Lesson 4: What is a Computer?

Overview

Question of the Day: What is a computer?

In this lesson students develop a preliminary definition of a computer. To begin the lesson, the class will brainstorm possible definitions for a computer and place the results of this brainstorm on the board. Next, students will work in groups to sort pictures into “is a computer” or “is not a computer” on poster paper. Groups will place their posters around the room and briefly explain their motivations for choosing some of their most difficult categorizations. The teacher will then introduce a definition of the computer and allow students to revise their posters according to the new definition.

Purpose

This lesson builds on the problem solving theme of the earlier lessons and focuses on the specifics of how computing is used in problem solving. In this lesson, students will consider different types of computers and that these computers use information as part of the problem solving process. Upcoming lessons will dive much deeper into what an information problem looks like and how computers solve these problems.

Assessment Opportunities

1. **Identify a computer as a machine that works with information.**

   In the last discussion of the main activity, check students' reasoning about whether a device is a computer. Make sure that they are mentioning that it uses information or solves information (or thinking) problems.

2. **Reason about whether particular objects are or are not computers.**

   In the last discussion of the main activity, check students' reasoning about whether a device is a computer. Make sure that they are mentioning that it uses information or solves information (or thinking) problems.

3. **Choose problems that can be solved with computing and justify those choices.**

Objectives

Students will be able to:

- Choose problems that can be solved with computing and justify those choices.
- Identify a computer as a machine that works with information
- Reason about whether particular objects are or are not computers.

Preparation

For each group

- Print out copies of the activity guide. Note there are two sets of pictures, but each group only needs a single set.
- Scissors (if you will not have time to cut the pictures prior to class)
- Poster paper
- Markers or colored pencils
- Glue or tape to attach pictures

Links

Heads Up! Please make a copy of any documents you plan to share with students.

For the teachers

- **CSD Unit 1 - Problem Solving and Computing** - Slides

For the students

- **What is a Computer** - Video (**Download**)
- **What is a Computer (Version A)** - Activity Guide
- **What is a Computer (Version B)** - Activity Guide

Vocabulary

In the wrap up activity, check that students have chosen information problems and have explained how a computer gets and uses the information needed to solve the problem.

Standards

Full Course Alignment

CSTA K-12 Computer Science Standards (2017)

▶ **CS** - Computing Systems

Agenda

Lesson Modifications

Warm Up (5 minutes)
Computers then and now

Activity (35 minutes)
Computer or Not?
Present Your Categorizations

Wrap Up (5 minutes)
Journal

- **Computer** - A machine that works with information.

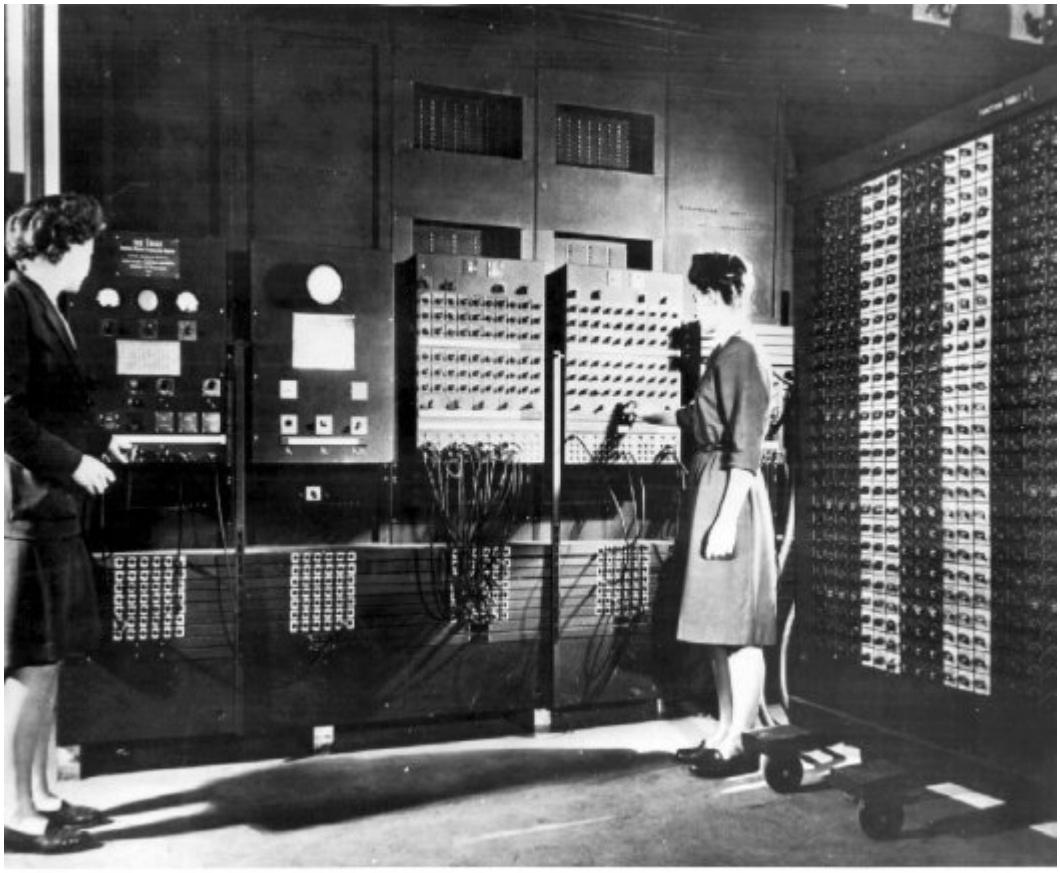
Teaching Guide

Lesson Modifications

 **Attention, teachers!** If you are teaching virtually or in a socially-distanced classroom, please **click here** to access modifications that can be used during this lesson.

Warm Up (5 minutes)

Computers then and now



Journal Prompt: This picture shows one of the world's first computers, and two of the world's first computer programmers. What are three ways this computer is different from computers that we use today? What are two ways that it is the same? What is one thing you think is true of ALL computers?

Discuss: Once students have reflected in their journals, they can share out their ideas "popcorn" style, with each student who shares an idea calling on a new classmate to share next. Run this conversation as a brainstorm, recording ideas on the board. Note and call out similarities in characteristics. Students may come up with counter examples for some of the common characteristics. Remind them that you are brainstorming and that it's important to consider all of the possible ideas, and that they will have more time to think about this question in the lesson.

Discussion Goal

Goal: This warm up starts students thinking about what the defining characteristics of a computer are. Students do not need to have a definition of a computer, but they should start to think about the different types of computers in their lives and what they have in common.

Note: The programmers pictured are Elizabeth Jean Jennings Bartik and Frances Bilas Spence. The computer pictured is the ENIAC.

Remarks

> Computers come in all different forms, and they've changed a lot over the years. Today we're going to think about what makes something a computer.

Question of the Day: What is a computer?

Activity (35 minutes)

Computer or Not?

Group: Place students in groups of 3 or 4

Distribute: Activity Guide as well as scissors, markers / colored pencils, poster paper, and glue / tape for making posters. (Note that there are two possible versions of the activity guide. Choose the best for your class, or give different groups different versions.)

Teaching Tip

Modifications from the Forum: Many teachers have shared ideas for extending modifying lessons on the forum **(link)**. Head there to check out ways teachers have reduced printables, integrated technology, or otherwise adapted this activity to fit the needs of their class. If you do something new, share your ideas too!

Give students the following directions:

- Draw a line down the middle of your poster, label one side "Computer" and the other "Not a Computer"
- Discuss as a group which of the objects in your set (from the activity guide) belong in each category
- Once your group is in agreement tape your objects to the appropriate side
- Develop a list of characteristics your groups used to determine whether an object is a computer

Circulate: Circle the room as students work to categorize the different images on the activity guide. Encourage groups to talk openly about their ideas and explain why they do or don't think an object should be categorized as a computer. For groups that can't decide on a categorization, ask members to defend their points of view, and try to reach a consensus. Assure groups that it is okay if one or two people disagree, and that everyone's point of view should be respected.

Teaching Tip

Tape First: Students will have an opportunity to update their categorizations later in the lesson. For now they should just tape their objects to their poster or even just place them on the correct side.

At the end of the time bring the class back together and ask them to place their posters at the front of the room.

Present Your Categorizations

Share: Have each group briefly present their posters, focusing their discussion on the following points

Teaching Tip

Comparing Categorizations: There are two different sets of objects in the activity guide. The first page of each set is identical while the second pages are different. This will mean all students will see some objects that they categorized already and some that are new. Use this to help drive conversation.

1. What rules or definition did you use to categorize your objects?
2. Which item was most difficult for you to categorize? How did you eventually make the decision of where to place it?

Invite the audience to respectfully question any categorizations if they disagree with the presenting group's decisions.

Remarks

> As you can see, it's not always clear whether something is a computer, and even experts sometimes have different points of view. Let's have a look, however, at a definition that we'll use throughout this course.

Display: Show **What is a Computer**. This video is also available to students on the Code.org website, including an alternative link for schools where YouTube is blocked. The video presents a computer as a machine that helps with certain kinds of thinking work by manipulating information. You may want to present the definition as "a machine that works with information".

Questions to think about with the video:

- What made computers different from machines that came before them?

1 **Video: What Makes a Computer, a Computer?**

Discussion Goal

After watching the video, students should understand that computers are machines designed to help people with thinking work, as opposed to physical work. Within a problem solving context, computers are designed to solve information problems. Subtleties may come up in the discussion around computers that have output mechanisms that allow them to do physical work (e.g. robots). It's okay if students do not come to a particular conclusion about every device they can think of.

Key Vocabulary:

- **computer:** a machine that works with information

Allow students to revise their posters using the definition they have just learned. They can use the following questions to guide them.

- What types of problems is this device used to solve?
- Does the device use information to solve problems?
- Where does it get the information?
- How does it use the information to solve problems?

Discuss: Did any groups change their minds about whether something was a computer? What about the definition convinced you?

Assessment Opportunity

Rather than looking at how particular items are categorized, check students' reasoning about whether a device is a computer. Make sure that they are mentioning that it manipulates information or solves information (or thinking) problems, and prompt them with the scaffolding questions if they are unable to give a sufficient definition.

It may be impossible to tell from the picture alone whether or not an item is a computer. Reassure the class that even experts often disagree about what exactly is or is not a computer.

Wrap Up (5 minutes)

Question of the Day: What is a computer?

Key Vocabulary:

- **computer:** - a machine that works with information

Journal

Prompt: Today you've had a chance to look at a definition of a computer that focuses on how the computer solves problems. We've also seen many different types of computers. In your journal, think of a problem that a computer can help you to solve.

- What is the information problem?
- What information does the computer need to solve that problem?
- What type of thinking work does the computer need to do to solve the problem?

Teaching Tip

Identifying Information Problems: Students are still developing an understanding of what information is or what an information problem that a computer could help solve looks like. Have students share their ideas if you like but frame the conversation as a first investigation of this question since they'll return to it repeatedly for the rest of the unit.

Assessment Opportunity

Check that the students have chosen information problems and have described how information can be used to solve the problem. The answers do not need to be specific enough to program into a computer, but should give enough of a general description to justify that it is an information (or computational) problem.