There is a Difference: Histograms vs. Bar Graphs

GRADE: 3-5,6-8
PERIODS: 1

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Using data from the Internet, students summarize information about party affiliation and ages at inauguration of Presidents of the United States in frequency tables and graphs. This leads to a discussion about categorical data (party affiliations) vs. numerical data (inauguration ages) and histograms vs bar graphs.

Prior to the beginning of this lesson, you will want to find a website listing all of the presidents and their party affiliation. A simple search on the internet should provide viable options. You may also choose to bookmark this site such that students have easy access to the chosen resource.

Start the lesson by engaging students in a discussion about the Presidents of the United States. You might ask: What factors influenced our last presidential race? Are there typical characteristics of a person running in any Presidential race? There are many answers to these questions. If no students suggest party affiliation and age at the time the person enters office, bring these characteristics into the discussion.

Discuss the data provided for each president with the class. Use questions to structure the discussion. What is the difference between raw data and summarized data? [Raw data is the individual values while summarized data is presented in a way for analyzing the data.] If I wanted to find the number of Presidents in each party, how could I summarize the data? [frequency table, bar chart, line chart, histogram] What would be the title for the columns of the frequency table? [Political Party, Frequency]

While distributing the Charting the Difference Activity Sheet, divide students into pairs a computer for each pair to share. If fewer computers are available, groups of 3 can be used with assign roles, such as announcer, recorder, and checker. However, avoid groups with more than 3, as there will be students with nothing to do.

Remind students on how to record data in frequency tables. Have them record the frequencies in groups of five tally marks.
As students begin their bar graphs for the political party data, check the graphs being created for correctness. Ask questions to help struggling students. How is the frequency scaling determined? [by the range of the frequency column] What should the frequency scaling be based on the lowest and highest frequency? [0-20 with marks at 5, 10, 15, 20] Since the political parties are separate categories, makes sure students' bars do not touch each other but are of the same width.

Circulate through the room as students work on the inauguration ages frequency table, asking questions like the following examples to help students.
• What is different about the data being collected in this frequency table? [The data is numerical, not categorical like the previous table.]
• Are we going to list every age at inauguration to summarize the data? [No, there would be too many rows.]
• What intervals of numbers might work better? How many intervals will there be? [Decades might work, but there would only be 3 intervals, which would not make the graph very informative. Intervals of 5 years would be better because then there would

be 6 categories.]
- Did the order of the political parties matter in the previous table? Does it matter in this table? [The categories in the first table are not related so they can be in any order. In this table, it makes sense for the categories to be in ascending or descending order since the categories are intervals of numbers.]

After all groups have finished, have the groups compare answers in a class discussion. Call on students to give their answers to the questions. As they do this, point out in ages at inauguration frequency table that the categories are numeric intervals in an increasing order with no gaps between the numbers. The graph also has no gaps between the bars. This is because there is no gap between the numbers for the ages. For example, one bar ends at 44 and then next starts at 45. This is a difference between the two frequency tables and this affects the graphs. To check for understanding, ask students: Why is it the bars in bar graphs do not touch and the bars in histograms do touch? [Bar graph bars do not touch because the data is categorical; histogram bars do touch because the categories intervals of continuous numbers.]

While students share their generalizations from Question 5, use questions such as those in *Questions for Students* to show that some answers cannot be determined by the graphs but may have to be researched using the raw data or using other sources.
Summarize Question 6, draw a table on the board with a column for characteristics of bar graphs and a second column for characteristics of histograms. A representative from each group can then add an observation to either or both columns, comparing and contrasting the attributes of the different graphs. Allow students to add statements one group at a time without repeat a prior statement. This will become more difficult as more groups go, so try to choose groups with longer answers to Question 6 after groups with shorter answers.

A partially complete table may look like this:

BAR GRAPHS	HISTOGRAMS
graph title and labeled axes	graph title and labeled axes
Bars do not touch.	Bars do touch.

Vertical scale is frequency.	Vertical scale is frequency.
categorical data	numerical data