A ROBOT or not?

OBJECTIVES

- Students will observe, compare, and contrast a selection of tools as they develop a strategy to sort robots from other tools.
- Students will describe relationships between structure and function as they determine if their object is a robot.
- Students will communicate and justify their classification by sharing the function and other features of their object with their peers.
- Students will explore local STEM careers as they identify and describe a robot at work within their community.

INTRODUCTION

In this activity students will compare and contrast a variety of tools and develop a series of criteria to distinguish a robot from another tool. Then they will brainstorm a list of robots at work within their home, school, and community. Students will select one robot to research. They will explore STEM careers as they create a profile for their robot. Optionally, students may submit completed profiles to the Cedar Valley Robot Week Website. Select profiles will be added to the Virtual Robot Tour annually.

Robots are specialized tools. Like other tools, robots assist humans by making a task (or multiple tasks) easier, safer, cleaner, faster, or more efficient in some other way. For this activity, we will define a robot as **a reprogrammable tool that is capable of completing a task on command or according to instructions**. Some robots are programmed by their manufacturer, some by their user, and some by both. A tool is anything that can be used as a means to accomplish a task or purpose. In Part I students will develop a definition and criteria for identifying a robot.

Robots are identified and classified in many different ways. One popular method of classifying robots is to divide them up by how they move (stationary, aerial). Cedar Valley Robot Week classifies robots by the work that they do (medical, educational, industrial).

Every robot has a job, a task to complete. Every robot also represents one or more STEM jobs. Robots are designed by engineers and maintained by technicians and programmers. Robots work side-by-side with scientists, doctors, machinists, educators, mathematicians, utility workers, and more.

We can learn a lot about the STEM Careers in our community by exploring the work of the robots that are all around us. Students will do just that in Part 2 of the activity.

MATERIALS - PART 1

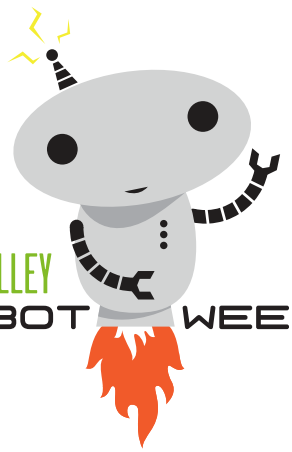
A wide variety of tools, 1 per every 2 students (including simple machines through robots)

Examples:

- Alarm Clock (required)
- Claw hammer
- Door jam/Wedge
- Screwdriver with adjustable head
- Flat iron
- Lint brush
- Automatic stapler
- Laser pointer
- Scissors
- Mechanical pencil
- Label maker
- Cat automatic laser toy
- Electric pencil sharpener
- Cell phone
- Tablet
- Digital camera
- Sewing machine
- Bar code scanner
- Motion controlled window alarm
- Electrical timer
- Digital thermometer
- Kitchen timer
- Rain gauge
- GPS unit

Also:

- Note cards or post-its
- A white board/bulletin board



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CEDAR VALLEY ROBOT WEEK

MATERIALS - PART 2

- Robot types handout
- Robot profile hanout and/or Submit a Robot Online
- Access to the web
- Digital camera/Phones with camera (optional)

PART 1 - WHAT IS A ROBOT

Introduction

Begin by introducing the students to an alarm clock.

"Today we are going to develop a list of robots at work in our community. Before we do this, we must be sure that we all know what a robot is. I'd like to start by introducing you all to a robot from my home. My robot is an alarm clock."

Present the alarm clock to the class and ask, *"What about this alarm clock makes it a robot?"* Collect their ideas about what makes an alarm clock a robot. Come back to the ideas and refine the criteria as the students investigate their assigned tools.

If the students have a difficult time thinking of an alarm clock as a robot, help them along using some of this text:

"Without it, I might not make it to school on time! I program my alarm clock to wake me up at a specific time. I can reprogram it to wake me up later on Saturdays. Or if I don't set the alarm, it won't wake me up at all. My alarm clock is a robot because it is programmed to do a job and it can do that job on command."

Activity

Divide the students into pairs. Provide each pair with a different tool. All of the items are tools, ranging from simple machines to robots, they all can be used to complete one or more specific tasks. Some of the items are robots. Start by making sure every group knows what their item is. Allow the rest of the class to assist if any group doesn't recognize their tool. Ask each pair to examine their tool and determine:

- *What is the name of their tool?*
- *What is it used for? What is it's job?*
- *How does it work?*
- *Is it a robot?*
- *Why or why not? How do they know?*

Give the pairs time to discuss their tool and write the answer to the questions on a note card or post-it notes. Move between groups, listening to the language they are using to describe the tool. As needed, ask additional probing questions:

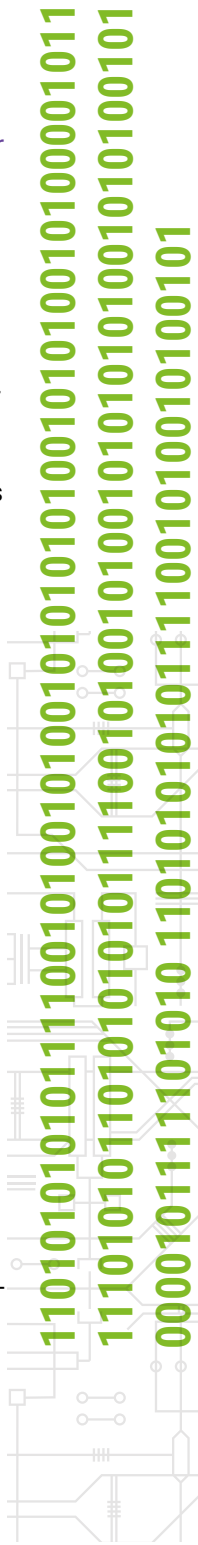
- *Who uses this tool? Can anyone use it or does it take special skills?*
- *Where are you most likely to find this tool? Why?*
- *Is the tool used for one task or many?*
- *Is the tool adjustable?*
- *Can the tool complete a task on its own? Can it complete any part of its task on its own?*
- *Do you know of any other tools that are used for the same task? If so, are they more or less complex than this tool?*

On a wall/bulletin board/white board distinugush two areas: Robots and Non-Robots (for older students: Simple Machines, Complex Machines, Robots).

Give each pair of students a turn to introduce their object to the class and post its name under the category that they believe it fits. Allow the class to ask questions. Encourage the students to discuss how robots are different from other tools and as a class build a list of criteria for identifying a robot. Throughout the activity, allow teams to move their tool into the other category if they wish.

As a whole class come to consensis about which objects are robots and which are other types of tools. You might also include a category for 'probably robots' if the group can't decide.

For example, when we piloted this activity, the students couldn't decide if a digital camera with a timer qualified as a robot or a complex tool. It could autofocus, it could take a photo using a timer, but it still required a lot of human assistance. They thought that autofocus and a timer were not quite enough automation to count as a robot. A person still has to select what is photographed, place the camera, set the timer, etc. They thought that a camera with time-lapse was definitely a robot because it can be set up and then left alone to complete its work over long periods of time. Then when asked if any of them could reproduce an image of a moment in time as accurately as a camera, many in the group changed their mind - maybe a camera is a robot. Making a hard distinction between robot and tool is not as important as being able to justify their own criteria and building an understanding that robots are complex reprogrammable tools that can complete tasks on their own. Robots take on tasks that are repetative, dangerous, dirty, or impossible for a human to do alone.



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Review the list of robots, then as a class, brain storm other robots they know about that are not on their list. How many robots do they interact with in a day? Can they think of robots in their home, at school, in the community? How many robots can they come up with in 5 minutes? If students can't think of many robots in their community, use the virtual tour on the CVRW website. Keep the list of robots for Part 2.

PART 2 - ROBOTS IN OUR COMMUNITY

If possible, complete this part of the activity in a computer lab or allow students to BYOD (bring your own device) so that each pair/group has access to the web to research their robot. Provide each student with the Robot Types Handout from www.cedarvalleyrobotweek.com (or use the online version). In their original pairs or in small groups, review the list of robots created in Part 1. Categorize the class list of robots into the robot types from the CVRW website. If you have web access, allow the students to explore the virtual tour of robots at CVRW. Are some of the robot's they identified on the tour? Which ones are not?

Assign each pair/group of students to research and write a profile for a robot (preferably one not already profiled on the website). Use the Robot Profile Handout to draft their profiles or ask older students to research and write reports. Students will identify the robot's name and it's job. They will also investigate who uses/works with the robot. The depth of detail expected in the robot profiles can vary by student age, availabilty of technology to do the research, and amount of time available. If desired, have students transfer the information from their profile handout into a poster about their robot.

End by having the students share their final robot profiles with the class or with another class. They should share what they know about the robot, it's role in our community, and any discoveries they made about local STEM jobs related to their robot.

WEB RESOURCES

- **www.cedarvalleyrobotweek.com**
- **JPL Robotics: www-robotics.jpl.nasa.gov/index.cfm**
- **see more links and articles on our pinterest board for CVRW: www.pinterest.com/stematuni/cedar-valley-robot-week/**

STANDARDS

Primariliy this activity is designed to help students discover that our community is full of robots as the context for exploring local STEM careers. However, throughout the activity students are expected to use their own preivious experience and seek out additional information in order to define and categorize robots and other tools and in order to discover jobs that involve working with and designing robots.

NGSS Practices

Obtaining, Evaluating, and Communicating Information

- 3-5 Communicate technical information orally and/or in written formats, including various forms of media.
- 6-8 Communicate technical information (e.g. about a proposed object, tool, process, system) in writing and/or through oral presentations.

NGSS Crosscutting Concepts

Structure and Function

- K-2 The shape and stability of structures of designed objects are related to their function(s).
- 6-8 Structures can be designed to serve particular functions.
- 9-12 The functions and properties of designed objects and systems can be inferred from their overall structure, the way their components are shaped and used.

NGSS Disiciplinary Core Ideas

ETS1.A Defining and delimiting an engineering problem.

ASSESSMENT

Suggested assessment points for this activity are when student pairs communicate to peers their criteria for determining if their tool is a robot and their completed robot profiles.

ROBOT PROFILE

Copy Page

CEDAR VALLEY ROBOT WEEK

Robot's Name: _____

Description: _____

What is your robot's task? How does it accomplish this task? Where does your robot work? How do you know it is a robot?

_____

_____

_____

Circle the type of Robot:

How does this robot help humans? _____

_____

_____

Who designed this robot? _____

_____

Who works with this robot? _____

_____

Attach a photo of your robot or draw a picture on the back of this page.

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