

Bell Ringer



- List three procedures discussed the first day of school.

Experimental Design



**ESSENTIAL QUESTION: HOW DO SCIENTISTS
PROPERLY DESIGN AND CARRY OUT AN
EXPERIMENT?**

Scientific Method



- Scientific experimentation is carried out with the scientific method in order to be able to confidently draw conclusions.

Steps of the Scientific Method

1. Make an **observation** and pose a question
2. Form a **hypothesis**-easily written as an **if-then** statement.
3. Make a **prediction** (can be included in hypothesis)
4. Design an **experiment**
5. **Analyze Data/ Draw a conclusion**

Observation-the act of perceiving using the senses



- Let's see how observant you are.
- The next slide will be shown to you for 30 seconds. Record as many observations as you can about the slide.

- Ready?

Observation Questions



- What color is the car that is off the carousel?
- red
- How many portable toilets are there in the picture?
- 3
- What appears on each door of the portable toilet?
- Crescent moon
- What animal escaped the zoo?
- lion
- What are the seals eating?
- fish
- How many bowling pins are knocked down?
- 2

Hypothesis- a proposed explanation for the way a particular aspect of the natural world functions.



- The hypothesis can easily be written as an if-then statement, though it is not the only way to write one.
- For example: **If** I increase my time studying **then** I will get better grades.

Hypothesis Practice



- While holding a flashlight you noticed the size of the illuminated (lighted) area was changing as you were walk.
- Write a hypothesis using an if-then statement proposing what factor is causing the size of the illuminated area to change.



Prediction- a statement that forecasts what would happen if the hypothesis were true.



- A prediction is record for each hypothesis.
 - Can be embedded in the hypothesis

Experiment- Used to test the hypothesis by gathering reliable data.

Many experiments are called controlled experiments. They have

- **Control Group-** the normal group or a group that provides a standard for comparison.
- **Experimental Group-same** as the control group except one factor is changed (**Independent variable**)

Variables



- Independent Variable-The manipulated variable.
 - It is the variable that the experimenter is adding to the experimental group to see how it compares to the control group.

An easy way to remember it is that the independent variable **Changed!**
- Dependent Variable- the responding variable or what is being **measured or counted**

Type of Data to Collect



- **Quantitative Data**- measurable using instruments.
 - Example: The illuminated area is **10cm** when the flashlight is **8cm** away from the chalk board.
- **Qualitative Data**-gathered through your senses (sight, smell, hear, touch, taste)
 - When the illuminated area got big students notice it was more dim.

Cautions in Science



- **Inferences**- make a conclusion on the basis of facts and previous knowledge rather than direct observation.
 - Waldo Picture- Some of you may have made inferences about what animal escaped the zoo.
- **Bias**-making a judgment based on prior knowledge.

Theory



After a lot of experimentation.....

- A **scientific theory** is a well-substantiated explanation of some aspect of the natural world that is acquired through the **scientific** method and repeatedly tested and confirmed, preferably using a written, pre-defined, protocol of observations and experiments.

Closing



- Tell me one or more things you learned from this presentation.