Situation 05: What Good are Box and Whisker Plots?
Prepared at Penn State
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Prompt

The teacher had just reviewed mean, mode, and median with average seventh grade class before introducing the students to box-and-whisker plots.

The teacher had written the following data set representing a football team's scores for each game of the season on the board:

<div align="center">3, 4, 7, 7, 7, 10, 13, 22, 32, 37, 44</div>

The teacher and students collaboratively computed the mean, mode, median, and quartiles for the data. They used this information as the teacher walked the students through a handout that explained how to construct a box-and-whisker plot:
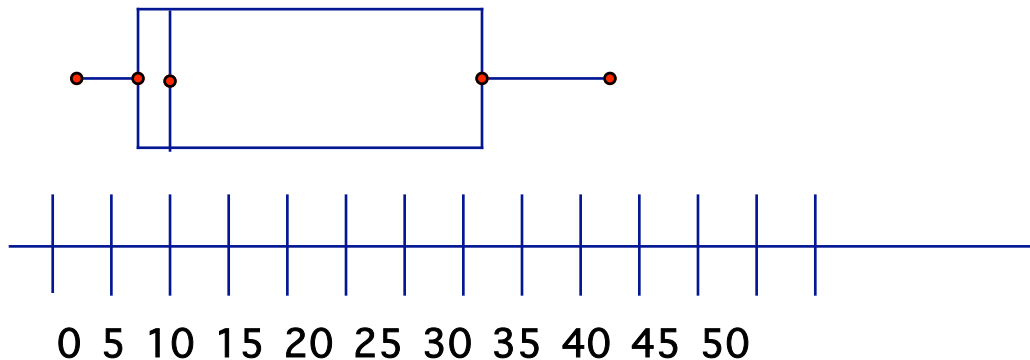
A student asks, "What does the box-and-whisker-plot stand for?" Another person adds, "What can you use it for?"

Commentary

<consider comments on mathematics used, end of each focus>

Mathematical Foci

Mathematical Focus 1

Box-and-whisker plots help us to see how the data plots spread out, or at least to see the spread of the quartiles. Although we cannot tell how far each point is from the median, in this example vary we can get a sense that the greater data values vary more than the lesser data values.

Mathematics used for Mathematical Focus 1

- Recognize that box-and-whisker plots show only the values of the quartiles and not the values of the data points

Mathematical Focus 2

Box-and-whisker plots help us to compare data sets. For example, consider these two box-and-whisker plots and suppose both represent grades in a math class:
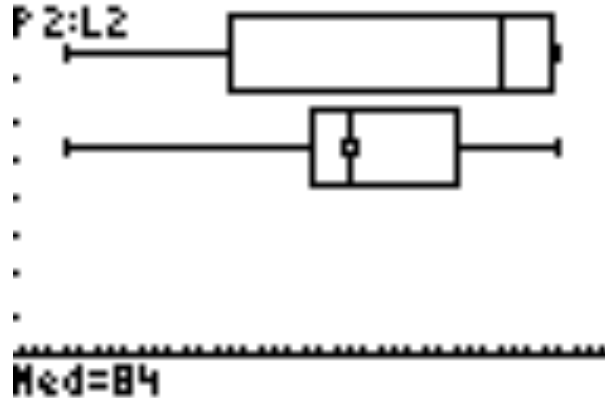
The first box-and-whisker plot suggests that there were several very high grades and a spattering of lower grades. The second box-and-whisker plot suggests that the grades follow more of a bell curve. If you scored 87 on this test, it seems that you did comparatively well in the second case but not in the first case. You can tell this easily since the median of the second plot is traced even if you do not know the data values (which were L1: 98, 98, 97, 95, 94, 87, 80, 72, 65 and L2: 98, 95, 87, 85, 84, 84, 82, 81, 65).

Mathematics used for Mathematical Focus 2

- Having the same scale facilitates comparisons
- Having the same range facilitates comparisons
- It is possible to trace values on the TI-83+ box-and-whisker plot
- To create the data sets requires exemplifying a skewed data set

Mathematical Focus 3

The box-and-whisker plot helps us to describe the distribution of a sample. In particular, we can tell when the data are bunched up above or below the median or between any two quartiles. We can compare the ranges of the top, bottom, upper-middle and lower-middle quarters of the data. When we look at other ways to describe spread of data, such as standard deviation, we see that the box-and-whisker plots do not help us with spread about the mean and they do not help us to see the role played by individual data points.

Mathematics used for Mathematical Focus 3

- Recognize that box-and-whisker plots show only the values of the quartiles and not the values of the data points
- See distance between quartiles as a sign of distribution.
- Know there are measures of spread, including standard deviation.

Mathematical Focus 4

Give a few dotplots of data and corresponding box-and-whisker plots. Determine how to tell which dotplot matches which box-and-whisker plot.

Mathematics used for Mathematical Focus 4

- Be able to interpret characteristics of the dotplot and the box-and-whisker plots as they are reflected in each other.
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References

Include books, articles, curriculum materials, URLs, etc. from which any ideas or quotes are drawn. (There may be none.)