Want to edit this document? Make a copy first!

Cubelets Challenge

Lesson Overview

Students will use critical thinking skills to build a specific robot based on a description.
One important philosophy behind Cubelets is there is no wrong way to build. Also, there are always multiple ways to design successfully. Today, students will be introduced to this understanding when they rotate between three different stations trying to address the same challenge at each *but with different combinations of Cubelets*. Based on your knowledge of your students and your classroom, teachers may choose how to divide their Cubelets among the groups - just make sure each group has a Battery, Rotate, Drive, Brightness, and Flashlight at the very least!

Lesson Tags

Grade Level
7+

Difficulty
Master

Duration
55 minutes

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

Supplies

Cubelets (6 groups of)
Try making different stations each with a unique combination of Cubelets. All stations should have at least a Rotate, Drive, Brightness, Flashlight and Battery. It is up to you how to divide the rest of your Cubelets among the stations.

Other Supplies
Sticky Notes

Description

Outline

1. Teacher gives challenge, students design to meet challenge constraints
2. Students draw models of their designs
3. Students rotate to a different station and design to meet challenge constraints.
4. Rinse and repeat.
5. Students share their responses to the challenges

Objectives
Students will use computational thinking skills to build a specific robot based on a description using different Cubelets combinations.

Assessment
While students are working, teachers collect data on student collaboration skills, perseverance, creativity, and the ability to revise their robots as they work. Students should be building with intention and use Cubelets-specific vocabulary to describe their design.

How did this lesson work for you? Let us know! goo.gl/bKXj6Z
Check out **our newest resources** at *www.modrobotics.com/thehub*

Want to edit this document? Make a copy first!

Standards

ISTE

1.c. With guidance from an educator, students recognize performance feedback from digital tools, make adjustments based on that feedback and use age-appropriate technology to share learning.
4.b. Students use age-appropriate digital and non-digital tools to design something and are aware of the step-by-step process of designing.
4.c. Students use a design process to develop ideas or creations, and they test their design and redesign if necessary.
4.d. Students demonstrate perseverance when working to complete a challenging task.
5.b. With guidance from an educator, students analyze age-appropriate data and look for similarities in order to identify patterns and find solutions.
5.d. Students understand how technology is used to make a task easier or repeatable and can identify real-world examples.
7.d. With guidance from an educator, students use age-appropriate technologies to work together to understand problems and suggest solutions.

K12CS

Modularity: Complex programs are designed as systems of interacting modules, each with a specific role, coordinating for a common overall purpose. These modules can be procedures within a program; combinations of data and procedures; or independent, but interrelated, programs. Modules allow for better management of complex tasks.

NGSS

Developing and Using Models: A practice of both science and engineering is to use and construct models as helpful tools for representing ideas and explanation. These tools include diagrams, drawings, physical replicas, mathematical representations, analogies, and computer simulations.

Vocabulary

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

Resources

Attachments

NA

Tips & Tricks

- Depending on your classroom routines and your students, you may decide students should record their robot models in a shared space for other groups to use as inspiration, or students may leave their solutions in an envelope to compare with other groups at the end of the class. This is up to the teacher's discretion because you know your students best.

Pacing

5 minutes: Teacher gives challenge.
15 minutes: Students design robot to meet challenge constraints and record the robot that is *closest to successful* to leave at the station.
15 minutes: Students rotate to a new station and attempt to meet the same challenge with a different combination of Cubelets.
10 minutes: students compare their models with each other.
10 minutes: students reflect on their new understanding of how Cubelets can work together and record a few unanswered questions they may still have.

How did this lesson work for you? Let us know! goo.gl/bKXj6Z
Check out **our newest resources** at *www.modrobotics.com/thehub*

Want to edit this document? Make a copy first!

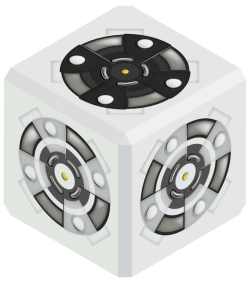
Instructional Steps

Step 1 - Pre-class setup

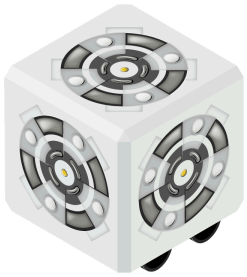
Time: 10 minutes

Cubelets Needed

- ❏ Separate Cubelets into 6 groups, each containing:



- ❏ Rotate

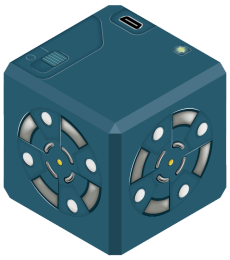


- ❏ Drive

- ❏ Flashlight

- ❏ Brightness

- ❏ Distance



- ❏ Battery

- ❏ Unique assortment of Cubelets at each station.

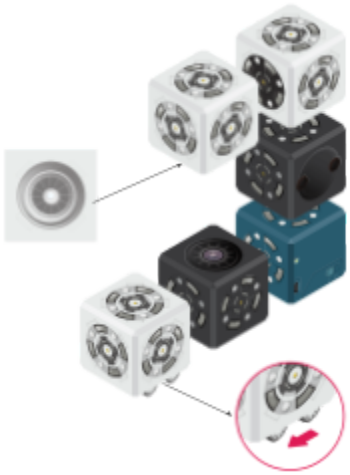
Want to edit this document? Make a copy first!

Before class, try to solve this challenge yourself so you know what your students will be experiencing:

- ❏ Build a robot that:
  1. Has a SENSE Cubelet that senses an ACT Cubelet
  2. *You may need a sticky note to cover your Brightness Cubelet if the room is too bright where you are working*

Think you did it? Congratulations! One way to build this robot is:

(but there are many other solutions, too)



Step 2 - Cultivate Wonder

Time: 5 minutes

Challenge

"We already know that SENSE Cubelets detect information from their environment that they then broadcast to the other robots in their robot construction. Today, we're investigating how many different robots we can build that SENSE themselves. What does this mean to you?

- Class discusses what this challenge means.

Step 3 - Experience Before Expertise

Time: 30 minutes

The Challenge

"You will rotate through three stations today, each of which has a different combination of Cubelets to address this challenge. During each rotation, you will have fifteen minutes to design and build your robot construction and record it at the station for others to use as inspiration later. Then you will rotate to a new station that has a different combination of Cubelets for you to use to try to address this challenge. "

- Teacher walks around using the Questions Guide to ask purposeful questions as students work.
- When a group successfully completes the challenge, ask them to design another solution to the challenge. Challenge them to use a different SENSE Cubelet than their original design used to achieve the same behavior.
- **For the first 10 minutes,** students collaboratively design their robot construction.
- **For the last 5 minutes**, students collaboratively draw a model of their most successful robot to leave behind for the discussion at the end.

Students rotate to a new station every 15 minutes to engage with a different combination of Cubelets.

Notes

★ It is important that every group records *their most successful robot* for the class discussion.

Want to edit this document? Make a copy first!

Step 4 - Co-Construct Meaning

Time: 10 minutes

Compare Models

"Some stations proved more challenging than others- and each group encountered different challenges along the way. Let's see what each of our groups came up with at each station."

- Teachers can choose how to organize this discussion. You may separate your class into thirds to discuss the two stations they went through since not everyone rotated through the same two stations. Or you may have the class stay together to discuss as a group.
- Regardless, host a discussion analyzing and comparing the models of Cubelets constructions left at each station.

Step 5 - Check for Understanding

Time: 10

Exit Ticket (optional)

Explain how you think Cubelets work together giving an example from class today--either at the stations or from the discussion afterward. Add at least one question (maybe more) that you feel is still unanswered.

Materials Managers put away Cubelets.

Differentiation - Intervention & Extension

Time: NA

Intervention

For students who are struggling, start them off with a challenge of a LightHouse Robot (a tower with the Rotate spinning the Flashlight at the very top). Then ask them if they can create a robot that has the Flashlight shine ***at*** the Brightness SENSE Cubelet. Then ask them if they can combine those two challenges to help them with the class challenge.

Extension

For students who are excelling at robot design, consider having them create robot challenges for each other. You could also provide them some Legos to accessorize their robots.