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ACTIVITY 5.1

Statistical Significance

Allyson J. Weseley, EdD
Roslyn High School, Roslyn Heights, NY

One of the hardest concepts for students to grasp is the meaning of a statistically significant difference. A statistically significant difference is unlikely to be due to chance. Three factors contribute to whether a difference between groups will be statistically significant:

- the size of the difference between the group means
- the size of the sample
- the variance within the groups

While all three of these factors are reasonably intuitive, the third is more complicated.

After introducing students to the idea that a statistically significant difference is one that is unlikely to be due to chance, try the following exercise. Divide students into groups to read the example below and formulate an answer. Then, discuss the answers as a full class and try to draw out the answers to the discussion questions below.

BACK TO CONTENT OUTLINE

Example

Melissa is running a study to see if girls and boys average different amounts of participation in classrooms. She hypothesizes that girls participate more than boys and plans to observe students in various classes and record how often they raise their hands to answer the teachers' questions.

1. For the first part of her data collection, Melissa selects two boys and two girls to study. She finds that the girls raise their hands an average of 4.7 times per week while the boys only raise their hands an average of 1.3 times in the same classes. Do you think this difference is likely to be statistically significant? Why or why not?

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2. Next, Melissa expands her study to observe 50 boys and 50 girls. She finds that girls raise their hands an average of 3.1 times per week and boys raise their hands an average of 3.0 times per week in their social studies classes. Do you think this difference is likely to be statistically significant? Why or why not?

3. In a third data collection, Melissa studies another 50 boys and another 50 girls. This time, she finds that girls raise their hands an average of 3.2 times per week and boys only raise their hands an average of 2.4 times in their math classes. However, a closer look at her data reveals that there is tremendous variability between the participation of the students. Some students—both boys and girls—never raise their hands while others—again both boys and girls—raise their hands more than 15 times per week. How do you think this last factor—the variability in responses—affects the likelihood of the difference between girls' and boys' participation to be statistically significant?

Discussion Questions

1. Why does the small sample size in the first example increase the likelihood that Melissa's results are due to chance?

2. Why does the small difference between boys and girls in the second example increase the likelihood that Melissa's results are due to chance?

3. Why does greater variability among students' responses increase the likelihood that Melissa's results are due to chance?

4. Based on the data described above, what should Melissa conclude about her experimental hypothesis?

5. As a researcher, which of the three factors that influence statistical significance can you most directly influence?