cubelets
ROBOT BLOCKS

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Investigating THINK Cubelets

Lesson Overview

Students investigate the THINK Cubelets.

Students now have a deep and fluent understanding of how SENSE and ACT Cubelets work together in robot constructions. THINK Cubelets open a whole new level of Cubelets play. Students start with the most challenging THINK Cubelet: the Inverse. Then they release some of the tension by investigating the Passive and Bluetooth Cubelets. IF you have any other THINK Cubelets in your pack, include them today. Note: since this lesson is still app-free, the Bluetooth Cubelet will function like a Passive. When students begin to play with the Cubelets App and Blockly App, the Bluetooth will be essential to programming their robot constructions.

Lesson Tags

Grade Level
Intermediate (4-6)

Difficulty
Master

Duration
45 minutes

Prerequisite Knowledge
SENSE Cubelets
ACT Cubelets
How SENSE and ACT Cubelets normally interact

Supplies

Cubelets (6 groups of)
1 Distance SENSE
1 Brightness SENSE
1 Rotate ACT
1 Drive ACT
1 Flashlight ACT
1 Battery
1 Inverse
1 Passive

Other Supplies
Flashlight (at least 6)
Cubelets Anchor Chart
Claim-Evidence-Reasoning Worksheet
(2 per student)

Description

Outline

1. Review vocabulary and Group Norms
2. Students investigate THINK Cubelets
3. Class discusses investigation and adds THINK Cubelets to anchor chart
4. Students plan how they might use THINK Cubelets to build a robot construction.

Objectives
Students will investigate THINK Cubelets

Assessment
Teachers look for students who are strategically investigating the THINK Cubelets so they can make logical conclusions..

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Standards

ISTE

1.d. Students explore age-appropriate technologies and begin to transfer their learning to different tools or learning environments.
4.a. Students engage in a cyclical design process to develop prototypes and reflect on the role that trial and error plays.
4.d. Students demonstrate perseverance when working with open-ended problems.
5.d. Students understand and explore basic concepts related to automation, patterns and algorithmic thinking.

K12CS

Hardware and Software - Hardware and software work together as a system to accomplish tasks, such as sending, receiving, processing, and storing units of information as bits. Bits serve as the basic unit of data in computing systems and can represent a variety of information.

Modularity - Programs can be broken down into smaller parts to facilitate their design, implementation, and review. Programs can also be created by incorporating smaller portions of programs that have already been created.

NGSS

Planning and Carrying Out Investigations - Scientists and engineers plan and carry out investigations in the field or laboratory, working collaboratively as well as individually. Their investigations are systematic and require clarifying what counts as data and identifying variables or parameters.

Using Mathematics and Computational Thinking - In both science and engineering, mathematics and computation are fundamental tools for representing physical variables and their relationships. They are used for a range of tasks such as constructing simulations; statistically analyzing data; and recognizing, expressing, and applying quantitative relationships.

Vocabulary

Collaborate	Sense	Battery	Drive
Cubelets	Think	Distance	Flashlight
Robot	Act	Brightness	Rotate

Resources

Attachments

Claim-Evidence-Reasoning Worksheet

Tips & Tricks

- **Keep the lights dim or off during this lesson**
- Before class, have your groups planned - think also of what collaboration structures make the most sense for your class or your school. Possible team roles:
  - Materials Manager
  - Team Leader (in charge of making sure group stays on task)
  - Recorder

Pacing

5 minutes: Review Cubelets vocabulary and group-work norms
15 minutes: Students investigate THINK Cubelets & write Claim-Evidence-Reasoning statements
15 minutes: Class discusses investigation and adds THINK Cubelets to anchor chart
10 minutes: Students plan how they might use the Cubelets they know to build a robot construction

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Instructional Steps

Step 1 - Pre-class setup

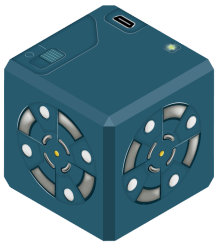
Time: 10 minutes

Cubelets Needed

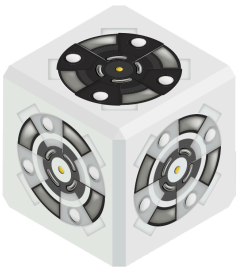
- ❏ Separate Cubelets into 6 groups, each containing:

1 Distance SENSE

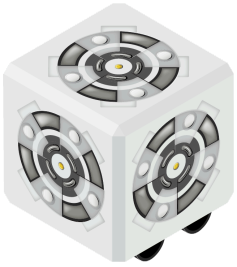
1 Brightness SENSE



1 Battery

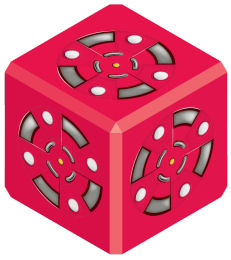


1 Rotate ACT

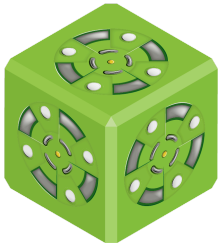


1 Drive ACT

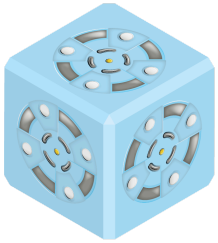
1 Flashlight ACT



1 Inverse



1 Passive



1 Bluetooth

- ❏ Prepare Anchor Chart to collect the names of the THINK Cubelets next to the Cubelets you already know - (Battery, SENSE Cubelets, and ACT Cubelets).

Classroom Management

- ❏ Plan 6 student groups (groups should be no more than 4 students, and are best with 2-3).
- ❏ Decide on collaboration roles that fit your classroom culture. Some ideas could include:
  - Materials Gatherer - the only team member that can leave the group. Gathers materials and puts materials away correctly.
  - Facilitator - responsible for making sure the group stays on task and follows directions.
  - Encourager - responsible for encouraging group members and making sure everyone has a chance to share their ideas
  - Time Keeper - monitors time to help team stay on track

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Step 2 - Cultivate Wonder

Time: 5 minutes

Review Cubelets Vocabulary and Group Norms

"What is a robot?"

- [A machine that can SENSE, THINK, and ACT]

"Excellent! Yes, SENSE, THINK, and ACT Cubelets all look very different from one another. We are already experts at SENSE and ACT Cubelets, so today you can become a Cubelets Master by exploring the other THINK Cubelets."

"First, let's remember the Group Norms we made on the first day of this Cubelets unit.

- Review ideas on Group Norm anchor chart.

"Today, you will be in groups of [2, 3, or 4] students. Each person will have a very specific job. [Review the jobs you decided on during your preparation for class]."

- Wrap up conversation by reviewing the group norms, separating students into their groups, and assigning group roles.
- Once students are in their groups, have them share with the other group members what their role in the group is.

Step 3 - Experience Before Expertise

Time: 15 minutes

Investigation

"Today is all about understanding the different THINK Cubelets. Be careful--THINK Cubelets are extra tricky. Spend some time putting the THINK Cubelet in the middle of your robot and then taking it out again. Try putting your THINK Cubelet in different places of your robot. Please only use one THINK Cubelet at a time while you try to figure them out. I promise, these are going to be your trickiest robot blocks yet!

- Groups get to work investigating THINK Cubelets one at a time.

Notes

★ Some teachers choose to use visual cues (like a necklace or a hat) to represent each group role.
★ It is recommended that one of your group norms be: Be respectful of materials. Cubelets are made for children and can sustain the hazards of normal play (falling off low tables, for instance), but are also machines that can break. Students may need help remembering to be gentle with Cubelets.

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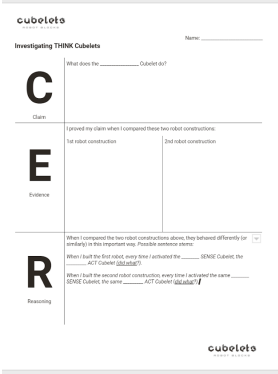
Step 4 - Co-Construct Meaning

Time: 15 minutes

Discussion

"Before we discuss what we think we learned about THINK Cubelets today, I'd like each of you to reflect on what you think you learned about each THINK Cubelet. You will fill out two of these pages - one for the green Passive Cubelet and one for the red Inverse Cubelet. For each Cubelet, you will first make a claim about what you think that robot block does. Then you'll provide an example of two robots you compared that proved your claim is true. Finally, you'll explain how those two robots behaved differently and how that proves your claim is true. When we're each finished with our independent reflection, we'll share our thinking."


cubelets

Name: _____

Investigating THINK Cubelets

C

Claim

What does the _____ Cubelet do?

E

Evidence

I proved my claim when I compared these two robot constructions:

1st robot construction

2nd robot construction

R

Reasoning

When I compared the two robot constructions above, they behaved differently (or similarly) in this important way. Possible sentence stems:

When I built the first robot, every time I activated the _____ SENSE Cubelet, the _____ ACT Cubelet (did what?)

When I built the second robot construction, every time I activated the same _____ SENSE Cubelet, the same _____ ACT Cubelet (did what?)

cubelets

- Students fill out Claim-Evidence-Reasoning worksheets

"What did you learn about the THINK Cubelets during your investigation today?"

- [INVERSE makes the SENSE do the opposite]
- [PASSIVE doesn't do anything]
- [BLUETOOTH doesn't do anything….yet]
- **Add definitions to Anchor Chart**

Step 5 - Check for Understanding

Time: 10 minutes

Application

"What are some robot constructions you might be able to build with these THINK Cubelets?"

- Students share out

Materials Managers put away Cubelets.

Differentiation - Intervention & Extension

Time: NA

Intervention

You may choose to pull students who struggle with this concept together into one group with you. The Inverse Cubelet is the trickiest one, and having an adult to moderate the scientific inquiry process can be very helpful for students. You may even choose to have an anchor chart where you record students' thinking so they can see the difference between a robot construction *with* an Inverse and a robot construction *without* an Inverse.

Extension

For students who very quickly figure out what each THINK Cubelet does, ask them to use Legos and brick adapters to make their robots "come to life" with what they think it could do or be.