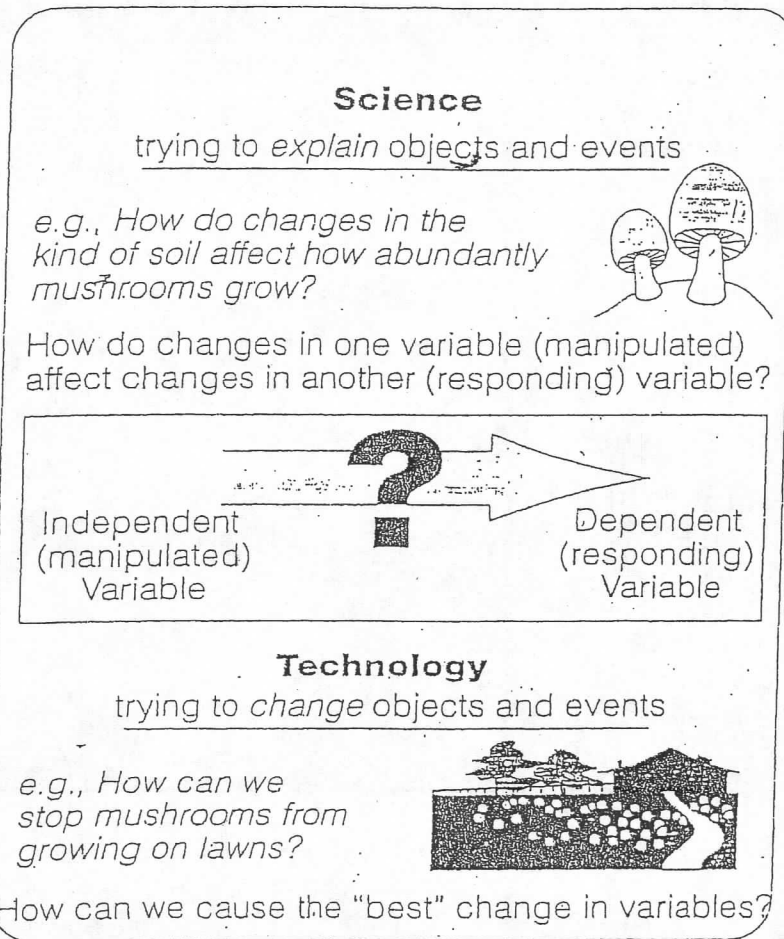


Science, the Scientific Method & Experimental Design

Science: Goals of Science and Technology



The Scientific Method

An Overview of the Scientific Process

- i) Science is based on facts or evidence which can be checked by other scientists
- ii) Scientists publish their findings so that they can share the knowledge with other scientists.
- iii) Other scientists must be able to duplicate their fellow scientist's experiments and get the same results.
- iv) Scientific explanations should account for all of the observed facts.
- v) Scientific explanations must be based on known, natural causes, rather than unknown, supernatural ones.

Jarvis CI
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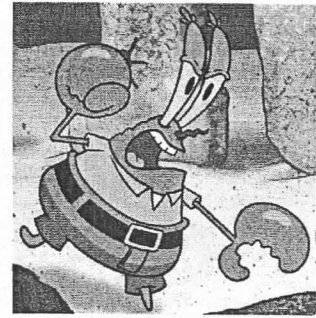
Experimental Design – Terminology

- Experiment -** An activity designed to test a hypothesis.
- Purpose -** A statement that outlines the reason for conducting an experiment.
- Hypothesis -** A prediction as to the outcome of an experiment. A suggested answer or reason why one variable affects another in a certain way. *It is made BEFORE an experiment is carried out.*
Example: "A decrease in the intensity of light shone on geraniums will cause a decrease in their growth rate."
- Materials -** A list of the type and quantity of all equipment used.
- Procedure -** A detailed, step by step set of instructions which the experimenter will follow in order to carry out the experiment. This includes the equipment to be used and a description of how the data will be analysed.
- Observation -**
- i) **quantitative:** An observation that is measured using instruments like rulers, balances and graduated cylinders (can be counted, considered objective).
Examples: length, mass, volume, etc.
 - ii) **qualitative:** An observation that is NOT usually measured using instruments (cannot be counted, considered subjective).
Examples: colour, shape, texture, etc.
- Conclusion -** A statement(s) which supports or rejects the hypothesis.
- Variable -** A factor that can change during an experiment (can influence its process).
- i) **independent:** a variable that the experimenter deliberately changes in order to observe its effects on the experiment.
 - ii) **dependent:** a variable that may or may not change as a result of the independent variable.
 - iii) **controlled:** variables that are kept constant during an experiment.
- Experimental - Error** Factors other than the independent variable that affect the dependent variable.
Example: variables that are not properly controlled.

Design of experiments: practice

Hypothesis	Independent variable	Dependent variable	Controlled variable: State 2 variable which must be kept the same ("controlled") from test to test in order to help ensure meaningful results are obtained.
Eating more fries increases body weight			1. 2.
	Level of stress	Test scores	1. 2.
Younger drivers have more accidents			1. 2.
	Attendance	Academic achievement	1. 2.
Higher tire pressure decreases gas mileage			1. 2.
	Hours of sleep	Memory	1. 2.
Eating more candy has no effect on tooth decay			1. 2.

SPONGEBOB + HOMER!



1 - Patty Power

Mr. Krabs wants to make the ocean a nicer place to live. He makes a new sauce that he thinks will decrease the amount of gas problems (farting) when eating crab sandwiches. He finds 100 customers who have gas problems. He tells 50 of them (**Group A**) to eat crab sandwiches with the new sauce. The other 50 (**Group B**) eat crab sandwiches with sauce that looks just like new sauce but is really just mayonnaise and food coloring. Both groups were told that they were getting the sauce that would decrease farting. Two hours after eating the crab sandwiches, 30 customers in **Group A** reported having fewer gas problems and 8 customers in **Group B** reported having fewer gas problems.

- A) What is your hypothesis?

- B) What is the independent variable?

- C) What is the dependent variable?

- D) What are the control variables?

- D) What should Mr. Krabs' conclusion be?

2 – Green Slime

Homer sees that his shower is covered in a strange green slime. His friend Barney tells him that orange juice will get rid of the green slime. Homer tests this out by spraying half of the shower with orange juice. He sprays the other half of the shower with water. After 3 days of "treatment" the green slime is still on both sides of the shower.

- A) What is your hypothesis?

- B) Identify the
 - control variable

 - independent variable

 - dependent variable

- C) What should Homer's conclusion be?

