

SIEMENS STEM DAY ACTIVITY

USE YOUR SENSES

1 1/2 HOUR

REAL-WORLD SCIENCE TOPICS

- An exploration of how the human body uses multiple sources of information to make decisions
- An exploration of the sensitivity of different areas to touch
- An exploration of the sense of smell
- An exploration of the ability of the brain to judge the source of a sound based on which ear the sound gets to first

OVERVIEW

In this activity, students will explore their senses by performing a variety of activities.

TOPIC

The senses

OBJECTIVE

Students will identify that the human brain uses many sources of information to understand and react to the surroundings.

MATERIALS NEEDED FOR DEMONSTRATION

- small candies (such as M&Ms, Reese's Pieces, or Skittles)
- paper

MATERIALS NEEDED FOR STATION 1

- chair

MATERIALS NEEDED FOR STATION 2

- 6 cotton balls soaked in a variety of food extracts or juices, such as lemon, lime, orange, chocolate, and vanilla
- 6 paper cups
- pictures of the foods from which the extracts or juices come or are used in (such as vanilla ice cream for vanilla, an orange for orange, etc.)
- tape
- marker

MATERIALS NEEDED FOR STATION 3

- a variety of objects, such as pinecones, pin-pong balls, marbles, erasers, coins
- blindfold

PRE-CLASS SETUP FOR STATION 2

1. Place one soaked cotton ball in each cup.
2. Use a marker to label the cups 1, 2, 3, 4, 5, and 6.
3. Tape a picture of a food item to each cup. Some of the pictures should match their smells, and some should not. Record the smell that you put in each cup as well as the picture you taped to the cup in a table like the one below. Students will use this to compare their guesses.

Cup	Picture	Smell
1		
2		
3		
4		
5		
6		

STANDARDS MET

National Science Standards Addressed

CONTENT STANDARD A

As a result of activities in grades K–4, all students should develop

- Abilities necessary to do scientific inquiry
- Understandings about scientific inquiry

CONTENT STANDARD C

As a result of their activities in grades K–4, all students should develop understanding of

- The characteristics of organisms
- Life cycles of organisms
- Organisms and environments

CONTENT STANDARD G

As a result of their activities in grades K–4, all students should develop understanding of

- Science as a human endeavor

SOURCE

National Science Teachers Association

<http://books.nap.edu/html/nses/overview.html#content>

STEPS FOR USE YOUR SENSES

Warm-up Activity: First, ask the students if they can name the five senses. They should list sight, smell, touch, taste, and hearing. Then ask them to name the sense organs that are associated with each sense (the eyes, nose, skin, tongue, and ears, respectively).

Ask one student to come to the front of the room and play catch with a balled-up piece of paper. Toss the piece of paper to the student and have the student catch it. Ask the other students which senses the catcher has to use in order to make the catch. They should recognize that it took both sight and touch in order to make the catch.

Next show students a handful of candies, such as Reese's Pieces, M&Ms, or Skittles. Ask students how they could identify what kind of candies they are. Students should recognize that they could look at them, taste them, or smell them to identify what kind they are. Tell the students that many decisions we make require us to use more than one sense. In this activity, they will explore how people use senses to help them make many simple decisions.

1. Distribute the *Use Your Senses* handout and materials to each pair of students.
2. This activity will be set up in stations. **Grades K–1** should only do Stations 1 and 2. **Grades 2–3** should complete all 3 stations. Before students begin, you should walk them through the procedure for each station. Remind the class that they should move through the stations in an orderly fashion.
3. Station 1 requires four students per group; stations 2 and 3 should be set up for pairs of students. If you have a large class then you may need to set up multiple versions of the same station.
4. **Station 1:** The first activity is a test of hearing. In this activity, one student (the listener) will sit in a chair with his or her eyes closed. Other students, arranged in a circle around the sitting student, will take turns clapping. Without looking, the student sitting in the chair will attempt to point to the location of the student who clapped. Invite several students to the front of the class to help you demonstrate this activity. Students will test their hearing with both ears uncovered and then again with one ear covered. Have students follow the procedure below:
 - One team member, the listener, should sit in a chair with his or her eyes closed.
 - The rest of the team members should spread out in a circle around the chair. One of these team members should also be the recorder.
 - To carry out the activity, one of the three students around the listener's chair should clap. The listener should try to identify the direction the clap is coming from without opening his or her eyes.
 - The recorder should use the table on the **listener's** Student Handout to record whether the listener correctly guesses where the sound is coming from. If the listener guesses right, make a checkmark in the column labeled "correct." If the listener is wrong, make a checkmark in the column labeled "wrong." Repeat the third and fourth steps four more times. The team members surrounding the chair should change places after each test.
 - Next, the listener should cover one ear with his or her hand.

- Have the clapping task performed 5 times. The recorder should record whether each of the guesses was correct or not.
 - The students in the group should trade off so that each member of the group gets a turn to be the listener.
- 5. Station 2:** Students will test the link between sight and smell. In this activity, students decide if the smell of a substance matches the picture identifying it. At this station, students smell samples of juice or extracts such as lemon, lime, orange, vanilla, and chocolate. They must decide if the picture on the container matches the smell inside.
- 6. Station 3 (Grades 2–3):** Students will test the sensitivity of different areas of their skin to touch. In this activity, students will use their fingertips and the backs of their upper arms to observe the textures of several different objects. They will try to identify the objects based on their sense of touch in these areas. They will use their observations to compare the sensitivity of these two areas of the body.
- One partner is blindfolded.
 - The other partner selects an object from the five options, and presses it lightly into the skin of the blindfolded partner's upper arm. The blindfolded partner guesses which object it is. Objects and guesses should be recorded on the **blindfolded partner's** Student Handout. All five objects should be tested this way.
 - All five objects should be tested using the fingertips. The order may be varied or the same.
- 7. Wrap-up Activity:** Discuss the results of these four activities with the class. First, discuss the results of Station 1. Ask the students if they were able to better identify where the sound was coming from with one or both ears uncovered. Most students should have had an easier time with both ears uncovered. Ask the students how the brain identifies where a sound is coming from. The students should recognize that the brain uses information about the sound from both ears, although they may not realize that the brain is actually calculating the difference in how long it took for the sound to reach each ear.

Next, discuss the results of Station 2. Were most students able to correctly identify the smells? Most students will likely have some problems identifying at least one of the smells. Ask them why it was difficult to correctly decide if the smells matched the pictures. They should realize that it was because their eyes and their ears were sometimes giving them different information.

Discuss the results of Station 3. Was it easier to identify the objects with fingertips or the back of the arms? Students should have found that their fingertips were the most sensitive. Have students suggest possible reasons for the high sensitivity of the hands. Students should realize that greater sensitivity in the hands allows them to be more useful for handling objects and learning about the environment.

Use Your Senses Extension Activity

- To extend this activity, have students conduct a test of reaction time. In this activity, one student should hold a ruler by one end just over the hand of another student. The first student should drop the ruler, and the second student should try to grab the ruler as quickly as possible. Students can use the markings on the ruler to measure how far the ruler fell before the second student caught it. The distance the ruler fell is directly proportional to the student's reaction time. Have each student perform this trial five times and average the results. Discuss how the senses of sight and touch are needed to perform this task successfully.

- If younger students (K–1) would like a challenge, you may have them perform the Station 3 activity

Use Your Senses Background Information

Why is it harder to tell which direction a sound comes from with one ear covered?

The human brain performs many complex calculations to identify the source of a sound. The brain can figure out whether a sound arrives at your right ear or your left ear first. It then uses the difference in arrival time to approximate the source of the sound. When a student covers his or her ear, that student is taking away that piece of information.

Why is it sometimes hard to decide what a smell is?

The human sense of smell is one of the most sensitive. Humans are able to distinguish a very large range of smells. In fact, when a person eats something, the smell of the food contributes as much to the taste as the actual tastes that the person senses with his or her tongue. However, when your eyes are giving you information that conflicts with what your nose tells you, it can make it harder to identify the smell, especially if the smells are similar, such as vanilla and chocolate, or lemon and lime.

Why are your fingertips more sensitive than the back of your arm?

Beneath the human skin is a network of nerves that are sensitive to pressure. When something presses down on the skin, these nerves register that pressure as the sensation of being touched. The density of these sensory nerves differs throughout the body. Areas of the body that require a lot of sensitivity, such as the fingertips and palms, have a lot of nerve endings. Other parts, such as the upper arm and back, have fewer nerve endings.

KEY VOCABULARY:

nerve: a cell that carries information from the brain to the body, and vice versa.

STATION 1: BRING IN THE NOISE

Use the tables to record the number of right and wrong guesses. Make a checkmark to show if each guess was correct or wrong.

EARS UNCOVERED

Trial	Correct	Wrong
1	Answers will vary	
2		
3		
4		
5		

ONE EAR COVERED

Trial	Correct	Wrong
1	Answers will vary	
2		
3		
4		
5		

Was it easier to tell where the sound was coming from with one ear uncovered or both ears uncovered?

[It was easier with both ears uncovered.]

STATION 2: NAME THAT SMELL

Smell each cup. Decide if the smell matches the picture. Record your observations in the table. Draw pictures or use words.

Cup	Picture	What do you think the smell was?	Did the smell match the picture (Circle Yes or No.)
1	Answers will vary		Yes No
2			Yes No
3			Yes No
4			Yes No

5			Yes No
6			Yes No

Compare your guesses with the correct answers. Did you guess right?

[No, I mixed up chocolate and vanilla.]

Why do you think that is?

[I think that sometimes your eyes help you know what a smell is.]

(Grades 2–3 only) Station 3: Can You Feel It?

Have your partner record your guesses in the tables below. Use pictures or words.

UPPER ARM

Object	Guess	Correct (Circle Yes or No.)
	Answers will vary	Yes No
		Yes No
		Yes No
		Yes No
		Yes No

FINGERTIPS

Object	Guess	Correct (Circle Yes or No.)
	Answers will vary	Yes No
		Yes No
		Yes No
		Yes No
		Yes No

USE YOUR SENSES

TEACHER KEY

Was your arm or your fingertips better for guessing the object?

[fingertips]

How do you know?

[It was easier to guess when I used my fingertips. I was right more of the time.]

USE YOUR SENSES

STATION 1: BRING IN THE NOISE

Use the tables to record the number of right and wrong guesses. Make a checkmark to show if each guess was correct or wrong.

EARS UNCOVERED

Trial	Correct	Wrong
1		
2		
3		
4		
5		

ONE EAR COVERED

Trial	Correct	Wrong
1		
2		
3		
4		
5		

Was it easier to tell where the sound was coming from with one ear uncovered or both ears uncovered?

STATION 2: NAME THAT SMELL

Smell each cup. Decide if the smell matches the picture. Record your observations in the table. Draw pictures or use words.

Cup	Picture	What do you think the smell was?	Did the smell match the picture (Circle Yes or No.)
1			Yes No
2			Yes No
3			Yes No
4			Yes No

5			Yes No
6			Yes No

Compare your guesses with the correct answers. Did you guess right?

Why do you think that is?

(Grades 2–3 only) Station 3: Can You Feel It?

Have your partner record your guesses in the tables below. Use pictures or words.

UPPER ARM

Object	Guess	Correct (Circle Yes or No.)
		Yes No
		Yes No
		Yes No
		Yes No
		Yes No

FINGERTIPS

Object	Guess	Correct (Circle Yes or No.)
		Yes No
		Yes No
		Yes No

Directions: Lorem Ipsum Dolor

		Yes	No
		Yes	No

Was your arm or your fingertips better for guessing the object?

How do you know?