Session II

Dr. Meghan Marrero

Methods of STEM Education

Session Agenda:

I. Engineering and Science Education

Guest Speaker:

Dr. Jenny Daugherty

Purdue University

II. The Nature of Science

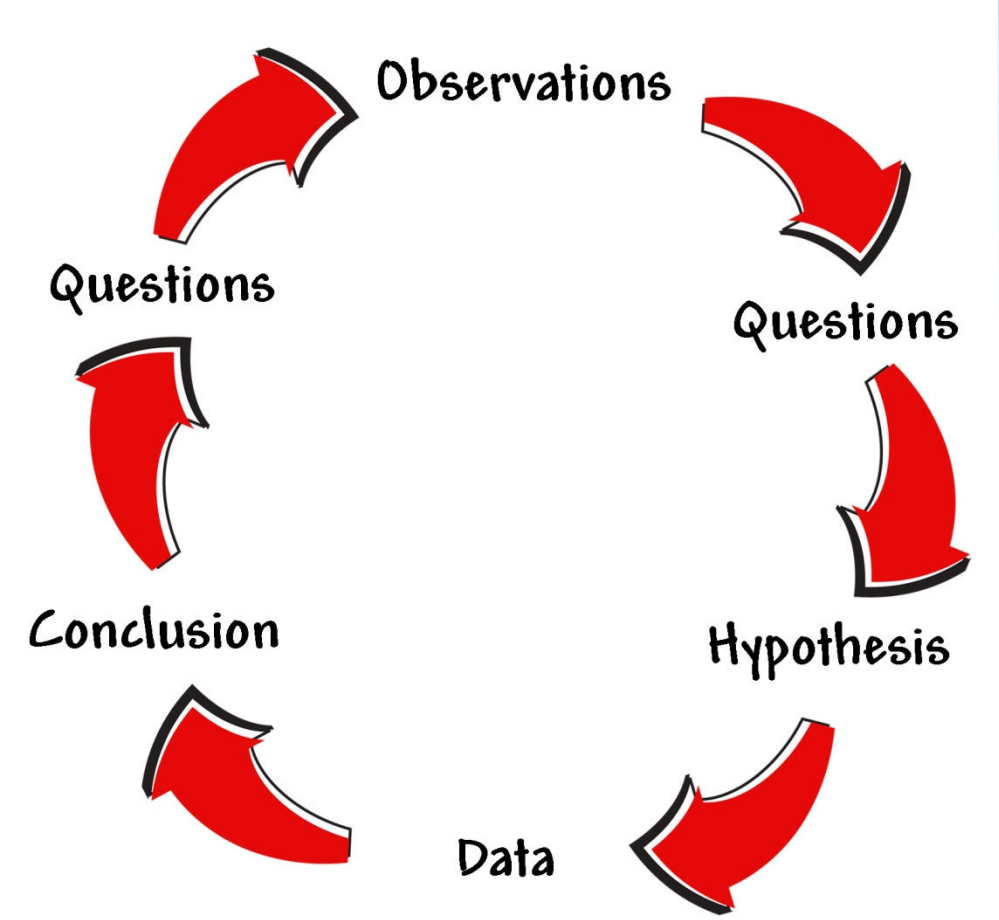
III. Housekeeping/Syllabus Issues

Guest Speaker:

Dr. Jenny Daugherty

Purdue University
West Lafayette, IN

The Scientific Method:



Some Important NOS Words:

- Hypothesis
  - A testable prediction based on prior observation and background knowledge
- Data
  - Collections of observations
- Fact
  - An objective, verifiable observation
- Theory
  - A scientifically accepted general principle that explains observations. A body of knowledge
- Law
  - A set of observed regularities expressed in a concise verbal or mathematical statement. Describes relationships between natural phenomena

Some Sample Theories and Laws:

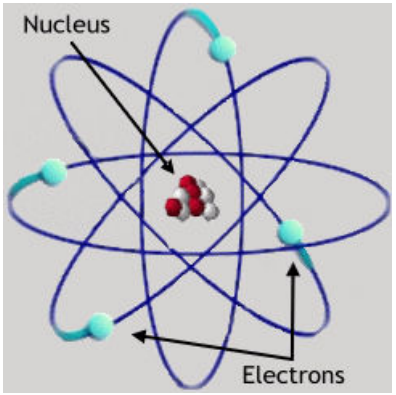
- Boyle's Law (V= T/P) relates facts about gases
- The Kinetic Theory of Gases explains why it is true

- Mendel's Laws calculate expected frequencies in integer ratios
- The Theory of Molecular Genetics explains why Mendel's Laws are approximately true, and when they are false

- Hubbell's Law states that the speed at which a distant galaxy is moving away from Earth is directly proportional to its distance from Earth
- The Big Bang Theory explains why Hubbell's Law is true

The Nature of Science

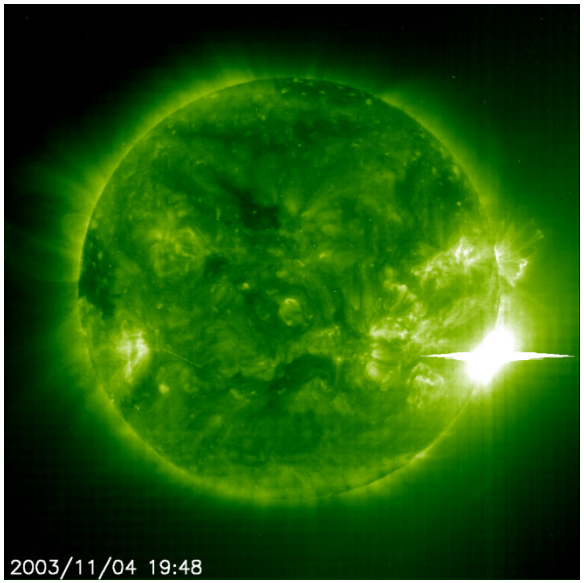
- Distinction between observations & inferences
- Distinction between laws and theories
- Knowledge is derived from observations of the natural world
- Involves human imagination and creativity and therefore is partially subjective
- Socially and culturally embedded
- Subject to change

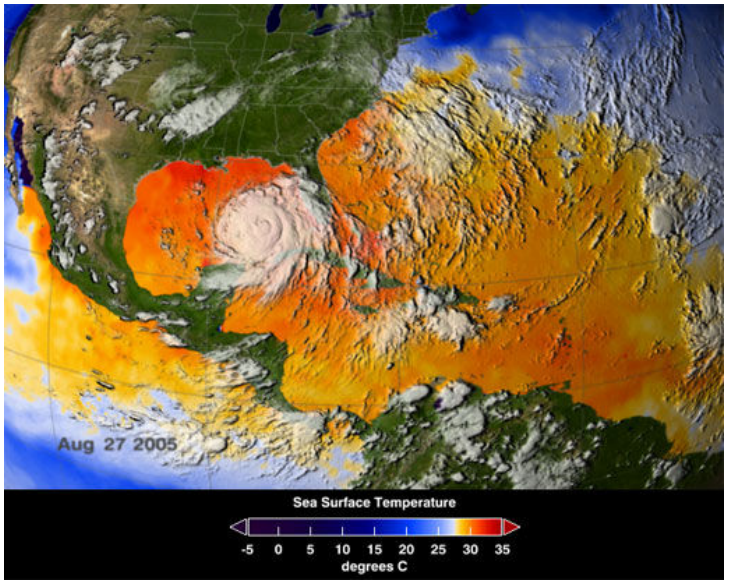


Science Project Assignment

- Use long term observation to examine a phenomena

- Can physically conduct the observation or use online data sets
  - i.e., weather, sunspots, sea surface temperatures, vegetation imagery, etc.



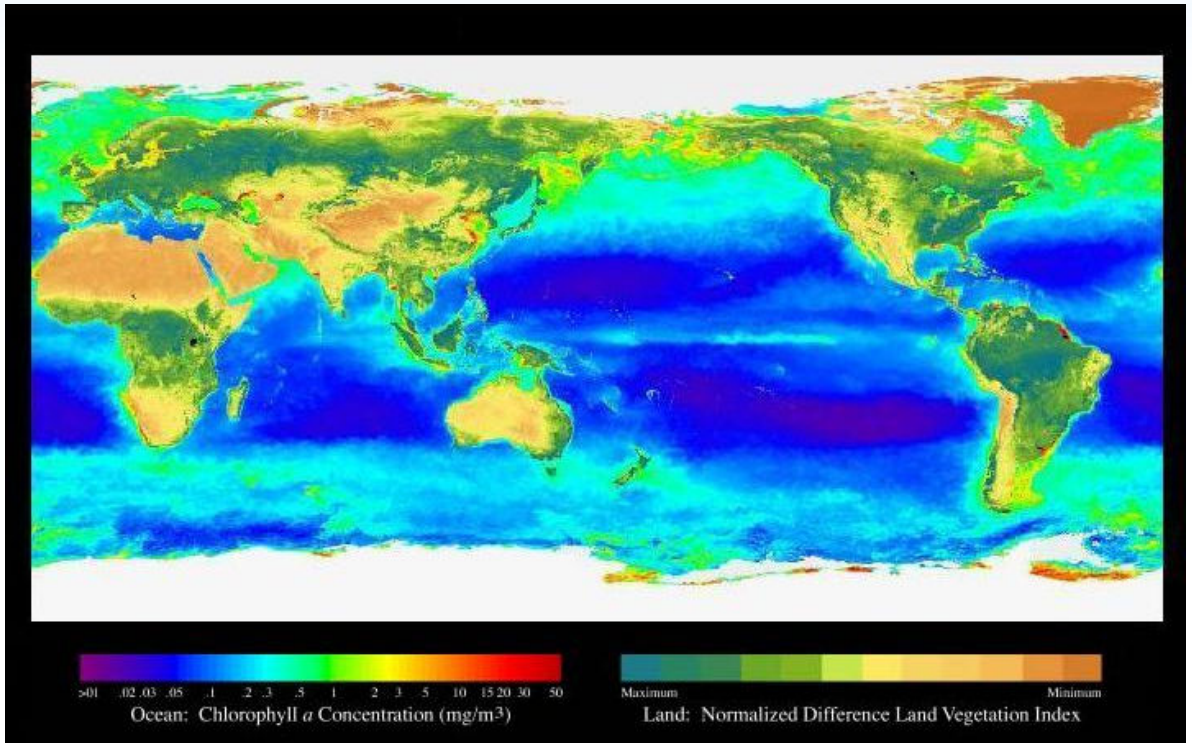


Credit: NASA

Science Project Assignment

•Give background– why do you want to know about this phenomenon?

•You will work through writing up a scientific paper.



Credit: NASA

Science Project Paper Outline

Introduction: Provide background information on the subject that you are investigating. Your research question and hypothesis should be identified here.

Methods: Describe how data are collected and analyzed. Be as specific as possible.

Observations/Data: What were your overall findings? Give charts, graphs, and/or drawings where appropriate.

Conclusions: What conclusions can you make based on your data?

Discussion: Why is this study significant? What are further research questions?

Conceptual Change

-What the research says

-Teaching for conceptual change

Course Policies & Procedures

- Asynchronous Week Procedures
  - Follow Instructions in “Lesson” for the Week
    - Readings
    - Discussion Topics
    - Mini Assignments

Methods of Applied Science Education