Many Methods

What are some scientific methods?

Scientific methods are the ways in which scientists answer questions and solve problems. There is no single formula for an investigation. Scientists do not all use the same steps in every investigation or use steps in the same order. They may even repeat some of the steps. The following graphic shows one path a scientist might follow when conducting an experiment.

Visualize It!

10 **Diagram** Using a different color, draw arrows showing another path a scientist might follow if he or she were observing animals in the wild.

Defining a Problem

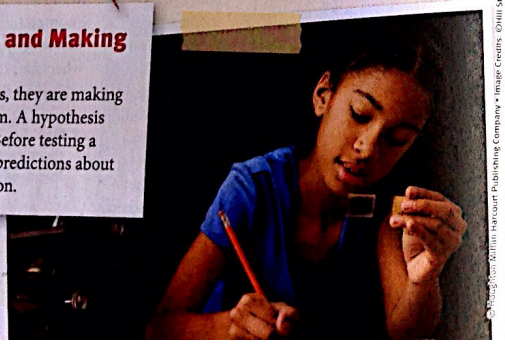
After making observations or reading scientific reports, a scientist might be curious about some unexplained aspect of a topic. A scientific problem is a specific question that a scientist wants to answer. The problem must be well-defined, or precisely stated, so that it can be investigated.

Forming a Hypothesis and Making Predictions

When scientists form a hypothesis, they are making an educated guess about a problem. A hypothesis must be tested to see if it is true. Before testing a hypothesis, scientists often make predictions about what will happen in an investigation.

Planning an Investigation

A scientific investigation must be carefully planned so that it tests a hypothesis in a meaningful way. Scientists need to decide whether an investigation should be done in the field or in a laboratory. They must also determine what equipment and technology are required and how materials for the investigation will be obtained.



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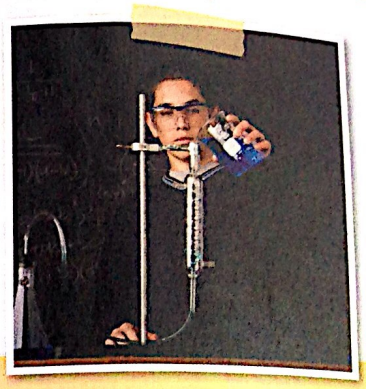
Identifying Variables

Before conducting a controlled experiment, scientists identify all the variables that can affect the results. Then they decide which variable should change and which ones should stay constant. Some variables may be impossible to control.



Collecting and Organizing Data

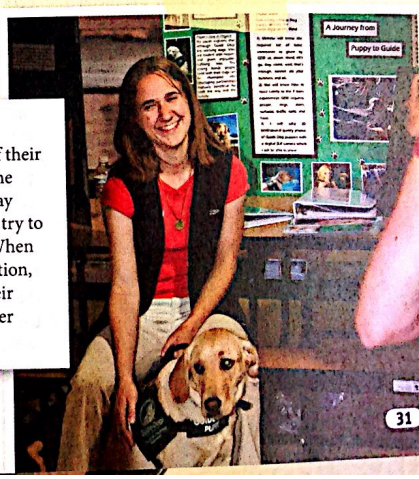
The data collected in an investigation must be recorded and properly organized so that they can be analyzed. Data such as measurements and numbers are often organized into tables, spreadsheets, or graphs.

Interpreting Data and Analyzing Information

After they finish collecting data, scientists must analyze this information. Their analysis will help them draw conclusions about the results. Scientists may have different interpretations of the same data because they analyze it using different methods.

Defending Conclusions

Scientists conclude whether the results of their investigation support the hypothesis. If the hypothesis is not supported, scientists may think about the problem some more and try to come up with a new hypothesis to test. When they publish the results of their investigation, scientists must be prepared to defend their conclusions if they are challenged by other scientists.



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