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Evaluating Scientific Investigations

Scientists must check experiments and conclusions (their own and those of others) in order to make sure that the experiments were performed correctly and the results can be trusted.

Scientists check their own work and the work of others. This makes the results obtained through an experiment more reliable. There are two main steps in the evaluation process:

1. A scientist shares the information she recorded about the procedures, data, and conclusions from her experiment.
2. Others scientists review the procedures, and the data and conclusions obtained from them, to see if they are valid.

If a scientist is reviewing her own work, she studies her own procedures, data, and conclusions to determine whether they are correct and reasonable.

A Scientist Shares her Work with Others

Checking work is made easier through the keeping of *honest, careful records* about observations and experiments. These records should never be changed to match a prediction or to hide something.

When a scientist reaches conclusions at the end of an investigation, she must make sure that the conclusions are based on evidence, such as data collected during the experiment. Conclusions should not be made from hopes, guesses, or opinions.

Scientists show *openness* when they provide all of the information about their experiments to others. When scientists share information about their experiments with others, it helps to make the final conclusions more trustworthy.

Evaluating the Investigations of Others

When scientists review the procedures and results from another scientist's experiment, they are often *skeptical*. This means that they question the correctness of the data. The scientists may try to learn if the results are correct by asking the following questions:

- Was the sample size large enough?
- Was the experiment controlled?
- Are the findings reasonable?
- Are the findings repeatable?
- Can the data be understood in a different way?

Scientific investigations that are done the same way should produce similar results, but sometimes similar investigations give different results.

When comparing the results of one scientific investigation to another, it is important to know whether or not the investigations are really *equivalent*, or the conditions in the investigations were the same. If the investigations are equivalent, their results are expected to be the same.

If two investigations are equivalent but their results are different, it is important to try to figure out *why* the results were different.

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