reliability of results | safeguards | expectations and explanations

9-12

The direction of scientific research is affected by informal influences within the culture of science itself, such as prevailing opinion on what questions are most interesting or what methods of investigation are most likely to be

Bias attributable to the investigator, the sample, the method, or the instrument may not be completely avoidable in every instance, but scientists want to know the possible sources of bias and how bias is likely to influence evidence.

Hypotheses are widely used in science for choosing what data to pay attention to and what additional data to seek, and for guiding the interpretation of the data (both new and previously available).

Scientists in any one research group tend to see things alike, so even groups of scientists may have trouble being entirely objective about their methods and findings. For that reason, scientific teams are expected to seek out the

To avoid biased observations, scientific studies sometimes use observers who don't know what the results are "supposed" to be.

Where a scientist's own personal, institutional, or community interests are at stake, he or she may be as biased as others are.

The expectations, moods, and prior experiences of human beings can affect how they interpret new perceptions orideas. People tend to ignore evidence that challenges their beliefs and to accept evidence that supports them.

Once a person believes a general rule, he or she may be more likely to notice cases that agree with it and ignore ones that don't.

6-8

Even with similar results, scientists may wait until an investigation has been repeated many times before accepting the results as correct.

Sometimes people invent a generalization to summarize a set of observations. But sometimes people overgeneralize, imagining generalizations on the basis of too few observations.

Scientists know about the danger of prior expectations to objectivity and take steps to try and avoid it when designing investigations and examining data. One safeguard is to have different investigators conduct independent

Scientific investigations usually involve the collection of relevant data, the use of logical reasoning, and the application of imagination in devising hypotheses and explanations to make sense of the collected

When similar investigations give different results, the scientific challenge is to judge whether the differences are trivial or significant, and it often takes further studies to decide.

What people expect to observe often affects what they actually do observe. Strong beliefs about what should happen in particular circumstances can prevent them from detecting other results.

Attending closely to any one input of information usually reduces the ability to attend to others at the same time.

3-5

Because we expect science investigations that are done the same way to produce the same results, when they do not, it is important to try to figure out why.

Clear communication is an essential part of doing science. It enables scientists to inform others about their work, expose their ideas to criticism by other scientists, and stay informed about scientific discoveries around the world.

The claims people make are sometimes based on how they feel about something rather than on what they observe.

There is a danger of choosing only the data that show what is expected by the person doing the choosing.

Sometimes scientists have different explanations for the same set of observations. That usually leads to their making more observations to resolve the differences.

Scientists' explanations about what happens in the world come partly from what they observe, partly from what they think.

K-2

When people give different descriptions of the same thing, it is usually a good idea to make some fresh observations instead of just arguing about who is right.

In doing science, it is often helpful to work with a team and to share findings with others. All team members should reach their own individual conclusions, however, about what the findings mean.