



Teacher Guide for Lessons 1-4

Krill Prefer Chill

[LESSON 1](#) * [LESSON 2](#) * [LESSON 3](#) * [LESSON 4](#)

Lesson 1 – Random Samples

Materials:

- Video: Our Planet: Frozen Worlds
- Presentation: Random Samples
- Article: Getting the Measure of Krill

Standard: 7.SP.1 Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.

Essential Question: How can you use a sample to gain information about a population?

Learning Objective: I can collect accurate data to answer a question about a population.

If you have time to watch any parts of the first YouTube video, it gets students excited about krill. The first 20 minutes talk about multiple different animals that eat krill.

The next video specifically focuses on collecting samples of krill and data on their populations. This ties random sampling to our overarching theme of krill.

The following directions are posted on the speaker notes of the slideshow.

Slide 5: Students should already know these. This should be a refresher. Explain to your students that there are multiple different ways to find the “Average” of a data set. These are the three ways that we, as mathematicians, will use to analyze different data sets. It is important to really understand your data in order to find the “average” that you believe best represents it.

Slide 6: Students should already know these words. This should serve as a refresher.

Slide 7: Ask students this question and have them discuss it in groups. Suggest discussing things such as: Who would you ask? When would you ask? What format would you ask the question (multiple choice, short answer)? What things might affect your final result?

Slide 8: Cover these two vocabulary words, make sure students understand the difference between a sample and a population.

Slide 9: Think about where you get your samples from. If you are trying to get data on the number of birds that suffer from a disease, you are not going to visit your local rehabilitation center for birds. You will go into their natural habitat and take samples. It needs to match the question you are asking!

Slide 10: Make sure that students understand the difference between a bias and random sample.

Slide 11: When students are collecting data they have to think about these specific questions. This will help ensure that they are able to collect a random sample.

Slide 12: Now that students have some background knowledge, you are going to use this question to talk about collecting data.

Slide 13: Have students identify what the population is. If you need to prompt them say, “Would we want to survey people that live in Texas?”

Slide 14: Have students come up with different ways you could reach the largest percentage of the population. Try to get a better response than just “ask people”. Make students give you specifics. Who are you going to ask? How are you going to ask them? Where are you going to ask them?

Slide 15: Should you ask people “Have you been unsafe and tested positive for Covid-19”? Why or why not?” Students should come to the realization that people will feel offended, be unwilling to answer your question, or may be more inclined to lie due to feeling judged. It could change the outcome of the response. Your question also needs to be unbiased.

Slide 16: There are many different strategies students can use. All of them will work as long as they are chosen at random.

Slide 17: Have students show you on their hands 0-5 do they feel as if they can meet the learning objective.

Lesson 2 – Dot Plot

Materials:

- Presentation: Dot Plot
- Khan Academy video: Frequency Tables and Dot Plots
- Student Dot Plot Packet (English and Spanish)
- Teacher Dot Plot Packet Answer Key

Standards:

7.SP.1 Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.

7.SP.2 Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.

MP. 4 Model with Mathematics

Essential Question: How can you compare two sets of data displayed in dot plots?

Learning Objective: I can use dot plots to draw conclusions from a random sample.

The following directions are posted on the speaker notes of the slideshow.

Slide 3: Give some examples of how to read the below dot plot.

“This dot plot shows that 3 people said 1. I know this because there are three dots above 1.”

“Which number had the most responses? 7 and 9, I know this because 7 and 9 are the same height. I could count the dots to double check.”

“This dot plot shows that 4 people answered 6.”

Have students make a statement about the dot plot to a partner.

Slide 4: This is not required but would help cement the understanding of what a dot plot is. We suggest skipping the part about the frequency table.

Slide 5: If you can, project this on a board or somewhere for students to see. Then have them vote, using a sticky note or expo pen. If you do not have this option, you are able to draw your own number line and have students vote in a different way.

Things to discuss:

What is the range that you should have on your number line? Is it actually reasonable to have -1 pets? (The answer is no). Should your number line go all the way up to 100 pets? When creating dot plots, you need to know how to pick a reasonable interval and range.

Visually, how is the data displayed on this dot plot? Are all the answers clumped in one area? Are there any data points that do not match the rest? Looking at this visually, what do you think the average is?

After these discussions, have students find the mean, median, range, and mode of the data.

- Mean: All added together and divided by how many data points you have.
- Median: The middle number in the dot plot
- Mode: Which data point occurs most?
- Range: Largest data point - smallest data point

Slide 6: If you would like students to practice this on their own, give them this data set.

Dot Plot Packet

Pass out **Dot Plot Packets**. Read through the first two pages together.

Complete the first two dot plots together. For Celsius, have the range go from -6 to 2 degrees. For Fahrenheit, have the range go from 22 to 30 degrees.

Then have students work through the first page independently.

For the next three dot plots, have students pick EITHER Celsius OR Fahrenheit. They should use the same range as the previous plots.

Finally, students should draw some inferences from the plots.

Here is a sentence frame for number 10:

Based on the plots and averages, I believe that the temperature in Antarctica is _____.

The dot plots show a _____.

The averages are _____.

Lesson 3a – Box and Whisker Plot

Materials:

- Presentation: Box and Whisker
- Video: Antarctic Krill
- Khan Academy: Construct a Box and Whisker plot
- Student Box and Whisker Packet, English and Spanish
- Data for Box and Whisker
- Teacher Box and Whisker Packet Answer Key

Standards:

7.SP.1 Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.

7.SP.2 Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.

MP. 4 Model with Mathematics

Essential Question: How can you compare two sets of data displayed in box and whisker plots?

Learning Objective: I can use box and whisker plots to compare krill populations and rising temperatures.

The following directions are posted on the speaker notes of the slideshow.

Slide 4, 5, 6: Go through definitions and make sure students understand them.

Slide 7: This is not required but would help cement the understanding of what a box and whisker plot is.

Slide 8: Somewhere where students can see, write the 5 different points you will need.

Median(Q2), Q1, Q3, Min, Max. Make a list of the number of siblings students in your class have. Order them numerically. Find the 5 points you need in order.

Things to discuss:

Visually, how is the data displayed on the box and whisker plot? Is the box small or spread around the graph (the box represents the middle 50% of the data)? Are there any data points that do not match the rest? Looking at this visually, what do you think the average is?

After these discussions, have students find the median and range of the data.

- Median: The middle number in the dot plot
- Range: Largest data point to the smallest data point

Slide 9: If you would like students to practice on their own, here is a number list.

Slide 10: When we begin to talk about krill populations and compare them to changing temperatures, it is important that students know that correlation between the two factors does not mean one caused the other.

Box and Whisker Plot Packet

If you want students to have to order everything numerically, only provide them with the krill abundance sheet. THIS WILL TAKE EXTRA TIME. If you would like them to focus on the box and whisker plot process, you can also print out the different spans of time in numerical order.

Pass out packets and data. Read through the first two pages together.

Complete the first two box and whisker plots together. We suggest having the intervals be either 2,500 or 3,000 krill.

Then have students work through the rest independently while being available for questions.

For the next three box and whisker plots, emphasize the importance of labels and titles.

Finally, students should draw some conclusions from the plots.

Here is a sentence frame for number 9:

Based on the plots and averages, I believe that the krill population in Antarctica is _____.

The plots show a _____.

The averages are _____.

Lesson 4 – Carbon Footprint

Materials:

- Presentation: Carbon Footprint
- Video: The Carbon Footprint Explained
- Website: International Student Carbon Footprint Calculator
- Class Data collection tools/examples
- Poster Rubric
- Random number generator (many calculators also have this function)
- Random Sample Tracker

Standards:

7.SP.1 Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.

7.SP.2 Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.

MP. 4 Model with Mathematics

Essential Questions: How can we accurately calculate our carbon footprints? What is the average carbon footprint of a (grade your students are in)?

Learning Objectives: I can calculate my own carbon footprint. I can draw conclusions about a population given a set of data.

If students have limited knowledge of carbon footprints, have them watch the video. Then have students try to define what a carbon footprint is in their own words. For example, have them write it down, say it to a partner, then share with their table group, and then have a whole class discussion.

The rest of the slideshow will walk students through how to find their carbon footprint and submit it to a class dataset. We found it easiest to create a Google Form into which the students could submit their data. An example of how to set up a Google Form is included in the lesson. Make sure that students are only writing down a number in the form, NO UNIT OF MEASUREMENT. Emphasize that the unit of measurement will be labeled on their posters.

Once everyone submitted their carbon footprint, create a Google Sheet of the entire class dataset created from the responses and share it with students.

Break students into groups of 3-4 and randomly assigned dot plots OR box and whisker plots. Have students read the rubric aloud within their groups and go through the rubric with the class to emphasize what would ensure a maximum score.

At this point, you can either have your students analyze all of the data OR you can have students use a random number generator to create a random sample. If you choose to have students use a random number generator, provide them with a copy of the “Random Sample Tracker” to keep their data organized.

Finally, students work in their groups to create posters. At the end, provide students with opportunities to see each other's work and final conclusions.