

# Robots and Sensing, Part I

*Cubelets SIX kits, 40 minute activity*

This lesson plan relates robots and sensing to human senses and reactions. Because this activity directs students to think about their own sensing and feeling, it is ideal for introducing younger students to robotics. Cubelets present the Sense, Think, and Act components of a robot in a discovery-based format that facilitates making connections between human senses and robotics while students play.

## For each class/group, this lesson plan includes 2 parts:

*Each segment is suggested to last 20 minutes in order to comprise one class of about 40 minutes.*

1. An “unplugged” section highlighting sensing and sensory information
2. A hands-on exploration of robotics components using Cubelets

Each segment is suggested to last for 20 minutes, with two segments comprising a 40 minute class. Where a class period affords less than 40 minutes, we suggest increasing time for each segment and using Part 1 as a single class and Part 2 as a single class activity the next day.

While these lesson plans have suggested age levels, it is also possible to use the younger student activities as a ramp up to older grades; e.g. use the 4 years old - 8 years old activities to ramp up and extend a lesson plan for a group of 9 year olds. Similarly, the activities suggested for older students can become a way to expand on challenges presented to younger learners if there is time and interest.



## Introduce each group to considering senses and sensory input:

“Sensing is when we get information about things around us from our bodies like touching something rough or smelling something good. What other senses do we have? (Try to get students participating by naming their senses - sight, hearing, touch, taste, smell.) What parts on our bodies do our sensing? What sees? What do we smell with? We sense things, animals

sense things, and today we’re also going to find out about robots sensing. First, let’s think about how senses work by testing our own senses and find out more about robot senses.”

# Part I: Simon Says Sensing

In this introduction, students have a chance to think about being able to process changes in sensory information as well as realizing their senses are not binary (on/off) but rather possessing the ability to perceive a spectrum of more or less input. Students can also investigate the results of getting sensory information from more than one source. “We’re going to play a game where you have to use your ears to decide if you should act. “

*Materials: radio or MP3 player/computer and speakers*

## Basic rules

1. When students hear music, they should wave their hands in the air. Louder music = more waving, Softer Music = less waving
2. When students hear clapping, they should sit down (No clapping = standing up)
3. We sense more than one thing at one time. When students hear clapping and music, they should sit **and** wave their hands. If it’s just music, then they should stand up and wave their hands. If there’s just clapping, they should just be sitting.
4. Simon says rules (may) apply! You can have your kids keep practicing different combinations, or you can impose an “out” if they wave hands when there is no music or forget to sit. Last person playing is the winner and can get a prize (being first to test their robot, a sticker, etc.)

## Suggested game progression

- “Our senses collect information about what’s going on around us. For this game, let’s use our ears to collect information. The first rule of this game is to wave our arms if we hear music. Everyone find a spot with room around them so that there’s no touching and you’re not too close to anyone else. I’m going to play something, and when you hear it, you should wave your arms.” (Play music)
- “Our senses can also tell if there’s a small amount of information or a large amount of information. One example is how we can hear big noises and small noises. So, now, when I play music, listen for a change in HOW MUCH you can hear. If it gets louder, wave your arms more. If it gets quieter, wave your arms less.” (Play music, changing the volume up and down.)
- “But, with our senses, we can collect information on more than one thing. Now, If I clap, you should sit down as long as I’m clapping. Let’s practice. “
- “What do you think should happen if I am clapping AND playing music? (Sitting down, but waving hands). And what should happen if you’re sitting down and I STOP clapping? (Stand up!) And what happens if the music stops? (Stop waving hands) And what happens if the music gets loud? (Wave hands more!) And what happens if it gets quieter? (Change and wave hands less)”
- “Let’s Play!”

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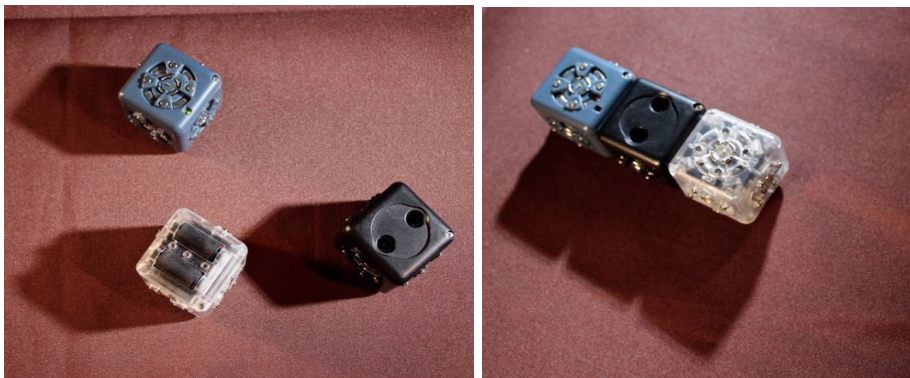
**Concepts presented:** sensing, sensory information, multiple senses, magnitude/amount  
**Vocabulary:** sense, stimuli, input, more, less, magnitude (how much)

## Part 2: Initial Cubelets exploration - Senses

*Materials: Cubelets SIX kits, groups of 1-4 students using each kit. Initially all groups use only the Distance, Drive, and Battery Cubelet*

Students work to understand what and how their robots sense. They are also exploring how changes and magnitudes of sensory information are detected

“Robots are computers that can sense, think, and act. Our robot senses are in these black sense cubes. Our robot action parts are in these clear cubes. Also, all robots need power, and the gray blocks are the battery or power blocks. The simplest robot we could make here has to have at least 1 black cube and 1 clear cube joined with a battery. I’m going to make our first robot using these three Cubelets (Demonstrate with Battery, Distance, and Drive, in that order) Now let’s see what we can find out about this robot sense.”



### Suggested age variations/progression:

- **4 years old to 6 years old:** Class investigation. “Let’s think about what it is sensing by seeing what makes the robot stop and what makes it go. What should we try? Does anyone have an idea of what our robot is sensing? Let’s hear your ideas and test them out. What could our robot be sensing? Take turns raising your hands with a suggestion and then you can come up and test it out. “ (Prompt students to try different ideas - can they clap for it? Tell it to move? Help them notice that whenever they come close to the black Sense Cubelet the robot moves! ) “Remember, robots might be sensing different things than humans sense.”
- **6 years old to 8 years old:** Individual Group investigation. “Now that you’ve seen me build a robot, I’d like for you to use the same three Cubelets and see if you can build a robot that works. (Have students also use the Battery, Distance, and Drive Cubelet, in that order) What do you think it is sensing? Try different things. Is there anything that works over and over for it to move?” (How close objects get to it. This is most powerfully demonstrated when the Distance Sense Cubelet gets close to a variety of objects, not just hands)
- **8 years old to 10 years old:** As above with 6 to 8 year olds.

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**Concepts presented:** Sensing, input  
**Vocabulary:** Sense, stimuli/input, reaction/output, behavior