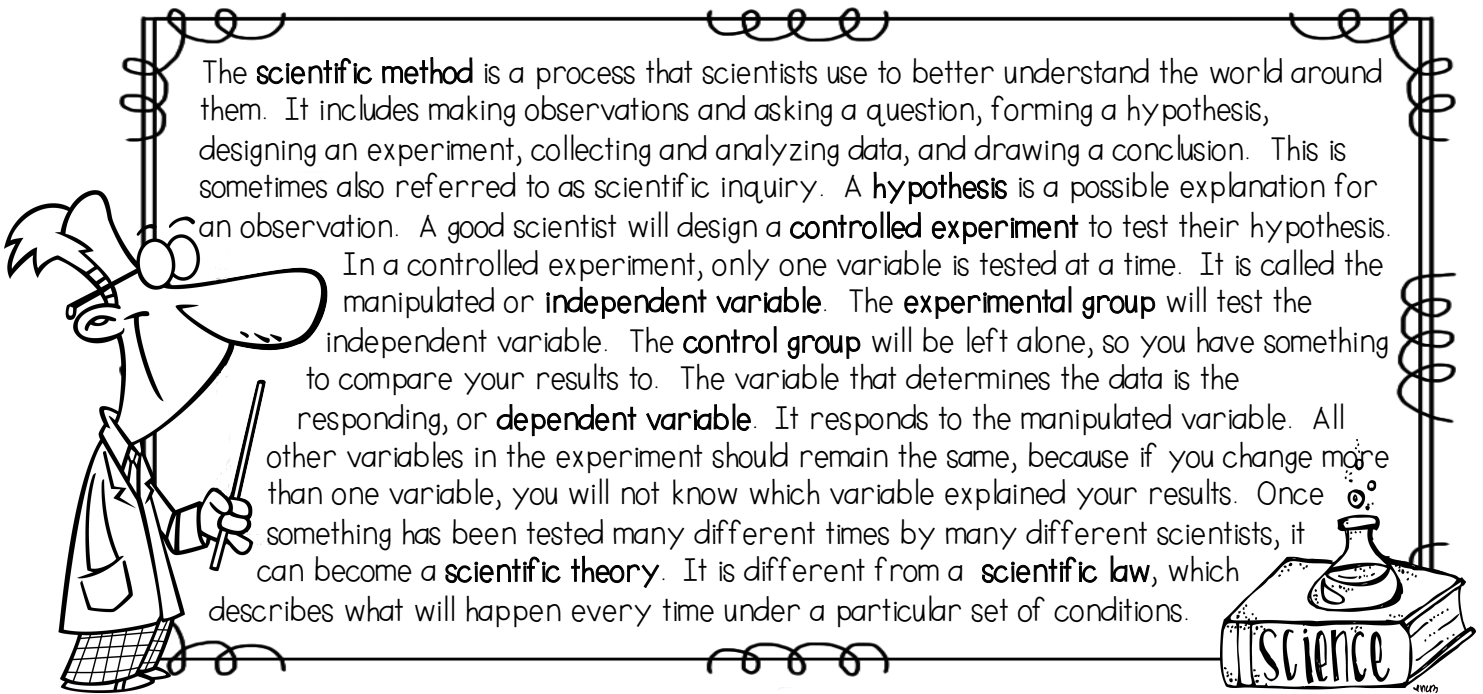


Exploring the Scientific Method

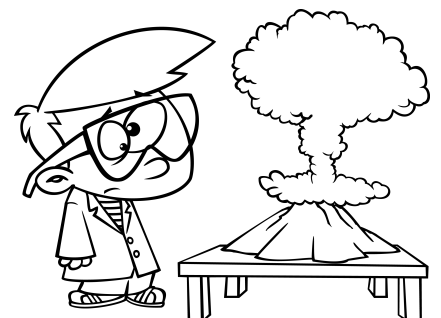


The **scientific method** is a process that scientists use to better understand the world around them. It includes making observations and asking a question, forming a hypothesis, designing an experiment, collecting and analyzing data, and drawing a conclusion. This is sometimes also referred to as scientific inquiry. A **hypothesis** is a possible explanation for an observation. A good scientist will design a **controlled experiment** to test their hypothesis. In a controlled experiment, only one variable is tested at a time. It is called the manipulated or **independent variable**. The **experimental group** will test the independent variable. The **control group** will be left alone, so you have something to compare your results to. The variable that determines the data is the responding, or **dependent variable**. It responds to the manipulated variable. All other variables in the experiment should remain the same, because if you change more than one variable, you will not know which variable explained your results. Once something has been tested many different times by many different scientists, it can become a **scientific theory**. It is different from a **scientific law**, which describes what will happen every time under a particular set of conditions.

True or False

If the answer is true, write "true" on the line. If the answer is false, replace the underlined word or phrase with one that will make the sentence correct. Write the new word(s) on the line.

1. _____ Forming a hypothesis is the first step of the scientific method.
2. _____ A scientific law is different from a scientific theory because it describes something in nature without attempting to explain it.
3. _____ In order for a hypothesis to be testable, scientists need to be able carry out investigations that will either support or disprove it.
4. _____ The experimental group is the group that is left alone during the experiment.
5. _____ The manipulated variable is the same thing as the independent variable.



Matching

Match the word to the definition. Write the letter on the line.

- | | |
|--------------------------------|--|
| 6. _____ Scientific inquiry | A. This group shows the effect of the variable being tested |
| 7. _____ Hypothesis | B. This is the one variable that is changed |
| 8. _____ Control group | C. A well-tested explanation for experimental results |
| 9. _____ Experimental group | D. The many ways in which scientists study the natural world |
| 10. _____ Independent variable | E. A possible answer to a scientific question |
| 11. _____ Dependent variable | F. This describes an observed pattern in nature |
| 12. _____ Scientific theory | G. This group is left alone and not experimented on |
| 13. _____ Scientific law | H. This is the variable that gets measured |

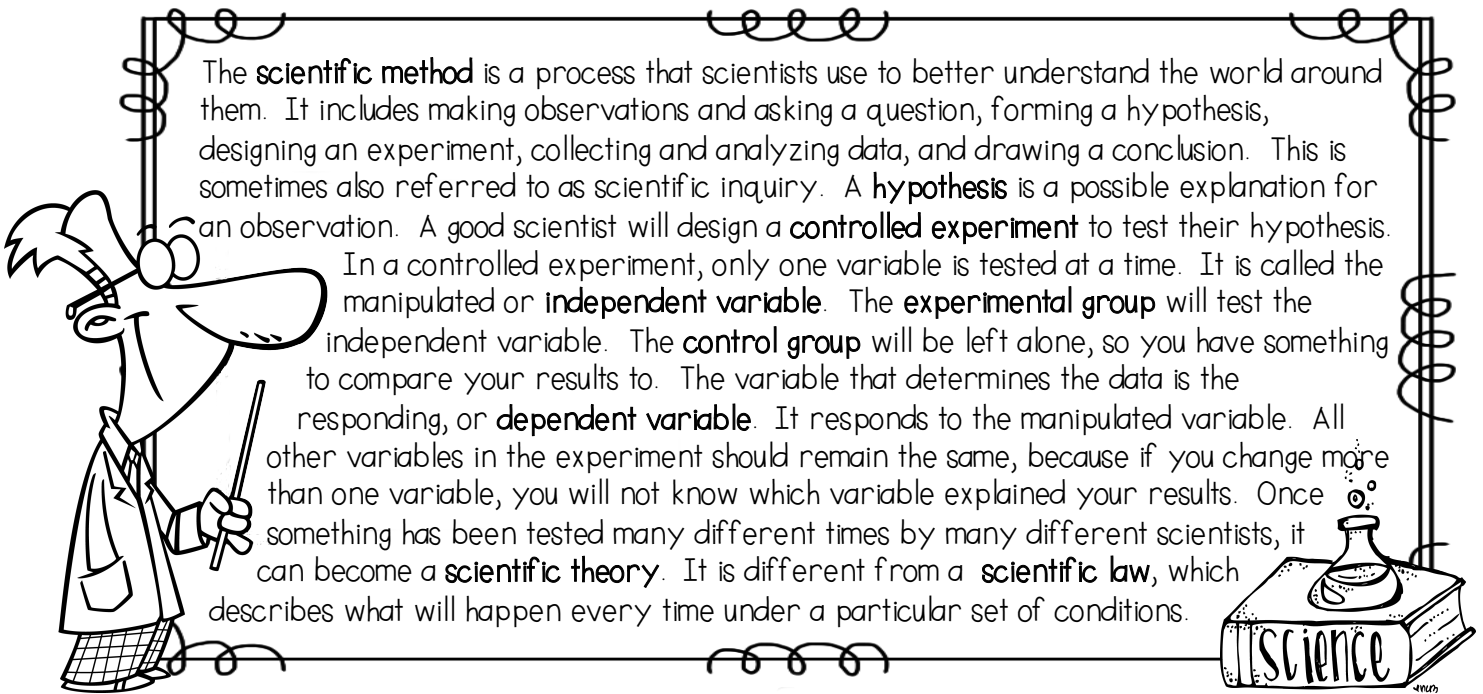


Identifying

Read through the following scenarios. Identify the control group, the experimental group, the independent variable, and the dependent variable.

Scenario	Independent Variable	Dependent Variable	Experimental Group	Control Group
A company wants to test a new dog food that is supposed to help overweight dogs lose weight. 50 dogs are chosen to get the new food, and 50 more continue their normal diets. After one month, the dogs are checked to see if they lost any weight.	14.	15.	16.	17.
A new sunscreen has been developed that is supposed to be more effective at preventing sunburn. 30 participants spray one arm with the new formula, and spray the other arm with the leading formula. After 4 hours in the sun, their skin is evaluated for any redness.	18.	19.	20.	21.
A student wants to study the effect of sunlight on plant growth. In his experiment, 12 plants receive normal amounts of sunlight, but half of them are kept under bright sun lamps all night long. After 6 weeks, the plants' heights are measured.	22.	23.	24.	25.

Exploring the Scientific Method

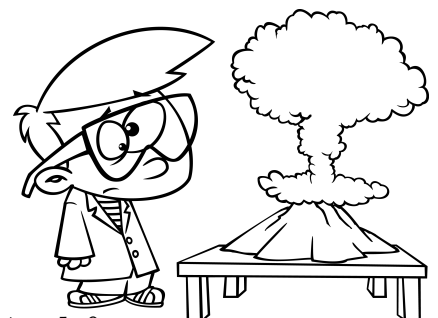


The **scientific method** is a process that scientists use to better understand the world around them. It includes making observations and asking a question, forming a hypothesis, designing an experiment, collecting and analyzing data, and drawing a conclusion. This is sometimes also referred to as scientific inquiry. A **hypothesis** is a possible explanation for an observation. A good scientist will design a **controlled experiment** to test their hypothesis. In a controlled experiment, only one variable is tested at a time. It is called the manipulated or **independent variable**. The **experimental group** will test the independent variable. The **control group** will be left alone, so you have something to compare your results to. The variable that determines the data is the responding, or **dependent variable**. It responds to the manipulated variable. All other variables in the experiment should remain the same, because if you change more than one variable, you will not know which variable explained your results. Once something has been tested many different times by many different scientists, it can become a **scientific theory**. It is different from a **scientific law**, which describes what will happen every time under a particular set of conditions.

True or False

If the answer is true, write "true" on the line. If the answer is false, replace the underlined word or phrase with one that will make the sentence correct. Write the new word(s) on the line.

1. **making an observation** Forming a hypothesis is the first step of the scientific method.
2. **true** A scientific law is different from a scientific theory because it describes something in nature without attempting to explain it.
3. **true** In order for a hypothesis to be testable, scientists need to be able carry out investigations that will either support or disprove it.
4. **control group** The experimental group is the group that is left alone during the experiment.
5. **true** The manipulated variable is the same thing as the independent variable.



Matching

Match the word to the definition. Write the letter on the line.

- | | |
|-----------------------------------|--|
| 6. <u>D</u> Scientific inquiry | A. This group shows the effect of the variable being tested |
| 7. <u>E</u> Hypothesis | B. This is the one variable that is changed |
| 8. <u>G</u> Control group | C. A well-tested explanation for experimental results |
| 9. <u>A</u> Experimental group | D. The many ways in which scientists study the natural world |
| 10. <u>B</u> Independent variable | E. A possible answer to a scientific question |
| 11. <u>H</u> Dependent variable | F. This describes an observed pattern in nature |
| 12. <u>C</u> Scientific theory | G. This group is left alone and not experimented on |
| 13. <u>F</u> Scientific law | H. This is the variable that gets measured |



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Read through the following scenarios. Identify the control group, the experimental group, the independent variable, and the dependent variable.

Scenario	Independent Variable	Dependent Variable	Experimental Group	Control Group
A company wants to test a new dog food that is supposed to help overweight dogs lose weight. 50 dogs are chosen to get the new food, and 50 more continue their normal diets. After one month, the dogs are checked to see if they lost any weight.	14. New dog food	15. Weight lost	16. Dogs on new food	17. Dogs on normal diet
A new sunscreen has been developed that is supposed to be more effective at preventing sunburn. 30 participants spray one arm with the new formula, and spray the other arm with the leading formula. After 4 hours in the sun, their skin is evaluated for any redness.	18. New sunscreen	19. Redness	20. Arm with new formula	21. Arm with leading formula
A student wants to study the effect of sunlight on plant growth. In his experiment, 12 plants receive normal amounts of sunlight, but half of them are kept under bright sun lamps all night long. After 6 weeks, the plants' heights are measured.	22. Sunlight	23. Plant height/ growth	24. Plants kept under lamps	25. Plants getting just normal sun