Methods of Science

Objectives: 1. Describe the difference between an observation and an inference. 2. Differentiate among control, independent variable, and dependent variable. 3. Identify the scientific methods a biologist uses for research.

Jesus answered and said to them, "Go and tell John the things you have seen and heard: that the blind see, the lame walk, the lepers are cleansed, the deaf hear, the dead are raised, the poor have the gospel preached to them. Luke 7:22

1. Ask a question

- Begins with observation…seeing something new that you haven't seen before and wanting to study it
- Often involves recording observations about the topic
  Record what you know and combine with your observations to make **inferences**

2. Research

-Find out what experiments have already been done related to this topic and use the information to help develop your ideas

3. Form a hypothesis

After you make all of your observations and inferences, you form a hypothesis, a testable explanation for a situation

4. Collect the data

- Conduct an experiment (investigate in a controlled setting to test a hypothesis)
- What do I mean by controlled?
  - Try to keep as many variables consistent as possible…WHY?
  - Have a **control** group and an **experimental** group; the control group is used for comparison
- Only one factor can change at a time…
  - This is the **independent variable** and is the tested factor; it might affect the outcome of the experiment
  - The **dependent variable** results from, or depends on changes to the independent variable
  - EXAMPLE?
  - A **constant** remains fixed while the other variables can change
  - Why do we need constants?

5. Analyze the Data

- Scientists need to ask themselves some questions at this point…such as?
- Scientists will work together to analyze the data and determine the next course of action

6. Report Conclusions

- Publish work
- Needs to be reviewed by peers
- Work must be original, and demonstrate the scientific method and accuracy