1.2 The Scientific Approach

Unit: Introduction

Learning Objectives:

a. **Describe** the steps in the scientific method.
b. **Compare** and **contrast** facts, scientific theories and scientific laws.
c. **Explain** the importance of models in science.
d. **Explain** the importance of safety in science.

Language Objectives:

- Understand and correctly use terms relating to the scientific method, such as "peer review"

Notes:

The scientific method is a fancy name for " ."

In the middle ages, "scientists" were called " ." These were church scholars who decided what was "correct" by arguing and debating with each other.

During the Renaissance, scientists like and started using experiments instead of argument to decide what really happens in the world.

Goal of the scientific method is

Steps:

1. Scientific investigations often begin with observations. An observation is information that you obtain through your senses.
2. A hypothesis is a proposed answer to a question.
3. In an experiment, any factor that can change is called a variable.

- The causes a change.
- The changes in response to the manipulated variable.

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- A is an experiment in which only one variable, the manipulated variable, is deliberately changed at a time. Repeat the experiment, varying your conditions as many ways as you can.

4. A conclusion describes how facts apply to a hypothesis.

5.

- A is a well-tested explanation for a set of observations or experimental results. Once a hypothesis has been supported in repeated experiments, scientists can begin to develop a theory.

More on Developing Theory

Share your theory, your experimental procedures, and your data with other scientists. Some of these scientists may:

a. Look at your experiments to see whether the experiments really can distinguish between the different outcomes.

b. Look at your data to see whether the data really do support your theory.

c. Try your experiments or other related experiments themselves and see if the results are consistent with your theory.

d. Add to, modify, limit, or suggest an alternative to your theory.

This process is called " ." If a significant number of scientists have reviewed your claims and agree with them, and no one has refuted your theory, your theory may gain acceptance within the scientific community.

Theories vs. Natural Laws

- A is a model that attempts to explain why or how something happens.

- simply describes what happens attempting to provide an explanation.

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- Both theories and laws can be used to predict the outcomes of related experiments.

- make it easier to understand things that might be too difficult to observe directly.

More on the Law

- For example, the states that objects attract other objects based on their mass and distance from each other.

- It is a law and not a theory because the Law of Gravity explain why masses attract each other.

More on Theory

- states that matter is made of atoms, and that those atoms are themselves made up of smaller particles. The interactions between the particles that make up the atoms (particularly the electrons) are used to explain certain properties of the substances.

- This is a theory because it gives an the substances have the properties that they do

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