ScienceNews

Activity Guide for Students: How Bias Affects Scientific Research

Directions:
In this activity, you will learn about bias in scientific research and how to identify it. Your teacher will first assign reading and the first two questions for homework. Following a class discussion, you and your classmates will break into groups to search the *Science News* archive for examples of different types of bias in scientific and medical research. Your group should then analyze how a National Institutes of Health policy works to reduce bias on the basis of sex and gender before coming up with additional guidelines to prevent bias. Finally, discuss with your class how policies and procedures can be used to eliminate or limit bias in scientific research or health care outcomes. If you need additional resources to help you understand bias, please consult the list provided by your teacher.

The setup
After reading the *Science News for Students* article "Think you're not biased? Think again" for homework, answer the first two questions before class. They and the remaining questions will be discussed with your class.

1. What is bias?

2. How can biases affect the accuracy of scientific understanding of a phenomenon? How can biases affect the application of results of scientific research or engineering design for everyone?

3. Describe two potential sources of bias in a scientific, medical or engineering research project. Try to give specific examples.

4. How can potential biases be identified before, during or after a scientific study?

Obtain and evaluate information about bias
With a group, search the *Science News* or *Science News for Students* archive and select one article that describes a scientific research study or engineering design project. Evaluate the article or the original research paper described in the article to identify any potential biases in the experimental design, data collection, analysis or results. Then, answer the following questions as a group. When you have answered these questions, present your answers to the class.

1. Record the title and URL of the article and write a brief summary of the study or project.

2. What sources of potential bias (if any) did you identify in the study or design project? Describe any procedures or policies deliberately included in the study or design project to eliminate biases.

3. How could any potential biases in the study or design project have affected the results or application of the results to the target population?

Analysis
With your group, review the *Science News* article "[Biomedical studies are including more female subjects (finally)](#)." Then, review the [NIH Policy on Sex as a Biological Variable](#), including the "[guidance document](#)." Answer the following questions in your group.

1. How did sex and gender biases affect the value and application of biomedical research before scientists made a more concerted effort to minimize those biases?

2. Why do you think the NIH created its policy to reduce sex and gender biases?

3. What impact has the NIH Policy on Sex as a Biological Variable had on biomedical research?

4. What other policies do you think the NIH could institute to reduce biases in biomedical research? If you were to recommend one set of additional guidelines for reducing bias in biomedical research, what guidelines would you propose? Why?

5. What biases would your suggested policy help eliminate? How would it accomplish that goal?

Class discussion about bias guidelines
Present your additional guidelines to your teacher and to at least one other group for feedback. After receiving feedback, revise your guidelines as necessary and then present your proposed guidelines to the class. Discuss the following questions with your class.

1. Why is it important to identify and eliminate biases in research and engineering design?

2. Were there any guidelines that were suggested by multiple groups? How do those actions or policies help reduce bias?

3. Which guidelines developed by your classmates do you think would most reduce the effects of bias on research results or engineering designs? Support your selection with evidence and scientific reasoning.

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