

A TOUCHY SUBJECT (1 Hour)

Addresses NGSS

Level of Difficulty: 2

Grade Range: 3-5

OVERVIEW

In this activity, blindfolded students will use their sense of touch to organize materials according to texture.

Topic: Sense of Touch

Real-World Science Topics

- An exploration of how the sense of touch helps human beings understand and describe the world around them
- An exploration of the range of sensitivity of the human skin

Objective

Students will gain an understanding of the sense of touch and its sensitivity in various parts of the human body

NGSS Three-Dimensions

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Engaging in Argument from Evidence <ul style="list-style-type: none">• Construct an argument with evidence, data, and/or a model	LS1.A: Structure and Function <ul style="list-style-type: none">• Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.	Systems and System Models <ul style="list-style-type: none">• A system can be described in terms of its components and their interactions

Background Information

What is touch?

The sense of touch is conveyed by special cells in the skin that respond to different cues from the environment, such as temperature, pressure, vibration, or chemical reactions. These environmental cues are called stimuli (singular: stimulus), and the cells in the skin that respond to these stimuli are called sensory receptors. Although our other senses are localized to a specific region on our bodies (for example, the sense of sight is localized at our eyes), touch occurs throughout the body, wherever skin comes in contact with the environment. When our skin interacts with a stimulus, the receptors send signals to our brain via nerves in the central nervous system. As a result, we experience the sensations of hot, cold, pain, and pressure.

How sensitive is our skin?

Sensory receptors are distributed unevenly throughout the skin. For example, fingers and lips provide very detailed senses of touch whereas the back of a leg provides only general sensitivity. The most sensitive parts of our body contain more nerve endings to help protect them from damage. Our face, feet, and hands contain the most nerve endings.

Key Vocabulary

Touch: one of the five senses; the transmission of information from the environment through sensory receptors in the skin, nerves, and brain

Nerve: a bundle of fibers that transmits signals throughout the central nervous system
stimulus: something in the environment that evokes a response

Skin: the largest organ in our body; skin contains sensory receptors that respond to stimuli

Materials Needed for Demonstration

- Thermos of hot water
- Thermos of ice water
- Two identical bowls
- Blindfolds

Materials Needed for Each Pair of Students

- Blindfold
- Set of various grades of sandpaper from very fine to very course

Teacher Preparation

Cut various grades of sandpaper into small pieces, approximately 1 x 1/2 inch strips. Create one set, composed of a range of grades, of sandpaper per student team. Label each strip from a set with a letter. (For example, if there are five strips of sandpaper, label them A through E.)

- 1. Warm-up Activity:** Prepare the hot and cold thermoses of water at the front of the classroom. Ask for a volunteer to place his or her hand inside each of the thermoses. The student should verify that one contains hot water and one contains cold water. Then, ask for a volunteer to perform a blindfolded test. Pour the thermoses of hot and cold water into different bowls. Blindfold the volunteer and rearrange the bowls so that he or she cannot predict the temperature of either bowl. Guide the hands of the blindfolded volunteer so that one hand is above the hot water bowl and one hand is above the cold water bowl. Then, have the volunteer quickly dip his or her hands into the bowls simultaneously. (Be sure that the volunteer removes his or her hands very quickly.) Have the volunteer indicate which bowl contains the hot and which has the cold water. Results will vary with the individual. Allow other students in the class to participate in the blindfolded investigation. As a class, discuss the results. Have students think about the different sensations that are experienced with the skin (pain, hot, cold, and pressure).
- 2.** As a class, review the five senses. Have students identify the associated organ for each of the five senses (sight/eyes, hearing/ears, and so on). Focus student attention on touch. Explain that the organ used in the sense of touch is the skin and it is everywhere on the body rather than in one place. Tell students that skin has nerves, and these nerves are located under the skin. The nerves carry information from the skin to the brain, and they make our skin sensitive to the environment.
- 3.** Divide students into pairs. Pass out the Student Handout, the set of sandpaper samples, and a blindfold to each pair of students.
- 4.** Have students observe the sandpaper. (They should not touch the sandpaper.) What is different about each of the samples? Explain that "coarse" sandpaper has very large particles on it, while "fine" sandpaper is smoother, with very tiny particles.
- 5.** Explain to students that they will try to organize the sandpaper from finest to coarsest using only their fingers to observe each sample. To prevent students from looking at the sandpaper, one student from each student pair will be blindfolded as he or she touches the materials.
- 6.** Have one student from each pair tie a blindfold around his or her eyes. Then, have the sighted partners mix up the sandpaper samples randomly and help the blindfolded individual as needed to locate the various sandpaper samples. Once the blindfolded partner has decided on the order, the sighted partner should record the order in the data table on the Student Handout. Then, have the sighted partner mix up the samples and have the blindfolded partner attempt to organize the samples a second time. The sighted partner should record the data for this second trial.
- 7.** Once the blindfolded partner has performed two or three trials, have partners switch roles and repeat the investigation, with one partner wearing a blindfold and the other recording the results.
- 8.** Have students repeat steps 6 and 7 using different parts of their body such as an elbow, the back of their hand, their wrist, or their calf. Be sure students rub their skin very gently with the sandpaper so that they do not cut their skin.
- 9. Wrap-up Activity:** Once all students have had an opportunity to sequence the sandpaper samples on different parts of their bodies, call the class to attention and review the results of the exploration. Share with students the correct order of the sandpaper samples, from coarsest to finest. Were students able to organize the sandpaper by texture using their fingers? Were the results different for different parts of the body? Have students think about why this might be the case. Explain to students that different parts of the body have different amounts of nerves. The fingers have many nerves located close together under the skin, while other areas, such as the calves, do not have as many nerves. How could this explain the results in the investigation?

Extension Activity

1. As a class, name and describe the five senses (touch, smell, sight, hearing, taste). Identify the various organs used to sense our environment. Have students explain the importance of each sense and how each sense contributes to their ability to experience and describe their environment.
2. Have students explain the range and limitations of each sense and, if they are able, give examples of the types of instruments scientists and engineers have built to extend our senses. If you have examples of such instruments or equipment, hold them up and discuss each. Examples of tools and equipment used to expand the ability of human senses such as: binoculars, microscope, hearing aid, litmus paper, tweezers, smoke or carbon monoxide detector.

Sources

National Science Teachers Association

<http://nsta.org>

National Council of Teachers of Mathematics

<http://standards.nctm.org/document>

National Educational Technology Standards

<http://cnets.iste.org/currstands/cstads-netss.html>

Name:

Date:

In your own words, describe how you use your sense of touch to explore and understand your world.

[Answers will vary]

Part of Body	Trial number	Order of Sandpaper
[Fingers]	Trial 1	[A,C,B,E,D]
	Trial 2	[A,C,B,D,E]
[Elbow]	Trial 1	[C,A,B,D,E]
	Trial 2	[C,B,A,E,D]
[Calf]	Trial 1	[B,A,C,D,E]
	Trial 2	[C,B,E,A,D]

Which samples were most difficult for you to separate while blindfolded and using only your sense of touch?

[Answers will vary]

Which part of your body was best at organizing the sandpaper samples? Which was the worst?

[Answers will vary]

If you want to poke your friend to get his or her attention, which of the following body parts would you poke: hand, calf, or elbow? Explain your reasoning.

[Sample answer: I would poke my friend's hand because the hand is more sensitive to touch than the calf and elbow.]

Name:

Date:

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	Trial 2	
	Trial 1	
	Trial 2	
	Trial 1	
	Trial 2	

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Which part of your body was best at organizing the sandpaper samples? Which was the worst?

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