OBSERVATIONAL STUDY OR EXPERIMENT WORKSHEET

Essential Question:
What is the difference between an experiment and observational study?

Activating Strategies:
Give the students the following question.

> A study follows two groups of students, who are randomly selected from a school, for one year. Students decide which group to join depending on which category they feel they belong to: I watch more than 10 hours of TV per week OR I watch fewer than 5 hours of TV per week. Students who watch no television, or who watch between 5 and 10 hours a week, were excluded from participating in the study. The study records the average grades and the percent of students who participate in team sports.

Question: Is this an observational study or an experiment? Explain.

Identify each of the following as an observational study or an experiment.

1. Compare the grades on a final math test of 25 students who use calculators and 25 students who do not use calculators. The students decide which group they are in.

2. Compare voter satisfaction levels between people assigned to use either paper ballots or touch-screen machines.

3. Determine if people who take vitamin C every day are less likely to get colds.

4. Determine which brands of orange juice people prefer. The people are randomly chosen at the supermarket and are asked to taste both brands without knowing which brand they are drinking.

For each situation, choose the most appropriate technique for collecting data. Use the technique exactly once.

Census   Sample Survey   Observational Study   Experiment

5. Estimate the number of students in your school who play video games more than 10 hours per week.

6. Decide if computer games are more effective than paper and pencil drills for children learning the multiplication tables.

7. Find out if not using car seat belts increases deaths and accidents.

8. Compare average class size for math classes and English classes in your high school.

Explain why each of these samples might be biased.

9. The first 10 customers of the day at a restaurant are asked if pizza should be added to the menu.

10. A random selection of women are called every morning for a week to determine if television shows are too violent.

Gathering Data Worksheet

1. Identify the population and the sample:

   a) A survey of 1353 American households found that 18% of the households own a computer.

   b) A recent survey of 2625 elementary school children found that 28% of the children could be classified obese.

   c) The average weight of every sixth person entering the mall within 3 hour period was 146 lb.

2. Determine whether the numerical value is a parameter or a statistics (and explain):

   a) A recent survey by the alumni of a major university indicated that the average salary of 10,000 of its 300,000 graduates was 125,000.

   b) The average salary of all assembly-line employees at a certain car manufacturer is $33,000.

   c) The average late fee for 360 credit card holders was found to be $56.75.

3. For the studies described, identify the population, sample, population parameters, and sample statistics:

   a) In a USA Today Internet poll, readers responded voluntarily to the question "Do you consume at least one caffeinated beverage every day?"

   b) Astronomers typically determine the distance to galaxy (a galaxy is a huge collection of billions of stars) by measuring the distances to just a few stars within it and taking the mean (average) of these distance measurements.

4. Decide which method of data collection you would use to collect data for the study (observational study, experiment, simulation, or survey):

a) A study of the salaries of college professors in a particular state

b) A study where a political pollster wishes to determine if his candidate is leading in the polls

c) A study where you would like to determine the chance getting three girls in a family of three children

d) A study of the effects of a fertilizer on a soybean crop

e) A study of the effect of koalas on Florida ecosystem

5. Identify the sampling technique used (SRS, VRS, cluster, stratified, convenience, systematic):

a) Every fifth person boarding a plane is searched thoroughly.

b) At a local community College, five math classes are randomly selected out of 20 and all of the students from each class are interviewed.

c) A researcher randomly selects and interviews fifty male and fifty female teachers.

d) A researcher for an airline interviews all of the passengers on five randomly selected flights.

e) Based on 12,500 responses from 42,000 surveys sent to its alumni, a major university estimated that the annual salary of its alumni was 92,500.

f) A community college student interviews everyone in a biology class to determine the percentage of students that own a car.

g) A market researcher randomly selects 200 drivers under 35 years of age and 100 drivers over 35 years of age.

h) All of the teachers from 85 randomly selected nation's middle schools were interviewed.

i) To avoid working late, the quality control manager inspects the last 10 items produced that day.

j) The names of 70 contestants are written on 70 cards, The cards are placed in a bag, and three names are picked from the bag.

6. Explain what bias there is in a study done entirely online.

7. A local newspaper ran a survey by asking, "Do you support the development of a weapon that could kill millions of innocent people?" Determine whether the survey questions is biased and why.

SOLUTIONS to Gathering Data Worksheet:

1. a) population: all American households
      sample: collection of 1353 American households surveyed
   b) population: all elementary school children
      sample: collection of 2625 elementary school children surveyed
   c) population: all people entering the mall within the assigned 3 hour period
      sample: every 6th person entering the mall within the 3 hour period

2. a) statistic – part of 300,000 graduates are surveyed
   b) parameter – all assembly-line employees were included in the study

   c) statistic – 360 credit cards were examined (not all)

3. a) population: all readers of USA Today; sample: volunteers that responded to the survey; population parameter: percent who have at least one caffeinated drink among all readers of USA Today; sample statistic: percent who have at least one caffeinated drink among those who responded to the survey
   b) population: all starts in the galaxy; sample: the few stars selected for measurements; population parameter: mean (average) of distances between all stars and Earth; sample statistics: mean of distances between the stars in the sample and Earth

4. a) survey b) observation c) simulation d) experiment e) simulation

5. systematic, cluster, stratified, cluster, VRS, convenience, stratified, cluster, convenience, SRS

6. It is limited to people with computers.

7. Yes, it tends to encourage negative responses.