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 able to confidently draw conclusions.

Steps of the Scientific Method

1. Make an **observation** and pose a question
2. Form a **hypothesis**
3. Make a **prediction**
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?


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COTTON CANDY

Observation Questions

- What color is the car that is off the carrousel?
- 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 described as a potential explanation for an observation.

- For example: Increasing the amount of time students study will increase the student's grade in Biology because more exposure to the content will help students remember the content easier.

Hypothesis Practice

- While holding a flashlight you noticed the size of the lighted area was changing as you were walking.

- Write a hypothesis proposing what factor is causing the size of the lighted area to change.

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

- A prediction is recorded for each hypothesis.
  - Can be written as the "if –then-because" statement.

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 lighted area is **10cm** in diameter when the flashlight is **8cm** away from the chalk board.
- **Qualitative Data**-gathered through your senses (sight, smell, hear, touch, taste)
  - When the lighted area got bigger students noticed it was more dim.

builder-event

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 or remember from today?