of their idea. For younger children the communication can just go in one direction – from the campsite to the hikers. For older children, the communication should go both directions: the campsite should communicate with the hikers and the hikers should be able to respond. You may have the child use the form at the end of this extension activity.

Allow the children to ask any questions they have at this time.



Record the child's questions and any answers you provide.

Ask the children to draw and describe their idea.



Record the child's response. Have the child draw his or her ideas and you should take a photo of the drawing and any ideas written down.

Ask the child to think of another solution to the challenge. He or she should then draw and describe the second idea. Again, the child can use the form at the end of this extension activity.




Record the child's response and take a photo of the child's idea.

Comparing Solutions


Ask the children which of their ideas they think is the “best” and to describe why. Pay particular attention to whether the children establish criteria and whether they compare the solutions across the same criteria. Note that since

the children have likely never practiced comparing designs, they may not establish any criteria. This is fine. Your job is to notice what they do.

-  Record the child's response and/or have the child record his or her comparison on the form at the end of the activity.

If the child does not specifically mention criteria for assessing their solutions, you may want to suggest some: Which solution can communicate the farthest? Does one require it to be dark or light for the communication? Which solution uses the fewest materials?



-  Record the child's response.

-  Summarize the child's thinking, and write down any interesting quotes.

Shrinking Shadows

(Optional worksheets to use with children)

Directions: Nina noticed that her shadow changes shape throughout the day.

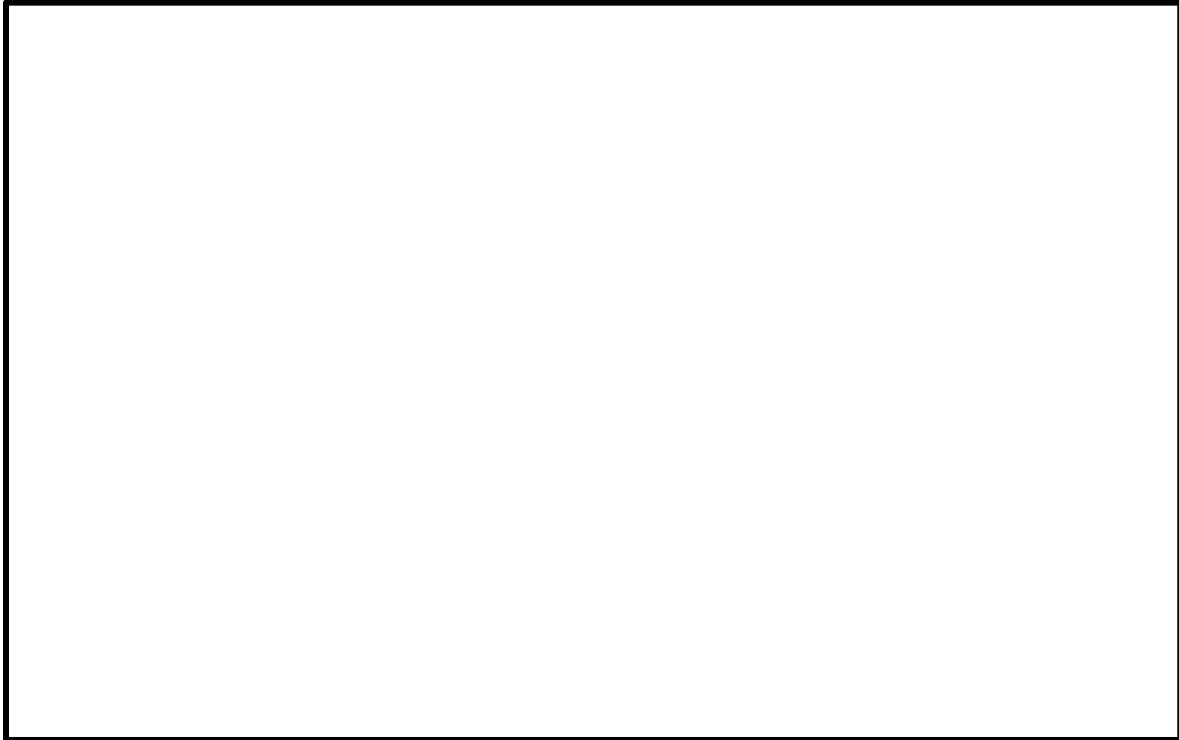
 A line drawing of a girl standing in profile, facing left. She has long hair and is wearing a long-sleeved shirt and pants. A very long, dark shadow is cast on the ground to her left, extending far behind her.	 A line drawing of the same girl standing in profile, facing left. She has long hair and is wearing a long-sleeved shirt and pants. A very small, dark shadow is cast on the ground directly beneath her feet.
<p>Nina notices she has a very long shadow in the morning before school.</p>	<p>Nina notices her shadow is small during lunchtime recess.</p>

How would you explain this to Nina?

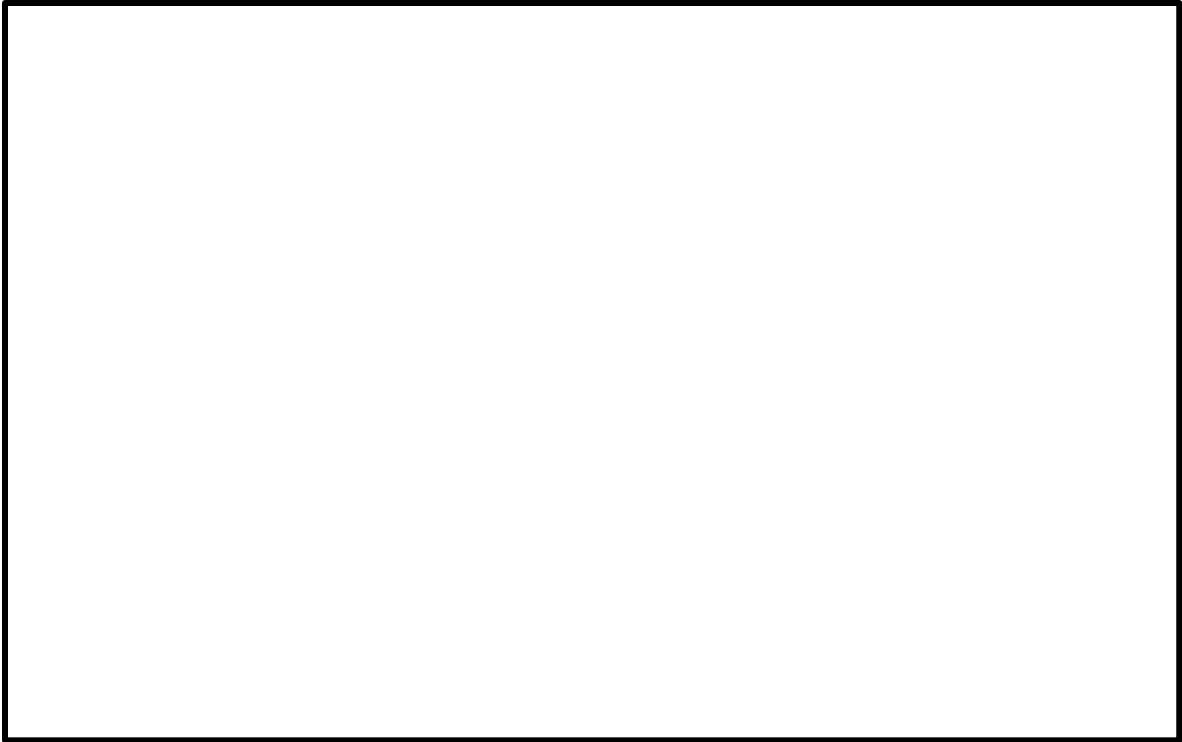
Communicating across Distances

(Optional worksheets to use with children)

Directions: Design a way to communicate with your friends using either sound or light.



Directions: Design a SECOND way to communicate with your friends using either sound or light.



Compare your two solutions. Which one is the “best” solution? How did you decide which one was best?
