

SENSORY EVALUATION



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Background

Sensory Evaluation is defined as “A scientific discipline used to evoke, measure, analyze, and interpret those responses to products that are perceived by the senses of sight, smell, touch, taste, and hearing (Stone and Sidel 1993).”



All of the senses are important when eating. Think about eating a potato chip – first you **see** the chip (maybe you notice if it has any dark/burnt spots?). Next you **touch** it (maybe you notice if it's greasy, or if it's thick?). Then as you bring the chip to your mouth you **smell** it (maybe you smell the seasoning? Or the oil it was fried or baked in?), then you eat it and **hear** the crunch of the chip, and you probably also **taste** the saltiness (maybe you also experience some additional flavor?). Imagine if any one of these experiences was missing – would a chip be the same if you didn't hear it crunch in your mouth?

References

Lawless, HT and Heymann, H. 1998. *Sensory Evaluation of Food: Principles and Practices*. New York: Chapman & Hall.

Stone, H and Sidel, JL. 1993. *Sensory Evaluation Practices*. 2nd ed. Academic Press: San Diego.

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Administrator's Guide

The following experiment was prepared by Sarah Smith-Simpson.

Grade levels: 9-12

Estimated Preparation Time: 30 minutes

Estimated Activity Time: 30 minutes

Standard Addressed: Content Standard C (Behavior of Organisms)

Multicellular animals have nervous systems that generate behavior. Nervous systems are formed from specialized cells that conduct signals rapidly through the long cell extensions that make up nerves. The nerve cells communicate with each other by secreting specific excitatory and inhibitory molecules. In sense organs, specialized cells detect light, sound, and specific chemicals, and enable animals to monitor what is going on in the world around them.

Objectives:

- To introduce sensory science to students
- To have students voluntarily participate in a sensory test
- To demonstrate the effects of sight on your ability to identify and distinguish the taste of beverages

(Note: Be aware that some students may have food allergies or sensitivities)

Materials:

- 2 – 2 liters of lemon lime soda (ex., Sprite or Sierra Mist)
- Red and blue food coloring
- 6-8 oz. plastic cups (total should equal 2 times the number of students)
- Marker
- Ballots
- Calculators

Set-up Procedures:

1. Before class, color one 2-liter bottle of soda purple by adding approximately 20 drops of red food coloring and 20 drops of blue food coloring into the bottle. Gently shake the bottle to disperse the color.
2. Before class, color the other 2-liter bottle of soda red by adding approximately 20 drops of red food coloring into the bottle. Gently shake

the bottle to disperse the color.

3. Label half the cups with a random three-digit code (for example, 209), label the other half of the cups with a different random three-digit code (for example, 047). There should be enough labeled cups so that each student receives one of each sample.

Example: If there are 12 students in the class, there should be 12 cups labeled 209 and 12 cups labeled 047.

4. Immediately before the test, pour one of the beverages into one set of labeled cups, and pour the other beverage into the remaining cups.
Example: Pour the purple beverage into the cups labeled 209 and the red beverage into the cups labeled 047.
5. Prepare the order of presentation for each student—half the students should receive the purple beverage (209) first, half the students should receive the red beverage (047) first.

Example:

Balanced Random Code Presentations:

Student #1 receives sample order: 209, 047

Student #2 receives sample order: 047, 209

Student #3 receives sample order: 047, 209

Student #4 receives sample order: 047, 209

Student #5 receives sample order: 209, 047

Student #6 receives sample order: 047, 209

Student #7 receives sample order: 209, 047

Student #8 receives sample order: 209, 047

Student #9 receives sample order: 047, 209

Student #10 receives sample order: 209, 047

Student #11 receives sample order: 047, 209

Student #12 receives sample order: 209, 047

Student #13 receives sample order the same as Student #1, and so on...

6. Prepare the ballots (Total should equal 2 times the number of students; see next page for photocopies).
7. Prepare the data sheets.

Extension: This demonstration can also be done using colorless flavored water. For example, purchase two 1-liter bottles of flavored water (such as Fruit²O[®] raspberry) and color one bottle red with red food coloring and one bottle purple with red and blue food coloring. Follow the directions above for preparation and serving. Source: Jason Bolton, So There are Five Basic Senses, prepared as part of the NSF GK-12 Sensors Fellowship, University of Maine.

Taste sample _____ and circle the box that represents the intensity of that attribute.

How sweet is sample?

Not sweet at all Extremely sweet

How sour is sample?

Not sour at all Extremely sour

How intense is the fruit flavor of sample?

Not intense at all Extremely intense

Comments:

Taste sample _____ and circle the box that represents the intensity of that attribute.

How sweet is sample?

Not sweet at all Extremely sweet

How sour is sample?

Not sour at all Extremely sour

How intense is the fruit flavor of sample?

Not intense at all Extremely intense

Comments:

Data Sheet:

Attribute #

<i>Student</i>	<i>Red Beverage</i>	<i>Purple Beverage</i>
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
Mean (\bar{x})		
<i>Standard Deviation</i>		

Sensory Test Procedures:

1. Students can voluntarily participate, but should not be forced to participate because all sensory tests that include human subjects must be conducted on a voluntary basis.
2. Present the two drinks to students one at a time. Remember – half of the students should receive the purple beverage first, and half of the students should receive the red beverage first. Each student should also have a cup of water. Direct the students to have a sip of water in between samples.

3. Give students the ballot and ask them to rate the intensity of each attribute on the 9-point scale.
4. Have each student fill in the data sheets in the front of the class with their scores for each attribute (1=Not sweet at all, 9=Extremely sweet).
5. If time allows, calculate averages (means) and standard deviations.

Example Data Sheet: Attribute #1: Sweetness

Student	Red Beverage (X1)	Purple Beverage
1	7	5
2	8	4
3	7	6
4	7	5
5	6	5
6	7	5
Mean (x)	7	5

Standard Deviation 0.577

$$\text{Standard Deviation} = \sqrt{(1/N * ((X1-X)^2 + (X2-X)^2 + (X3-X)^2 + (X4-X)^2 + (X5-X)^2 + (X6-X)^2)}$$

N= total number of students

X1= rating for student #1

X= Mean

Example Standard Deviation Calculation: Red Beverage

$$\text{Standard Deviation} = \sqrt{((1/6)*(7-7)^2 + (8-7)^2 + (7-7)^2 + (7-7)^2 + (6-7)^2 + (7-7)^2)}$$

$$\text{Standard Deviation} = \sqrt{((1/6)*((0)^2 + (1)^2 + (0)^2 + (0)^2 + (-1)^2 + (0)^2)}$$

$$\text{Standard Deviation} = \sqrt{((1/6)*(2))} = 0.577$$

Ask the students:

1. Did you rate the sweetness levels of the two beverages differently?
2. Did other members of the class rate the sweetness about the same?
3. What about the sour or fruit flavor?
4. What flavors do you think the two samples are?
5. What affected your rating?
6. What other changes could be made to the beverages that would affect the ratings?

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Student Handout

Background: Humans have five senses: taste, smell, touch, sight, and sound. All of the senses are important when eating. Think about eating a potato chip — first you **see** the chip (maybe you notice if it has any dark/burnt spots?). Next you **touch** it (maybe you notice if it's greasy?) or if it's thick?). Then, as you bring the chip to your mouth, you **smell** it (maybe you smell the seasoning?) or the oil it was fried or baked in?). Then you eat it and **hear** the crunch of the chip, and you probably also **taste** the saltiness (maybe you also experience some additional flavor?). Imagine if any one of these experiences was missing — would a chip be the same if you didn't hear it crunch in your mouth?



Objective: To experience the effects of sight and smell on your ability to identify and distinguish the taste of foods and beverages.

Procedures:

1. You have just tasted two beverage samples and rated the intensity of each attribute on the 9-point scale.
2. Fill in the data sheets in the front of the class with your scores for each attribute (1=Not sweet at all, 9=Extremely sweet).
3. If time allows, calculate averages (means) and standard deviations.

Conclusion Questions:

1. Did you rate the sweetness levels of the two beverages differently?

2. Did other members of the class rate the sweetness about the same?

3. What about the sour or fruit flavor?

4. What affected your rating?

5. What other changes could be made to the beverages that would affect the ratings?
