

Lesson 1: Representation Matters

Overview

Question of the Day: How does data affect decisions we make every day?

In the first lesson of the data unit, students get an overview of what data is and how it is used to solve problems. Students start off with a brief discussion to come to a common understanding of data. They then split into groups and use a data set to make a series of meal recommendations for people with various criteria. Each group has the choices of meal represented in a different way (pictures, recipes, menu, nutrition) that gives an advantage for one of the recommendations. Afterwards, groups compare their responses and discuss how the different representations of the meal data affected how the students were able to solve the different problems.

Purpose

This lesson introduces a number of important ideas that students will explore in this chapter. They'll see that the same objects can be represented in a number of different ways. In Chapter 1 they'll learn the different representation systems that computers use to represent information. They'll also see in this lesson that representation matters when we use data to make decisions. In Chapter 2 of this unit students will explore more deeply how data can be used by humans and computers to make decisions.

Assessment Opportunities

1. **Provide examples of how representing data in different ways can affect its ability to solve different problems.**

WIn the discussion at the end of the activity, students should identify how the nature of each problem lent itself to a particular representation.

2. **Choose the best way to represent some information based on how it will be used.**

In the discussion at the end of the activity, students should justify the "better" and "worse" representations within the context of the various problems they were asked to solve.

Objectives

Students will be able to:

- Choose the best way to represent some information based on how it will be used.
- Provide examples of how representing data in different ways can affect its ability to solve different problems.

Preparation

- Print copies of the Meals Data resource so that each group can get one of the four pages
- Print one copy of the activity guide for each group

Links

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

For the teachers

- **CSD Unit 5 - Data & Society** - Slides

For the students

- **Representation Matters** - Activity Guide

Standards

CSTA K-12 Computer Science Standards (2017)

► **DA** - Data & Analysis

Agenda

Warm Up (5 minutes)

Journal

Activity (35 minutes)

Person 1

Person 2

Person 3

Person 4

Reflection

Wrap Up (5 minutes)

Journal

Teaching Guide

Warm Up (5 minutes)

Remarks

Today we're going to start talking about data and how it's used in computer science. Before we start, let's take a few minutes to think about what data is.

Journal

Prompt:

- What is data?
- How do you use data in your life?
- How can data help you solve problems?

Teaching Tip

Offer Encouragement: If students have a hard time getting started, remind them that this is really just a brainstorm, and they will be working on answering these questions for the entire unit. Data may have different definitions depending on context (mobile phone plan, math class, etc.). Encourage the students to think of different situations in which they have used data, and remind them that there is no one "right" answer.

Discuss: Give students a few minutes to think on their own about what data is, and then allow them to share quietly with a partner. After all students have had a chance to speak to each other, share as a whole class, writing the ideas down in the front of the classroom.

Discussion Goal

Goal: Students should understand that data is information that has been collected about the world. They should see that data could be any type of information, not just numbers.

Remarks

These are all great ideas. We're going to spend the rest of the unit looking more closely at what data is, where it comes from, and how it can help us in computer science. For now, we're going to define data as "Information that's been collected to help us to answer a question or solve a problem."

Question of the Day: How does data affect decisions we make everyday?

Activity (35 minutes)

Group: Put students into groups of 3-5

Distribute: Give each group a copy of the activity guide and one of the four versions of the Meals Data resource. Make sure at least one group has a picture resource, one the menu resource, one group the nutrition resource, and one group the recipe resource.

Display: Read through the instructions for this activity. Each group of students will make a meal recommendation to four different people, and they must justify their recommendation with only their group's data. Because different groups have different data sets, the difficulty of the recommendations will vary from group to group.

Circulate: Allow students to complete the activity in their groups. Monitor conversations to ensure groups are discussing each others ideas, and making reference to the data they have.

Teaching Tip

Dealing with Frustration: Because each group will only have adequate information for one of the four recommendations, students may become frustrated that they cannot find the "right" answer. Reassure them that there's not always a "right" recommendation, and that the most important part of the exercise is for them to explain why they made their choice.

Representation Matters

Person 1

"I am allergic to eggs."

Although the menu and pictures may help somewhat, the recipe data set is the only one that tells the students the ingredients in each meal.

Teaching Tip

Questions and Assumptions about the Given Data: During the discussion, some students may note that chilaquiles often have eggs. This is a good chance to point out that if the data about the meal was collected in a way that didn't include information about the ingredients, then they didn't have enough information and made the best decision based on the data that they had. Remind students that although it's reasonable to make certain assumptions, that only with the relevant data can they be confident in their decisions.

Person 2

“My doctor said to eat less sodium.”

Those with the nutrition data should see which meal has the lowest sodium content.

Person 3

“I’m trying to save money.”

Those with the menu data set should see prices for each meal.

💡 Teaching Tip

Using the Data You Have: For any of these questions, students may have reasons to choose a different answer, or complain that it’s not fair that they did not have all the information that they needed. Remind them that the activity is about using the data they have in a reasonable way, not necessarily getting a particular answer.

Person 4

“I want to post a nice picture of it online.”

While the recommendation for this one is more subjective, the group with the picture data set is in the best position to make an informed recommendation.

Reflection

After making the recommendations, groups should choose the recommendation that they thought was the easiest to make, and explain their reasoning.

Share-Out: When all groups have completed the worksheet, come back together as a class and ask one person from each group to share the answers and reasoning for each recommendation. As the groups share answers and reasoning, allow them to see each other’s data sets.

Display: As groups share the datasets they used, use the slides to highlight their data so the entire class can see

Prompt: Now that you’ve seen all of the different ways we represented the four meals, think about what makes a way of representing something good or bad. Do you think any of the representations were better or worse than others? What made them better or worse?

Discuss: Allow students to reflect on their own before discussing with a partner. Ask a few partners to share with the class.

✔ Assessment Opportunity

Goal: Students should understand that different representations are good for solving different problems. As they explain which representations are better or worse, make sure that they are justifying their choices within the context of particular problems they were asked to solve in the activity. They should recognize that each representation had advantages and disadvantages for different problems, and identify how the nature of each problem lent itself to a particular representation.

Remarks

When we collect information about the world, we have to make choices about what is important for us to include in our representations. The choices that we make affect what kinds of problems we can solve with our data. In the next few lessons, we'll talk about how computers represent data and how we use that data to solve problems.

Wrap Up (5 minutes)

Journal

Prompt: Today, you saw four different ways of representing a meal, and how those different representations were useful for solving different problems.

- Why were some representations more useful than others?
- If you were to create a way of representing a meal, what would be the most important things for you to think about?