

## And the Survey Says...

### Purpose

Students will explain why arguments are invalid if based on very small samples of data, biased samples, or samples for which there was no control sample.

### Materials

*For the teacher:* transparency of Black Line Master (BLM) *Soft Drinks and Grades*, chalk, chalkboard

### Activity

#### A. Pre-Activity Discussion

1. Tell students that you conducted a study in the school, and that you have evidence to support the hypothesis that the amount of soft drinks students consume is directly correlated with the grades they earn.
2. Explain further that you have concluded that students who consume four soft drinks or more a day receive lower grades than students who drink fewer or no soft drinks in a day.
3. Show students the transparency of the BLM *Soft Drinks and Grades* and discuss the data on the graph.
4. Tell students that based on the evidence collected, students who drink as many as three soft drinks a day are the most likely to be D students and those who do not drink soft drinks are more likely to be A students.
5. Discuss students' responses and ask them if they have any questions about the study. [Students should question the validity of the study by asking how many students participated in the study, over what time period the study took place, if there was a control group, etc.]
6. Tell students that you conducted a survey of 10 students in the school. Tell the class that you chose the following students for the study:
  - two students who claimed they were failing their classes
  - one who claimed she was a D student
  - four who claimed they were C students
  - two who claimed they were B students
  - one who claimed she was an A student
7. Explain that you asked all of them how many soft drinks they had the previous day, and you recorded their responses.

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connecting  
across the  
curriculum



#### Social Studies

Direct students to research how the U.S. Census Bureau conducts its studies. Have students look up census data from the Web site:

[www.census.gov](http://www.census.gov).

EXTENDING  
THE  
ACTIVITY



Direct students to investigate a science-related controversy and write an informative speech about claims made by a group that is using small samples, biased samples, or no control group in its arguments.

Standards Links  
8.1.3, 8.1.4,  
8.2.8, 8.2.10

## Activity (continued)

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### B. Discussion

1. Ask students: “Do you think that my argument is valid or invalid based on the evidence I presented?”
2. Divide students into groups of two to three and direct them to find as many reasons as they can to refute the argument based on the information given about the study.
3. Discuss each group’s reasons and record them on the chalkboard. Be sure to discuss the following:
  - The argument is based on a very small sample of data.
  - The data is not necessarily representative of the students’ typical drinking habits.
  - A biased sample was used.
  - There is no true control in the experiment.
  - You cannot show a causal relationship from a simple survey such as this.

### C. Experiment Design




1. Ask students to brainstorm how they could design a new experiment to test whether or not there is a correlation between consumption of soft drinks and grades earned by students.
2. Additionally, ask students to design an experiment of their own interest that they would be able to test at school.
3. Discuss the importance of using evidence that is unbiased, representative of a large sample, and includes a control.
4. Discuss how experiments should not be carried out in order to prove a hypothesis but rather to test a hypothesis.

## Classroom Assessment

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### Basic Concepts and Processes

During the activity, ask questions such as the following:

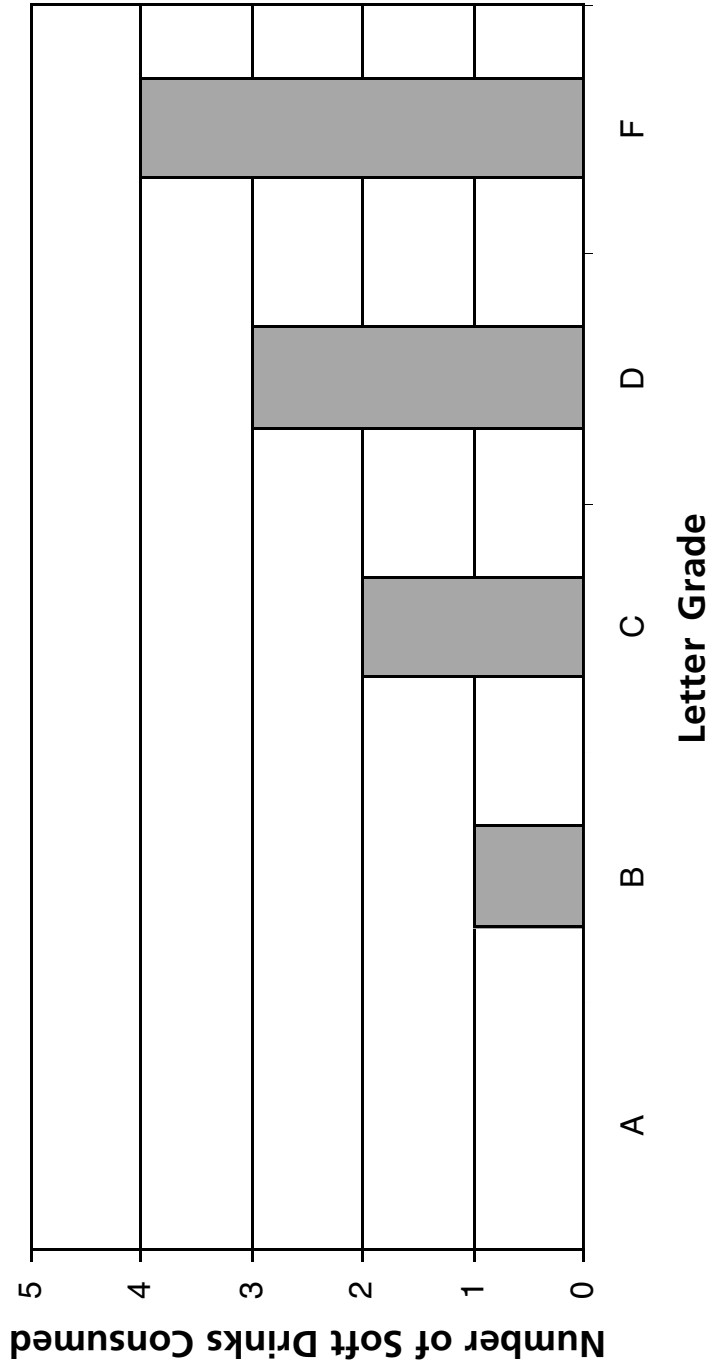
-  Why are arguments invalid if based on very small samples of data, biased samples, or samples for which there is no control sample?
  -  What makes the argument in the activity invalid?
  -  How could you redesign the experiment so that the evidence is more likely to be valid?
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# SOFT DRINKS AND GRADES

*Hypothesis:* Students who consume a large number of soft drinks achieve lower grades than students who consume few or no soft drinks.

Results of data collection:

**Correlation Between Soft Drink Consumption and Grades for Middle School Students**



# ***SOFT DRINKS AND GRADES***

## **Teacher Directions**

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Make a transparency of the BLM *Soft Drinks and Grades* and direct students to scrutinize the information presented. Discuss why the evidence presented on the BLM does not validate the argument that an increase in soft drink consumption is directly correlated with receiving lower grades in school.

## **Answer Key**

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Not applicable.