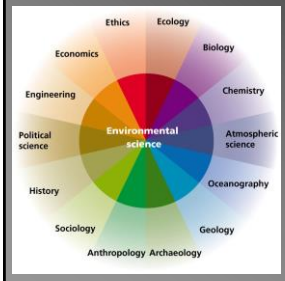
The What, When, Where, Why, and How… of

What is Environmental Science?

- Interdisciplinary
- Broad field
- Ecology is a basic tool
- Goals
  - Establish general principles about how the natural world functions
  - Identify, understand, and solve problems

What is Environmental Science?



- **An interdisciplinary field**
  - **–Natural sciences: information about the natural world**
  - **–Social sciences: study human interactions and behavior**

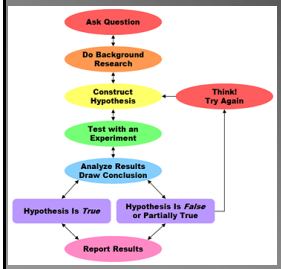
Environmental Science is not Environmentalism

- **Environmental science**
  - The pursuit of knowledge about the natural world
  - Scientists try to remain objective
- **Environmentalism**
  - A social movement dedicated to protecting the natural world

What is Science?

- Not just a body of knowledge
- Dynamic process
- Requires collection of data
- An ongoing enterprise
- Requires reevaluation

The Scientific Method



1. Identify a Problem / Ask a Question
2. Do Background Research
3. Make a Hypothesis
4. Test the Hypothesis
5. Make Observations
6. Analyze Data and Draw a Conclusion

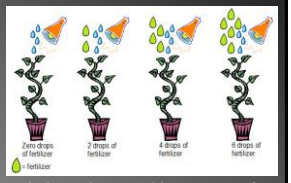
Testing the Hypothesis

- A good hypothesis makes a prediction
- Experiment: an activity which tests the validity of the hypothesis

Hypothesis:
If fertilizer helps a plant grow, then plants should grow larger when more fertilizer is applied to the soil.

Testing the Hypothesis

- Variables: factors that influence a process
  - Independent variable: condition that is manipulated
  - Dependent variable: thing that is affected by the independent variable
  - Controlled variables: conditions that are kept the same



Independent variable – amount of fertilizer
Dependent variable – how tall the plant grows
Controlled variables – amount of water and sunlight

Practice

Experiment 1 How do the different chemicals in fertilizers affect plant growth?	Independent variable: Dependent variable:	

Practice

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Experiment 2 How long does it take three different types of enzymes each individually to digest a litre of milk?	Independent variable: Dependent variable:	
Experiment 3 What is the effect of the density of different mediums (e.g., air and glass) on the speed at which light travels?	Independent variable: Dependent variable:	

Practice

Experiment 1 How do the different chemicals in fertilizers affect plant growth?	Independent variable: Dependent variable:	different chemicals in fertilizers plant growth
Experiment 2 How long does it take three different types of enzymes each individually to digest a litre of milk?	Independent variable: Dependent variable:	type of enzyme time taken to digest milk
Experiment 3 What is the effect of the density of different mediums (e.g., air and glass) on the speed at which light travels?	Independent variable: Dependent variable:	density of different mediums speed at which light travels

Testing the Hypothesis

- Experiment:
  - Experimental Group: receives the independent variable
  - Control Group: has all parts of the experiment but independent variable; it is the 'normal'
- A control group is included to help judge the effects of the independent variable

More Practice

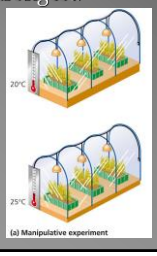
Smithers thinks that a special juice will increase the productivity of workers. He creates two groups of 50 workers each and assigns each group the same task (in this case, they're supposed to staple a set of papers). Group A is given the special juice to drink while they work. Group B is not given the special juice. After an hour, Smithers counts how many stacks of papers each group has made. Group A made 1,587 stacks, Group B made 2,113 stacks.

Identify the:

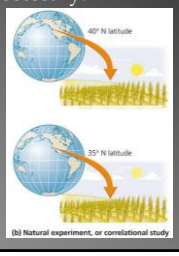
1. Control Group
2. Independent (Manipulated) Variable
3. Dependent (Responding) Variable
4. What should Smithers' conclusion be?
5. How could this experiment be improved?

Testing the Hypothesis

Manipulative experiments are strongest.



Natural or correlational ones are often necessary.



Scientific Theory

- Integrated explanation of numerous hypotheses
- Solid ground of science
- Accepted as true
- Subject to change as new evidence is found

Conclusion

- Environmental science is SCIENCE
- It follows the scientific method