Statements about the Social Nature of Scientific Research

**(Teacher Guide)**

Write “A” for Agree and “D” for Disagree in the space before each statement. Write a brief explanation about why you feel that way. When you are finished, talk your ideas over with another student.

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| \_**A**\_ 1. Scientists’ opinions, biases and personal beliefs influence their research. ***Agree:*** *Science is a human endeavor and is not fully objective. There are features of research that provide checks and balances within the system, including: running multiple trials, using placebos, double-blinding a study, working collaboratively, peer review, and scientists reproducing each other’s work. Opinions and personal beliefs, however, can still influence what science gets done, what is studied, and what is funded.*  | \_**D**\_ 7. Scientists usually stick to the “scientific method” which is used to test a hypothesis by controlling and manipulating variables. ***Disagree:*** *There is no single “scientific method”. The linear method often taught in school may describe how some experiments are carried out, but science uses a number of approaches to explore and find meaning in the natural world, including observational and descriptive studies, epidemiological studies, correlational studies – even serendipity can play a part in scientific discovery.*  |
| **\_A\_** 2. A scientific idea is not valid in the scientific community until it has stood up to the scrutiny and critique of other scientists. ***Agree:*** *Science is a collaborative process and is not done in isolation over the long term. Scientists rely on others not only to guide them in the type of work they do, but also to share ideas and improve the scientific approach. Additionally, scientific studies published in journals are critically reviewed by peers to ensure the outcome is the result of a valid and relevant study.*  | \_**D**\_ 8. Science is able to prove or disprove theories, facts, and laws once and for all. ***Disagree:*** *Although much scientific knowledge is reliable, durable, and has not changed over time, scientific knowledge, by nature, cannot be absolute or certain. Scientific ideas can change considering new evidence, new perspectives, or new technology. It is also subject to skepticism. Even a scientific law that is supported by empirical evidence cannot be proven to be upheld in every circumstance under every condition. Science is able to describe patterns and provide useful generalizations about predicting how things work under specific circumstances, but scientific knowledge is always subject to change.*  |
| \_**A**\_ 3. Scientists can look at the same set of data and come up with different valid interpretations. ***Agree:*** *Scientists aren’t a homogenous group. They can have differing opinions and views on data. Talking through these different ideas and challenging each other can help scientists come up with more valid conclusions based on the data. Though there may be valid conclusions about data that are contradictory, we assume that there are stable features of nature that can be discovered through science.*  | **\_D\_** 9. A scientific fact is absolute, fixed, permanent. It never changes. ***Disagree*:** *Scientific discoveries are not considered absolute until they have been proven to be true in every circumstance under every condition. There are absolute scientific facts (e.g. the contents of a cell), but there is also a lot of emerging science constantly being developed. Emerging science is not yet considered absolute and is still being tested and proved in different circumstances (e.g. medical trials).*  |
| \_**A**\_ 4. Scientists will critically assess and evaluate each other’s work, even if they agree with the results of that work. ***Agree:*** *The process of peer review and critiquing scientific findings is important for scientists and science. There is a misconception in some of the popular media that climate scientists or evolutionary scientists, for example, conspire to put out a unified message, while ignoring conflicting evidence.*  | **\_D\_** 10. Scientists have solved most of the major mysteries of nature. ***Disagree*:** *This is a tough one to answer, because it is difficult to determine how much you don't know! However, there are still many big questions about the universe, and life on Earth that remain unanswered. If anything, more questions appear every time new knowledge is acquired.* |
| \_**D**\_ 5. A good scientist is one who gets the results he or she was expecting. ***Disagree:*** *Getting expected results has nothing to do with being a good or bad scientist. Being a good scientist entails refining methods and experimental designs, continuing to ask testable questions and understanding why an experiment did not go as anticipated. Unexpected results are not the sign of a “failed” experiment. In fact, scientists can sometimes learn more from unexpected results than from expected results.* | **\_D**\_ 11. Anything done scientifically is always accurate and reliable. ***Disagree*:** *Although there are multiple checks and balances built into science to enhance accuracy and reliability, there are times when previously reported scientific outcomes are proven to be inaccurate and are retracted from the scientific literature. Scientific studies can be proven unreliable if they do not include adequate sample sizes, interpret literature accurately, or appropriate control for the variables to be tested.* |
| \_**D**\_ 6. Science is universal and is not affected by the culture in which it is practiced. ***Disagree:*** *This is an active area of discussion among scientists and philosophers. Currently, most people recognize that science reflects the norms and social/political values of the culture in which it is practiced. This is one reason that feedback and input from a heterogeneous scientific community is important to the scientific process.*  | \_**D**\_ 12. Science can prove anything, solve any problem, or answer any question. **Disagree:** *Science is only able to provide knowledge about observable natural phenomena. Many problems and questions, such as how to re-build communities after the devastation of the Indian Ocean Earthquake, are only addressed with knowledge acquired from many disciplines.* |