

The Scientific Method

Observation

Made at every step of your experiment

1. Problem

Question you want to answer



2. Literature

Existing theory and research on your topic



3. Hypothesis

Best guess or prediction



4. Experiment Design

Independent and dependent variables
Control and experimental groups



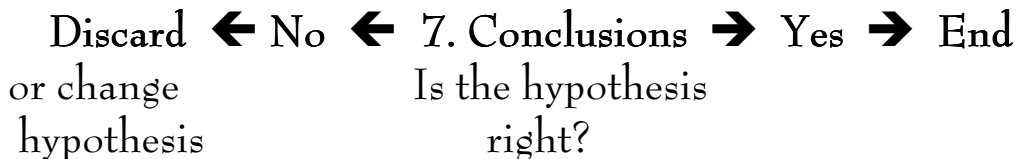
5. Collect Data

Materials
Steps to do it (procedure)



6. Analyze Data

What you observed
-tables
-graphs
-charts
-diagrams



Steps in the Scientific Method

1. **Defining the Problem**
Selecting a topic for research and defining key concepts.
2. **Reviewing the Literature**
Familiarizing oneself with the existing theory and research on a topic.
3. **Forming a Hypothesis**
Defining the relationship between measurable variables so that they can be measured and the hypothesis tested.
4. **Choosing a Research Design**
Selecting a method for study: experiment, survey, or field observation. To set up an experiment you will need to identify your independent variable, dependent variable, control group, experimental group, and procedure.
5. **Collecting the Data**
Collecting the information that will test the hypothesis.
6. **Analyzing the Data**
Working with and examining the data to shed light on the hypothesis.
7. **Drawing Conclusions (inferring)**
Summarizing the outcome of the study, indicating its significance, relating the findings to existing theory and research, and identifying problems for future research.

Scientific Method:

Principles and procedures for the systematic pursuit of knowledge involving the recognition and formulation of a problem, the collection of data through observation and experiment, and the formulation and testing of hypotheses.

The Scientific Method

- Analyzing Data: The process of determining whether data are reliable and whether they support or refute a given prediction or hypothesis.
- Classifying: The process of sorting objects or events into groups based on their common features.
- Collecting Data: Gathering and recording of specific information based on observations.
- Communicating: Sharing information. Includes critiquing work of other scientists and gaining insight from other scientists that can benefit your own work.
- Controlled Experiment: Based on a comparison of a control group and an experimental group.
- Dependent Variable: The factor that changes as a result of the independent variable. The responding variable.
- Experimenting: The process of testing a hypothesis or prediction by carrying out data-gathering procedures under controlled conditions.
- Hypothesizing: The process of forming testable statements about observable phenomena, is often one of the first steps in a scientific investigation. A statement is testable if evidence can be collected that either supports the hypothesis or refutes it. Although a hypothesis may be refuted, it can never be proved true beyond all doubt. It can only be supported by evidence.

Independent Variable: The one factor that you change in an experiment. The manipulated variable.

Inferring: An Inference is an attempt to explain or interpret observations or to say what caused what you observed.

Measuring: The process of determining the dimensions of an object, the number of objects in a group, the duration of an event, or other characteristics in precise units.

Modeling: Involves constructing a representation of an object, a system, or a process that helps show relationships between data.

Observing: The use of one or more of the five senses to perceive objects or events.

Organizing Data: Involves placing observations and measurements in some kind of logical order, such as a graph, chart, table, or map.






Predicting: Stating in advance the result that will be obtained from testing a hypothesis. A prediction often takes the form of an "if - then" statement.

Sequencing: A sequence is an arrangement of things or events in a particular order.

Theory: Most probable explanation for a large set of data.



Identify the Controls and Variables

 <p>Smithers thinks that a special juice will increase the productivity of workers. He creates two groups of 50 workers each and assigns each group the same task (in this case, they're supposed to staple a set of papers). Group A is given the special juice to drink while they work. Group B is not given the special juice. After an hour, Smithers counts how many stacks of papers each group has made. Group A made 1,587 stacks, Group B made 2,113 stacks.</p>	<p>Identify the:</p> <ol style="list-style-type: none"> Control Group Independent Variable Dependent Variable What should Smithers' conclusion be? How could this experiment be improved?
 <p>Homer notices that his shower is covered in a strange green slime. His friend Barney tells him that coconut juice will get rid of the green slime. Homer decides to check this out by spraying half of the shower with coconut juice. He sprays the other half of the shower with water. After 3 days of "treatment" there is no change in the appearance of the green slime on either side of the shower.</p>	<p>6. What was the initial observation?</p> <p>Identify the-</p> <ol style="list-style-type: none"> Control Group Independent Variable Dependent Variable What should Homer's conclusion be?
<p>Bart believes that mice exposed to microwaves will become extra strong (maybe he's been reading too much Radioactive Man). He decides to perform this experiment by placing 10 mice in a microwave for 10 seconds. He compared these 10 mice to another 10 mice that had not been exposed. His test consisted of a heavy block of wood that blocked the mouse food. he found that 8 out of 10 of the microwaved mice were able to push the block away. 7 out of 10 of the non-microwaved mice were able to do the same.</p> 	<p>Identify the-</p> <ol style="list-style-type: none"> Control Group Independent Variable Dependent Variable What should Bart's conclusion be? How could Bart's experiment be improved?
 <p>Krusty was told that a certain itching powder was the newest best thing on the market, it even claims to cause 50% longer lasting itches. Interested in this product, he buys the itching powder and compares it to his usual product. One test subject (A) is sprinkled with the original itching powder, and another test subject (B) was sprinkled with the Experimental itching powder. Subject A reported having itches for 30 minutes. Subject B reported to have itches for 45 minutes.</p>	<p>Identify the-</p> <ol style="list-style-type: none"> Control Group Independent Variable Dependent Variable Explain whether the data supports the advertisements claims about its product.
<p>Lisa is working on a science project. Her task is to answer the question: "Does Rogooti (which is a commercial hair product) affect the speed of hair growth". Her family is willing to volunteer for the experiment.</p> 	<p>20. Describe how Lisa would perform this experiment. Identify the control group, and the independent and dependent variables in your description.</p>

