

# Decisions Using Data!

## Unit Overview

The purpose of this unit is to introduce students to what data is, how to collect, visualize, and present data, and how to use data to make predictions or decisions.

The unit culminates in students performing their own surveys of the class and then presenting their results based on the data they gathered. The unit does **not** require computers, but teachers seeking a computer component can have students use Google Forms to collect, visualize, and present their data for the survey project. There is a separate Remote Version for teachers teaching remotely that makes the use of Google Forms more explicit.

**Lesson 1: What is Data?** - Students will be able to define data and use data to predict an outcome. (DA-04)

**Lesson 2: Cause/Effect in Science** - Students will be able to identify the effects of an event and given a set of data, be able to identify when a certain event occurred. (DA-04)

**Lesson 3: Designing Surveys** - Students will be able to gather data through surveying. It will help them gain a better understanding of quick, simple data collection. (DA-03, DA-04)

**Lessons 4/5: Modeling and Interpreting Survey Results** - Students will learn how to visualize data through the use of different types of graphs such as bar charts and pie charts. They will also be able to interpret what these results mean and draw conclusions from them. (DA-03, DA-04)

*Note: Lessons 4/5 are effectively one lesson, but since it is longer, we describe it as being 2 lesson plans.*

**Lessons 6: Presenting Data** - Students will present their data collected to the class. (DA-03, DA-04)

# What is Data?

## Decisions Using Data: Lesson 1

### Lesson Overview



Introduction

5 minutes



Using Data for Decision-Making

10 minutes



Using Data for Predicting

10 minutes



Reflection

5 minutes

### Standards

DA-04 Communicate using data



## Introduction

Today, we are starting a new unit on “data.” Have some students share what they think of when they hear the word “data.” After a couple of students share their thoughts, you can say that data is simply “pieces of information.” Now, the question is, why is data important? You can again call on a couple of students to answer why they think data is important, before stating that data can be used to share an idea, make a decision, or predict what might happen in the future.



## Using Data for Decision-Making

Now students will participate in an activity that models an example of using data to make a decision. Say that the class is a soccer team and they are trying to choose a color for their uniforms. What are some ways the group can decide on a color when there's a lot of people on the team? Ask the students to share their answers and try to get responses beyond just voting. Some examples include randomization, having parents/guardians or the teacher choose, or choose it based off of a mascot or school colors.

Voting as a group is usually the best option, so we'll use this as an example of how to get more information about what the group likes and organize it to make a decision.

Ask students for suggestions for five different uniform colors, and list them on the board in a quick table:

	Vote One	Vote Two
Red		
Blue		
Green		
Yellow		
Pink		



## Using Data for Decision-Making (cont.)

First, have students vote for their favorite color, but they only get one vote. After tallying the votes under Vote One, you can ask the students to share what this says about what the group should do as a team.

Next, have the students vote again, but they can vote multiple times. If a student likes red and blue, they can raise their hand for both of these options. After tallying these votes under Vote Two, have the students discuss how this was different from the first vote and what this says about what the group should do.

This is a really important idea in data collection; how the questions are structured makes a significant difference in the information that is collected and the conclusions that we can generate.



## Using Data for Predicting

The previous activity used data to communicate an idea. Now the students will use data to try and predict an outcome. In this activity, students will try to guess each other's favorite food using collected data. Ask for suggestions for foods and make a table as shown below.

Foods	Votes
Pizza	
Tacos	
Hamburger	
Pasta	

Now, have the students quietly think about their favorite food without letting revealing what their choice is.



## Using Data for Predicting (cont.)

For this activity, we can employ a student helper to make it more engaging, so choose a student and give them a piece of paper. Have them step out into the hallway and write down their favorite food from the options in the table then wait to be called back inside.

The rest of the class will conduct a blind vote. Everyone closes their eyes and raises a hand when their favorite food is called out. Like the first round of the previous activity, each student can only vote once. When the votes have been tallied, have everyone in the room open their eyes.

You can have the students turn and talk to their neighbor about how they can use data to make a prediction about the missing student's favorite food.

Now bring the student back in the room but have them not share out their answer yet. Ask the students in the classroom to predict what the student's favorite food was and have them justify their response.

Students share out and then have the missing student give their real response. The students can discuss if the prediction was accurate, and what that means about how to predict outcomes using data.



## Reflection

- Why is data helpful?
- What are some ways that we used data today?
- Do you think it is better to have more data or less data when you are making a choice? Explain your answer.

# Cause/Effect in Science

## Decisions Using Data: Lesson 2

### Lesson Overview



Introduction

5 minutes



Guided Cause/Effect in Weather

10 minutes



Cause/Effect in the Forest

10 minutes



Reflection

5 minutes

### Standards

DA-O4

Communicate using data

### Materials

1

1 Wk. Grph (prvd.)

2

2 Wk. Grph (prvd.)

3

Deer Pop (prvd)

4

Paper and Pencil



## Introduction

Today's lesson will be looking at data to determine cause and effect relationships. It would be helpful to review the last lesson by having students volunteer to answer the following questions: What is data? How can we use data to make a decision? How can we use data to predict an outcome?

A cause and effect relationship is when some event happens that **causes** an **effect**, which can be something new that happens or something being changed. One example is cutting a piece of paper in half to get 2 smaller pieces of paper. Cutting the paper is the cause, and the effect is the one piece of paper is now two pieces of paper! Ask the students to think of more cause and effect examples. Be sure to say why something a student says is or is not a cause and effect relationship.



## Cause and Effect in Weather

The first activity will be guided then the next one will allow the students to work through one more independently. Show the students the first graph provided, One Week Weather Graph, showing the average temperatures for each day in a week. Ask the students if they notice any cause and effect relationships here. Have them work in small groups for 1-2 minutes to figure something out. Have someone share the cause and effect relationship they found. Call on volunteers until someone correctly answers that the rain caused the temperatures to drop.



## Cause and Effect in Weather (cont.)

Now show students the next graph, Two Week Weather Graph, with average temperatures over two weeks. Let the students work together for a few minutes to hypothesize which days it rained on. Students should be able to identify it rained on the days where the temperatures dropped afterwards: both Wednesdays and the second Monday.

Through the activity, the students have synthesized information by figuring out there is a cause and effect relationship between rain and temperature and using that to hypothesize what days it rained on!

Tell the students that cause and effect relationships unfortunately are not always true. For example, the weather might get colder even if it didn't rain, and even if it does rain the weather might not get colder. However, the data is useful in that it allows us to make an educated guess about information that we do not know.



## Cause and Effect in Forest

For the second activity, show the students the Deer Population Graph.

Introduce it by saying that it shows us the amount of deer in a certain forest over time. At some point, a population of wolves moved into the forest. Have the students work with the person next to them and write down the year they think the wolves moved into the forest and why. Also have them write down what year they think there will be no deer left in the forest and why.

Give the students 5-7 minutes to work on this. Then, call on students to volunteer their answers and make it clear what the correct answers are. (Correct answers: Wolves moved into the forest in 2003, and since the population has been decreasing by 100 each year since then, we should hypothesize the population would reach 0 in 2 years, 2007)



## Reflection

- What is an example of a cause and effect relationship?
- Why is being able to identify cause and effect relationships useful?

# Designing Surveys

## Decisions Using Data: Lesson 3

### Lesson Overview



#### Introduction

5 minutes



#### Surveying

20 minutes



#### Reflection

5 minutes

### Standards

DA-O3 Organize and Present Data

DA-O4 Communicate using data

### Materials

1 Writing Utensil

2 Paper



## Introduction

This lesson will introduce students to using surveys through an interactive activity. Start by saying that today, the students will try to plan a party using the class's preferences. After explaining the goal, ask for suggestions on how to collect this data. You can provide feedback on the suggestions and then guide the classroom to one method: surveys.

Remind students of the first lesson in this unit when they voted on what color their soccer uniforms should be. That was an example of a survey with one question, but surveys can have many questions!



## Surveying

Since the students are not sure what to get for the class party, surveying the classroom will help solve the problem. Provide the students with three general steps on collecting surveys, but try not to provide too much guidance so that they brainstorm on their own. For example, the first step is to create questions. The students should discuss what kind of questions to create on their own.

Here are the three steps.

1. Create the Questions
2. Ask the Questions
3. Tally the Results



## Surveying (cont.)

The students should follow these steps and produce the results. The activity, overall, can be conducted in groups, pairs, or individually. This activity will allow students to not just gather data, but also compare their results with each other. Also, if desired, the teacher could use the results to throw the students a real party!

Note: If you have access to computers, you can have students create their surveys using Google Forms if you'd like! Here is a Youtube video explaining the basics of Google Forms: <https://www.youtube.com/watch?v=fhA1A5T-Zc8>

Choosing this option will slightly modify the next two lessons, as will be discussed there.



## Reflection

- How similar or different is your data compared to your peers? Why do you think it is similar or different?
- What made you ask the questions you asked?
- Did you expect different results? If so, why? Why do you think they were different?
- How could your survey collecting improve? What are the pros and cons?

# Modeling and Interpreting Survey Results

Decisions Using Data: Lesson 4 & 5

## Lesson Overview



Introduction  
5 minutes



Graphing and Interpreting Results  
20 minutes



Group Work - Design Posters  
30 minutes



Reflection  
5 minutes

## Standards

DA-O3 Organize and Present Data

DA-O4 Communicate using data

## Materials

1 Posters

2 Rulers

3 Colored Pencils



## Introduction

Remind students that in our last lesson they designed a survey of questions, administered the survey, and collected the results. Now that they have data to work with, this lesson is about visualizing data!



## Graphing and Interpreting Results

While we could just present our results by saying what the most popular answer to each survey question was, a more interesting and powerful way to share our survey results is by using graphs. Ask if anyone knows different types of graphs. Take student responses and write them on the board.

The two we will focus on are bar graphs and pie charts.

Display or draw a simple bar graph on the white board and go over what everything means.

- On the x-axis (along the bottom), we want to place our different options. For example, if this was a question about favorite ice cream flavors, we would put the different ice cream flavors here.
- On the y-axis (up the side), we put the number of responses for the corresponding category. For each option, we draw a bar up to the number of votes that option got. For example, if 10 people said their favorite ice cream was vanilla, we would draw a graph with a height of 10 for vanilla.
- The most popular result is the one with the largest bar - the least popular result is the one with the smallest bar.



## Graphing and Interpreting Results (cont.)

If you want, you can show that you can do a horizontal bar chart, and draw the axis for one on the board. Ask the students this time what you should put on each axis, and how we can tell what the most popular/least popular data points are.

Next, display or draw a pie chart on the white board and go over what everything means.

- Each piece of the pie is divided up based on all of our different options
- How big a piece is refers to the number of votes that option received. The larger the piece, the more people that chose this option.
- The biggest segment is the most popular result and the smallest segment is least popular.
- With pie charts, the key thing is to understand about how big each piece should be compared to the other pieces. Make two pie charts with this example data, one with correct piece sizes and one with incorrect piece sizes and have students vote on which one makes more sense given this data: Vanilla - 10, Chocolate - 20, Strawberry - 15, Mint Chocolate Chip - 5



## Design Posters

Students should work in the same group that they did to make the surveys. They will work on posters to represent their survey data. They can use bar charts or pie charts. You can tell them to use a mix of different ones for different questions to practice making both.

Have the students write interpretations of their data next to each graph - what the most popular choice was, what the least popular choice was, etc.

Note: If you chose to use Google Forms in the previous lesson, you can have students create their charts using Forms instead, which will do most of the work for them.



## Reflection

- Why is having graphs useful?
- How is the data presented better using graphs? If at all?
- Compare and contrast bar graphs and pie charts and their usefulness.

# Presenting Data

## Decisions Using Data: Lesson 6

### Lesson Overview



Introduction  
5 minutes



Gallery Walk  
20 minutes



Reflection  
5 minutes

### Standards

DA-O3 Organize and Present Data

DA-O4 Communicate using data

### Materials

1 Posters/Graphs



## Introduction

Note: If you chose to use Google Forms to create the surveys and visualize the data, everything in this lesson plan is the same except students will present their results on their computer instead of using posters.

We are ending the unit by having students present their survey results to the class! Remind students that everyone worked hard on these projects, and that we want to show support for each other and be very respectful. Also, it's good to ask questions about the survey questions and results.

Start by telling students how we will be doing the presentations. If you have your own desired presentation method, feel free to use it. Otherwise, here's a method you can use:

Assign each group as either being Red or Blue. The Red groups will present their results first. Students in the Blue groups will have sticky notes and walk around to learn about the different apps. You can time it so that groups rotate every 3 or so minutes, with each Blue group starting at a Red group's poster. The Red groups will explain what questions they asked, why they asked them, why they used the graphs that they chose, and what their final results were. Students then can write down a piece of positive feedback for the presenters.

After the Blue groups have finished rotating through, switch sides so that the Blue groups are now presenting, and repeat!



## Gallery Walk

Now to do the presentations as described above! (unless you're using your own method)

Before students begin listening to presentations, give them some sticky notes or note cards that they can write short feedback on and give to the groups they listen to. Some examples of what they can write are "My favorite question you asked was ....", or "I like how you displayed this result" The feedback should not be generic like "good job!" It should include something specific from that poster.

As the presentations are happening, circulate the room listening to presentations and also make sure that all feedback is respectful and positive. If students are not following instructions, pause the presentations, review expectations with them, and then resume.



## Reflection

- What is something you saw on other students posters that you liked?
- What do you think you did well on in this assignment?
- What is something you would do differently next time?

# Resources

Monday	Tuesday	Wednesday	Thursday	Friday
68°F	69°F 	62°F	64°F 	58°F

Monday	Tuesday	Wednesday	Thursday	Friday
58°F	60°F	59°F	53°F	54°F
Monday	Tuesday	Wednesday	Thursday	Friday
57°F	49°F	52°F	45°F	48°F

Deer Population in Wonder Mountain Forest

