LAB 22 Conducting a Survey

Goal

Students develop one or more survey questions, conduct the survey, and analyze the results. Along the way, students use what they have learned about writing unbiased questions, sampling, data displays, measures of central tendency and dispersion, and making predictions.

Materials

- graphing calculator

Grouping

Students may work individually or in small groups, sharing calculators as necessary.

Alternative Strategy

If time is limited, you may want to work through the lab as a class and conduct the survey in your class. In this case, the population for the survey is all students in the class and the sample is a subset of students who take the survey. You can have all students complete Steps 4–6 as homework.

Starting the Lab

If possible, bring in an example of a survey that has recently appeared in the media. Briefly discuss and analyze the survey with the class, reminding students to use correct vocabulary. Such a discussion can provide a quick, contextual review of terms such as *population*, *sample*, *bias*, and so on.

Teaching Strategy: Step 1

As students brainstorm possible survey topics, encourage them to choose topics for which they can collect quantitative data. This will make it possible for them to calculate measures of central tendency and dispersion in Step 4.

Teaching Strategy: Step 2

Unless it is possible to identify every member of a population, it can be difficult or impossible to choose a sample that is truly random. For example, if students conduct a survey in which the population is all adults in your city, it is unlikely that students will be able to get a complete list of residents from which to choose a sample. Students can continue with the survey as long as they are aware of, and can articulate, these limitations.

Teaching Strategy: Step 3

Ask students to pay particular attention to how they round the data values. Rounding decisions can have an impact on whether or not there is a mode and can affect the appearance of histograms and other displays.

Avoiding Common Errors

Step 3 Students might identify the data in the example as continuous data because the times can theoretically take on any values that are non-negative real numbers. Point out that these times are rounded to the nearest minute. As such, the data are discrete.

Teaching Strategy: Steps 4 and 5

You may want to have students use a spreadsheet for these steps. Ask students to discuss the advantages and disadvantages of using a spreadsheet rather than a calculator. Students will find that a spreadsheet makes it easy to try a variety of data displays, but that the choice of displays may be limited (for example, most spreadsheet programs do not offer box-and-whisker plots).

Teaching Strategy: Step 6

If time permits, have students communicate their findings to the population that they studied. For instance, to report the findings from the example, students could prepare a one-page newsletter for the school that includes a written summary of the results as well as data displays and other graphics.

Key Discovery

A well-designed survey is a powerful tool for making predictions about a population.

Closing the Lab

Ask students the following questions:

1. What other choices could you have made for displaying your data?

   Sample answer: **histogram, stem-and-leaf plot**

2. At which step of the process did you have the greatest chance of introducing errors or bias into your work? Why?

   Sample answer: **choosing a sample because it is difficult to choose a sample that is truly representative of the population**

ANSWERS

Answers will vary. Where possible, answers are given using the values in the Examples.

Step 1

a. *Sample answer:* The topic is travel times to school. Ask students how long it takes them to get to school.

b. *Sample answer:* The survey question in the example is not biased.

c. Answers will vary.

Step 2

a. *Sample answer:* The population is all students at the school.

b. *Sample answer:* 800

c. *Sample answer:* It is not possible to conduct a census because it is not practical to survey all 800 students.

d. *Sample answer:* Get a list of the students at the school and choose every 40th name on the list. This is a systematic sample.

e. *Sample answer:* The systematic sample described above should be reasonably representative of the population.

Step 3

a. *Sample answer:* quantitative

b. *Sample answer:* univariate

c. *Sample answer:* discrete

Step 4

a. *Sample answer:* mean: 15.65 minutes; median: 16 minutes; mode: 25 minutes; standard deviation: about 7.9 minutes

b. *Sample answer:* It takes a typical student about 16 minutes travel to school in the morning.

Step 5

a. *Sample answer:* box-and-whisker plot; this type of graph is appropriate for showing the spread of univariate, quantitative data.

b. *Sample answer:* Half of the students take between 8 and 24 minutes to travel to school.

Step 6

a. *Sample answer:* 560 students in a school of 800 students travel 10 or more minutes to get to school; 200 students travel 25 or more minutes to get to school.

b. *Sample answer:* According to a recent survey of students, the mean travel time to get to school in the morning is 15.65 minutes. At our school of 800 students, about 560 students travel 10 or more minutes to get to school; about 200 students travel 25 or more minutes to get to school.

What Do You Think? Answers

1. *Sample answer:* If the sample consisted of a convenience sample (e.g., the first 20 students to arrive at school one morning), the results might have been very different. The first students to arrive at school might have all arrived on the same bus and therefore have longer commute times than students who do not ride a bus.

2. *Sample answer:* Choosing a larger sample would have helped ensure that the sample was more representative of the population.