Statistics Lesson Plan
Interpreting Categorical and Quantitative Data
Show Me The Data!

Grades 9-12

Rationale

- Students need to recognize that there is a variety of methods to display data. Students will gain a deeper understanding of statistical representations when they gather the data and create their own displays. Data displays that employ the use of the number line, including dot plots, histograms, and box plots, further reinforce the importance of the elementary mathematical figure. Students will also compare and contrast the benefits and drawbacks of the different displays.

Goal

- To collect data and create displays to deepen the understanding of data representation

Standards

- S-ID.1 Represent data with plots on the real number line (dot plots, histograms, and box plots).

Objectives

- Students will gather data.
- Students will display data in a histogram, dot plot, and box plot.
- Students will compare and contrast different displays.

Materials

- Tally charts at student stations (see procedures below)
- Graph paper where students can create displays
- Blue and red pens or colored pencils
- Measuring tape
- Straight edge

Procedures

- Set up 6 stations around the room where students can create and collect their data:
    - Station 1: Number of letters in your FULL name
    - Station 2: Shoe size
    - Station 3: Number of days you ate breakfast in the past week (0–7)
    - Station 4: Month you were born (in numeric form)

- Station 5: Heights (in inches)
- Station 6: Number of pets you own

- Have students go to each station and answer the question located at each. Use a tally chart for the collection of data at each station. For the shoe sizes and heights, you can have boys write their data in blue and have girls write their data in red.
- Break the students into 6 groups, one at each station.
- Give each group the worksheet explaining dot plots, histograms, and box plots.
- Explain that students will be creating dot plots, histograms, and box plots using their data. Remind students that that each display uses an *x*-axis as a number line and that the number line must contain the entire range of values from the data set. The number lines must also be consistently drawn, with the same distance between consecutive integers.
- For students whose data set contains more than 10 different values, suggest that the number line skip by 2s or 5s. For example, if the number of letters in the students' names ranges from 8 to 28, you can suggest a number line that goes from 5 to 30 by 5s.
- Encourage students to carefully label all the axes and title each graph appropriately.
- Have each group create a dot plot of their data.
  - Make sure that their dots are similar in size across the plot.
- Have each group create a histogram of their data.
  - Explain that a histogram shows a frequency of data and generally does not show single data points. Students will need to determine groupings of their data that makes the most sense. For example, students may group the months data into 1–3, 4–6, 7–9, and 10–12 and the breakfast days data into 0–1, 2–3, 4–5, and 6–7.
  - Recommend that students use a straight edge so that their histogram is easy to read.
- Have each group create a box plot using their data.
  - Depending on students' abilities, remind students to arrange their data *in order* to help find the minimum, maximum, median, and quartiles of the data.
  - Depending on students' abilities, help students find the median, "If there is an even number of pieces of data, then how can you find the median?" wait for answer. "If there is an odd number of pieces of data, then how can you find the median?"
  - Depending on students' abilities, help students find the quartile data. If there is an even number of data points: "Find the medians of the lower half and the upper half." If there is an odd number of data points: "Discard the middle number, and then find the medians of the lower half and the upper half."
- Have students list a benefit and drawback for each of the displays.
- Have each group briefly share their displays of the data, noting any patterns or interesting features of their displays.

Teacher Tips

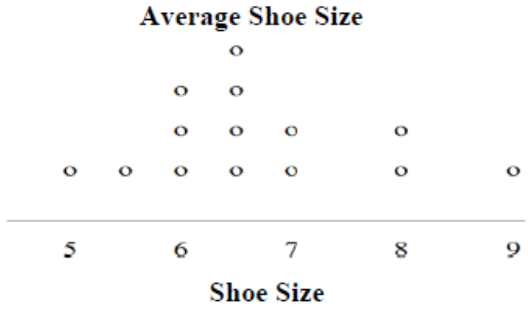
- You may choose to have students initially provide their responses at each station in a list. Then the students at each station will have to determine how best to organize the data before displaying it. For example, students may choose to create a tally chart or a stem-and-leaf plot.
- If you are using this lesson to introduce these three displays, then it may take students longer to complete this activity, especially with the box plots. You may want to introduce each display by presenting one and explaining how they should be created. Box plots will require greater detail.
- If students are proficient with a graphing calculator, then TI graphing calculators have the capability of inputting the data and creating different display using the *statplot* option.

Extension Activities

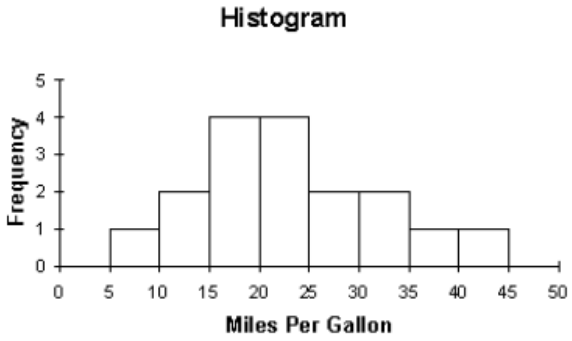
- You can extend the lesson by splitting up the boy and girl data from Shoes Sizes and Heights and creating plots on the same scales. Side-by-side box plots are especially interesting when comparing data.
- You can extend the lesson by having students create circle graphs using the breakfast and the months data.
- You can have students extend this lesson by having them come up with some additional questions and gathering data at the end of class. Then they can create each of these displays for homework, using their newly collected data.

Show Me the Data!

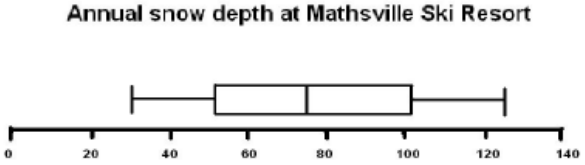
Dot Plots – Dot plots are used to display the frequency at which particular responses were given. You must set up a scale along your axis that covers the entire range of your data. You then need to put a dot above each particular value for each occurrence.



Histograms – Histograms are used to display the frequency at which particular responses were given. Your data values usually go on the horizontal axis and the frequency is measured along the vertical axis. Create a bar above each response that corresponds the frequency that the response was given.



Box Plots – Box plots break the data into quartiles, where each quartile contains 25% of the data (not 25% of the range!) You begin by creating a scale that covers the entire range of your data. Then you find the median, which corresponds with the middle of the box and splits your data into two halves. Find the median of the lower half of your data, which is the left of the box, known as Quartile 1. You find the median of the upper half of your data, which is the right of the box, which is Quartile 3. The left whisker proceeds down to your smallest piece of data, and the right whisker travels all the way to your largest piece of data.



Compare & Contrast

	Benefits	Drawbacks
Dot Plot		
Histogram		
Box Plot		

Data is displayed in a variety of ways. Write a brief paragraph discussing why there are so many ways to collect and display data.