

Lesson 1: Big Idea #1 – Computers perceive the world using sensors.

Grade Level: K to 2nd Grade

Overview

The students will explore the difference between sensation and perception with a concrete approach.

Purpose

Big Idea #1 – Computers perceive the world using sensors.

Just as humans explore the world with five senses (seeing, hearing, smelling, tasting, and touching), the ability of a computer to emulate sensation is possible through the development of AI. Students should understand that computers have sensors that help them understand the world around them and computers are learning to perceive.

CSTA K-12 Standards & AI K-12 Standards

- 1A-CS-02: Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware).
- 1A-DA-06: Collect and present the same data in various visual formats.
- Extension
 - 1A-IC-16: Compare how people live and work before and after the implementation or adoption of new computing technology.

Cross-curricular Opportunities with PA State Standards

Language Arts

- CC.1.4.B: Informative/Exploratory Focus
- CC.1.5.A: Comprehension and Collaboration – Collaborative Discussion
- CC.1.5.C: Comprehension and Collaboration – Evaluating Information
- CC.1.3.F: Craft and Structure Vocabulary

Vocabulary

- Sensing: How something looks, smells, sounds, tastes, and feels
- Perceiving: How our brain understands what it senses.
- Sensors: How a computer sees, hears, and feels things

Objectives

1. I can identify a computer's sensors. (CSTA K-12 Standard 1A-CS-02)
2. I can define sensing. (PA Language Arts CC.1.3.F)
3. I can define perceiving. (PA Language Arts CC1.3.F)
4. I can recognize AI modeling of perception. (CSTA K-12 Standard 1A-DA-06)

Get Ready

- White cardstock cut into shape from grade level template
- Assorted crayons or markers depending on chosen template
- Water and paper towels
- Smocks or protective clothing
- Rough, soft, smooth, smelly, loud, yummy items such as a ball, a stuffed animal, a scarf, a piece of candy or fruit, a drum or phone alarm, either realia or photos of the items.
- Clear tape
- Stapler and staples
- Worksheet #1.
- Picture of Optical Illusion (link to the picture in printable format)
- Picture of Cat 1
- Picture of Cat 2
- Picture of how a computer sees a cat

Procedure

Warm Up (5-10 minutes)

Goal: Help students understand that while we all may see the same thing, what we perceive can be different.

- Have students stand up. Show them that there are two areas marked in the classroom as “in” or “out”.
- Tell them you are going to show them a picture for 3 seconds. Depending on what they see, they are going to move to their area.
- Show them the Optical Illusion (Figure 1) picture for 3 seconds.
 - This time should be enough for your students to process the picture but not long enough to second guess themselves. They need to make an immediate decision.
- Tell them to move to the “In” side or “Out” side of the room depending on what they saw.
- Ask them what they saw and have fun with this!
 - What?! You saw a ball inside a cube?? Wait! YOU saw a ball outside a cube?!?! Well which is it? Inside or outside??
 - The goal is for them to start to realize that even though they all were shown the same picture, they perceived it differently.
 - Seeing happens with our eyes, but perception happens in our brain.
- Direct students to sit down where you conduct group instruction.

- Explain that even though we all were shown the exact same picture, we saw something different than someone else.
 - Why do you think this happened?
 - Was the picture the same?
 - Now that you are looking at it longer and know it can look different, do you see something else than what you first saw?
- This is the difference between sensing and perceiving.
- Review unit vocabulary.
 - **Vocabulary**
 - *Sensing: How something looks, smells, sounds, tastes, and feels. (Objective 2).*
 - Realia can help drive this word home. Let them feel, smell, look, and listen.
 - How does an orange smell?
 - What does the basketball feel like?
 - Is the stuffed animal soft?
 - How does this whisper sound?
 - Is the light bright?
 - *Perceiving: How our brain understands what it senses. How we perceive something is based on what we know. (Objective 3).*
 - Realia can help drive this word home.
 - Look at this stuffed animal. Is it soft? How do you know?
 - Look at this orange? How do you think it smells? Why?
 - What if you never smelled an orange?
 - Show a picture of a grapefruit (Figure 6). This is a grapefruit. Has anyone ever smelled a grapefruit? Ok, don't give it away!
 - For those that haven't, how do you think it smells? Why?
 - Our brains help us perceive things – even if we don't know it. Let's see how that works.

Sensing versus Perceiving (15-20 minutes)

Goal: Help students differentiate between sensing and perceiving.

- Hand out the cut templates to students based on grade level.
 - Kindergarten: Rectangles in Template 1

- First Grade: Choose either Rectangles in Template 1 or Circle in Template 2 depending on classroom level.
- Second Grade: Choose either Rectangles in Template 1 or Circle in Template 2 depending on classroom level.
- Give students crayons or markers and instruct them to color the templates as desired.
 - Kindergarten: Crayons.
 - They should not color the backgrounds on the Kindergarten templates. The fish can be a variety of colors.
 - First Grade: Crayons or markers depending on chosen template.
 - Second Grade: Crayons or markers depending on chosen template.
- After students have completed coloring their templates, you can help them construct their spinners.
- Test them out! What happens? Why?
 - Even though we see different pictures/colors, our brain perceives them as one picture/color! **(Objective 3)**.
 - Show Sensing V. Perceiving Graphic (corresponding graphic) on the SMARTboard if possible during the activity.
 - As students complete their spinners you can hand out worksheet #1: Sensing (*include a direct link to this resource*) or utilize corresponding SMARTboard/SMART Notebook resource (*include a direct link to this resource*). **(Objective 2)**.
 - Differentiation: This worksheet can be conducted as an individual task, a partner task, a small group task, or with large group instruction utilizing the SMARTboard resource depending on your class level and pace.
 - Extension: This worksheet can also be used as an extension activity.
 - As students complete Worksheet 1 you can hand out worksheet #2: Identifying Characteristics (*include a direct link to this resource*) or utilize corresponding SMARTboard/SMART Notebook resource (*include a direct link to this resource*). They will use this later if they complete it. **(Objective 3)**.
 - Differentiation: This worksheet can be conducted as an individual task, a partner task, a small group task, or with large group instruction utilizing the SMARTboard resource depending on your class level and pace.
 - Extension: This worksheet can also be used as an extension activity.

Tie In & Closing (10-15 minutes)

Goal: This is the time to tie in the concept of perception to AI.

- Have students gather for group discussion.
 - If there is a computer in the classroom, this is a good opportunity to point out these parts.
 - You can use the computer graphic to display.
 - Now we are going to tie in sensing to a computer.
 - Computers have sensors too!
 - Brainstorm how computers have senses. (**Objective 1**)
 - ✓ Cameras
 - ✓ Microphones
 - ✓ Speakers
 - ✓ Thermometers
 - ✓ Pressure sensors (in a keyboard)
 - But do computers have a brain?
 - Depending on time, students can brainstorm this.
 - With AI, the computer does have a brain and can perceive things.
 - Scientists are teaching computers to how to perceive.
 - Computers learn to identify a cat from many different views, for example. Then it can recognize the features of a cat and accurately determine it is a cat.
 - This is collecting data on the cat.
 - Show a picture of a cat (Figure 2).
 - Let's look at this picture of a cat. What do you see? (Students who completed this activity may answer quickly).
 - Pointy ears.
 - Whiskers
 - Nose
 - Round eyes
 - Show a second picture (Figure 3).
 - Does this cat have the same features?
 - Pointy ears.
 - Whiskers
 - Nose
 - Different eyes
 - Different mouth

- Show AI cat graphic (Figure 4). Computers are learning to perceive a cat from learning what cats should look like. **(Objective 4).**
- Let's remember the grapefruit. Some of you had never smelled a grapefruit but guessed what it smelled like. (Show the picture).
 - The computer, like you, can see a picture and perceive it. It will make a conclusion based on its experience and what it has learned.
 - Show a picture of a tiger (Figure 5)
 - Is this a cat?
 - What do you think will happen if I show this picture to the computer?
 - How many of you think it will say it is a cat? Why?
 - Who thinks the computer won't think it is a cat? Why?
- Extension: Students can draw a picture or write a sentence or paragraph about one of their senses and how it relates to a computer.
 - What senses do you have that a computer also has?
- Extension: Students can discuss how this technology can be helpful/harmful to society.
 - How can computers perceiving be helpful to humans?
 - Computer can now identify us to access our cell phones or computers.
 - Computers can help catch people speeding by reading license plates.
 - Computers can identify someone breaking the rules with facial recognition software.
 - How can computers perceiving be harmful to humans?
 - Computers can track us everywhere we go.
- Now you can review the "I can..." statements about what you have learned.
 1. I can identify a computer's sensors. (CSTA K-12 Standard 1A-CS-02)
 2. I can define sensing. (PA Language Arts CC.1.3.F)
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 4. I can recognize AI modeling of perception. (CSTA K-12 Standard 1A-DA-06)

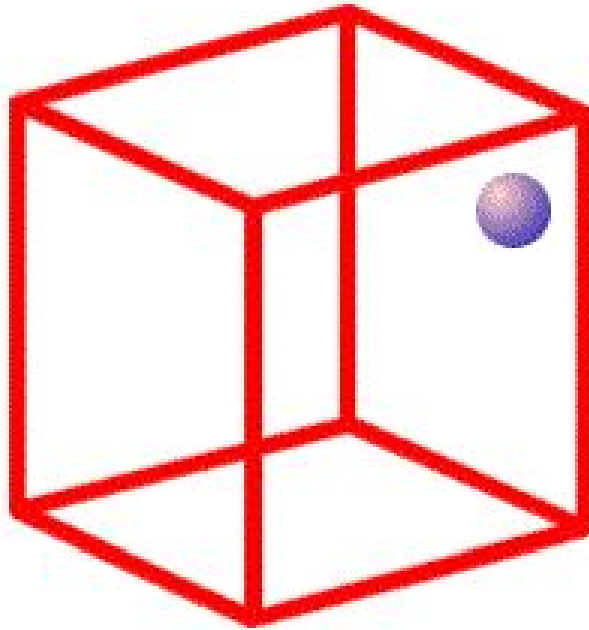


Figure 1: Optical Illusion



Figure 2: This cat shows traditional cat features.



Figure 3: This cat looks a little different.



Figure 4: How AI Sees a Cat



Figure 5: Would AI see this as a cat? Why or why not?



Figure 6: How does this grapefruit smell?