Designing and Managing On-line Courses

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Developing Online Courses

Challenges

- outreach teaching not recognized for faculty or department in workload decisions
- concerns about courses interfering with graduate program
- Negative perception of online courses
- Heavy "front loading" limits spontaneity in course

Benefits

- good collaborations with other faculty within departments and beyond campus help
- building online courses as a group has worked well
- good planning can produce desired results.

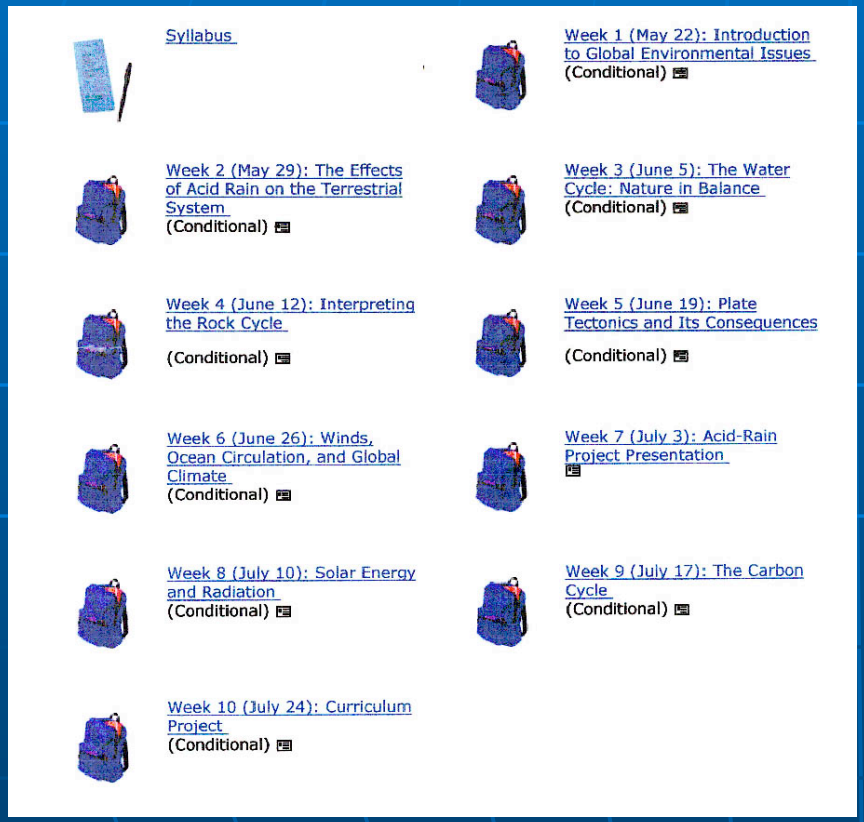
Planet Earth: Hands-on Earth Science Online

- **Earth Systems Science course**
- **Originally developed in a face-to-face format**
- **In-service teachers prime audience, but open to all**
- **Online and face-to-face versions**
- **Hands-on, collaborative, few "lectures."**

Course Goal and Objectives

- Goal
  - Provide an inquiry-based exploration of Earth systems
- Objectives
  - Obtain relevant content knowledge
  - Solve problems related to Earth System Science using on-line resources
  - Design and carry out experiments and research projects
  - Work collaboratively with a team
  - Adapt science content to middle-school teaching

Course Plan



- Each week devoted to a specific content topic
- Long-term experimental project
- Lesson-plan development

Structure of a Week

- Low-stakes check-in question connected to life experience
- Hands-on experiment
- Reflective component or summary

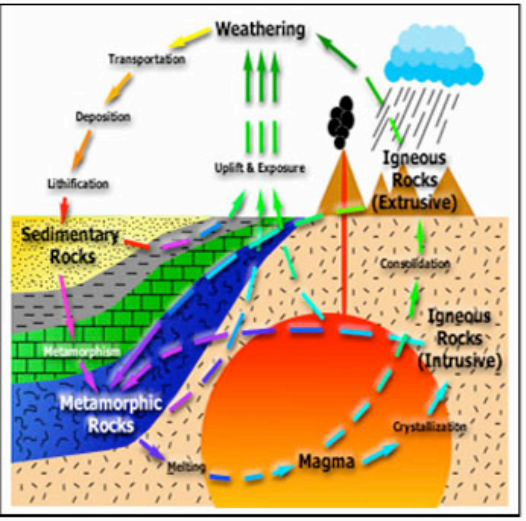
Introduction:

Planet Earth

Interpreting the Rock Cycle

Objectives:

- Differentiate among the various rock types.
- Examine the processes of rock weathering and soil formation
- Connect the mode of rock origin to its physical characteristics

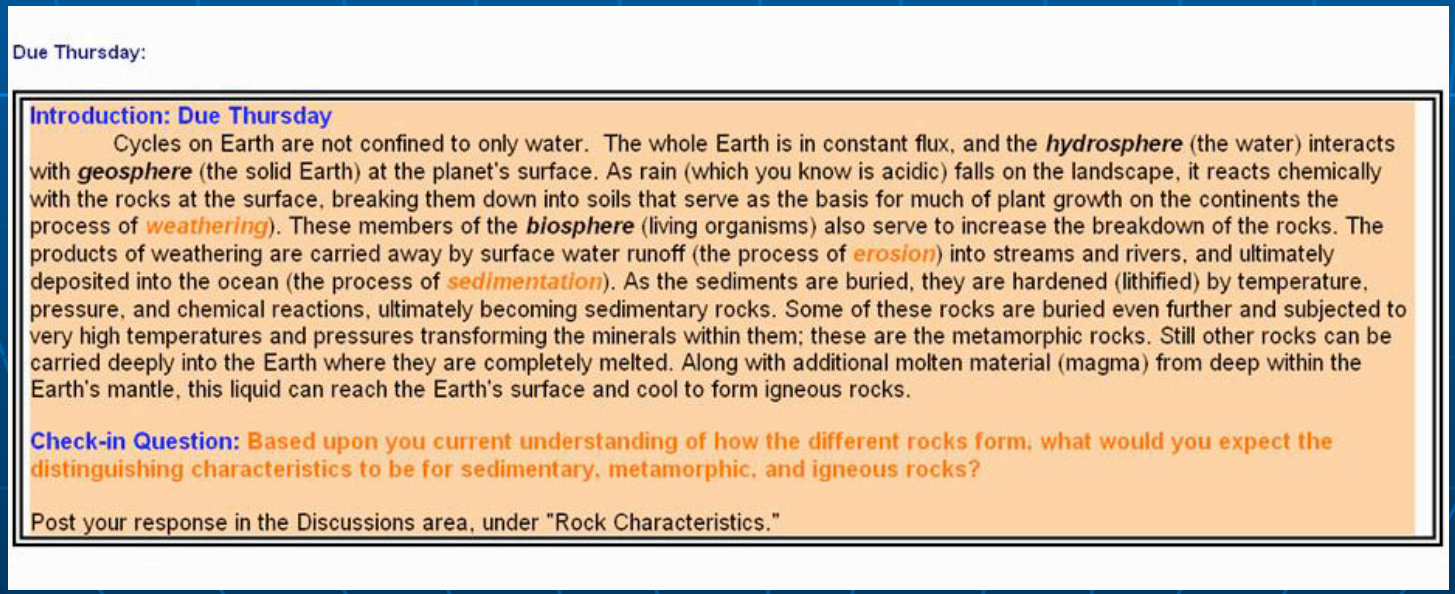


Calendar:

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				Read Instructions, Gather Materials, Check-in		Post Results of Rock Investigations
	Team Summary; Complete Rock Cycle Test					

Check-In Question

- Something to engage students at the beginning
  - Likelihood of earthquakes occurring in your state
  - Most convincing argument that the U.S. does not need to reduce CO_2 emissions
  - Wildest thing you know that people have blamed on El Niño



Due Thursday:

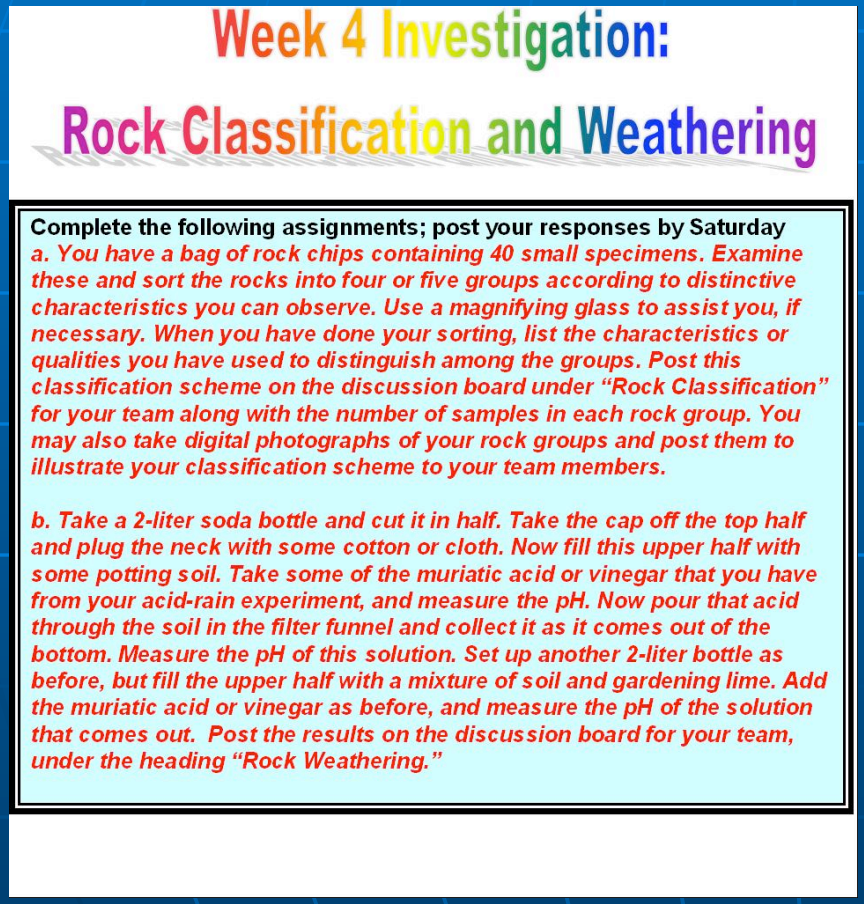
Introduction: Due Thursday

Cycles on Earth are not confined to only water. The whole Earth is in constant flux, and the ***hydrosphere*** (the water) interacts with ***geosphere*** (the solid Earth) at the planet's surface. As rain (which you know is acidic) falls on the landscape, it reacts chemically with the rocks at the surface, breaking them down into soils that serve as the basis for much of plant growth on the continents the process of *weathering*). These members of the ***biosphere*** (living organisms) also serve to increase the breakdown of the rocks. The products of weathering are carried away by surface water runoff (the process of *erosion*) into streams and rivers, and ultimately deposited into the ocean (the process of *sedimentation*). As the sediments are buried, they are hardened (lithified) by temperature, pressure, and chemical reactions, ultimately becoming sedimentary rocks. Some of these rocks are buried even further and subjected to very high temperatures and pressures transforming the minerals within them; these are the metamorphic rocks. Still other rocks can be carried deeply into the Earth where they are completely melted. Along with additional molten material (magma) from deep within the Earth's mantle, this liquid can reach the Earth's surface and cool to form igneous rocks.

Check-in Question: Based upon you current understanding of how the different rocks form, what would you expect the distinguishing characteristics to be for sedimentary, metamorphic, and igneous rocks?

Post your response in the Discussions area, under "Rock Characteristics."

Hands-on Experiments



Week 4 Investigation:

Rock Classification and Weathering

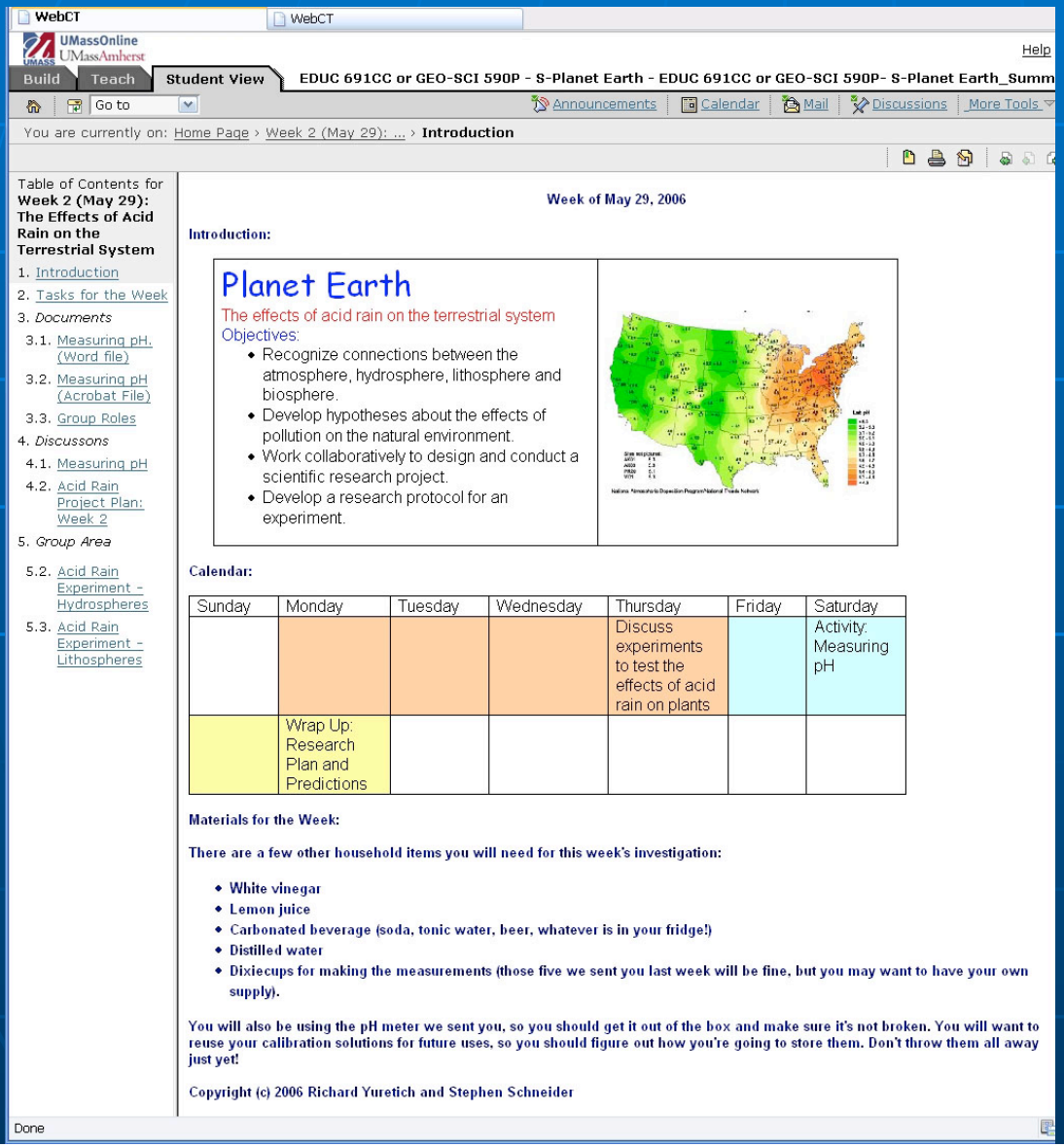
Complete the following assignments; post your responses by Saturday

a. You have a bag of rock chips containing 40 small specimens. Examine these and sort the rocks into four or five groups according to distinctive characteristics you can observe. Use a magnifying glass to assist you, if necessary. When you have done your sorting, list the characteristics or qualities you have used to distinguish among the groups. Post this classification scheme on the discussion board under "Rock Classification" for your team along with the number of samples in each rock group. You may also take digital photographs of your rock groups and post them to illustrate your classification scheme to your team members.

b. Take a 2-liter soda bottle and cut it in half. Take the cap off the top half and plug the neck with some cotton or cloth. Now fill this upper half with some potting soil. Take some of the muriatic acid or vinegar that you have from your acid-rain experiment, and measure the pH. Now pour that acid through the soil in the filter funnel and collect it as it comes out of the bottom. Measure the pH of this solution. Set up another 2-liter bottle as before, but fill the upper half with a mixture of soil and gardening lime. Add the muriatic acid or vinegar as before, and measure the pH of the solution that comes out. Post the results on the discussion board for your team, under the heading "Rock Weathering."

- Specialty supplies packaged in a kit ordered from supplier
- Supplemented by household items
- Promote collaboration and inquiry-based learning

Extended-Duration Experiment



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Build | Teach | Student View | EDUC 691CC or GEO-SCI 590P - S-Planet Earth - EDUC 691CC or GEO-SCI 590P- S-Planet Earth_Summ

Go to | Announcements | Calendar | Mail | Discussions | More Tools

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Table of Contents for **Week 2 (May 29): The Effects of Acid Rain on the Terrestrial System**

1. Introduction
2. Tasks for the Week
3. *Documents*
   - 3.1. Measuring pH, (Word file)
   - 3.2. Measuring pH (Acrobat File)
   - 3.3. Group Roles
4. *Discussons*
   - 4.1. Measuring pH
   - 4.2. Acid Rain Project Plan: Week 2
5. *Group Area*
   - 5.2. Acid Rain Experiment - Hydrospheres
   - 5.3. Acid Rain Experiment - Lithospheres

Week of May 29, 2006

Introduction:

Planet Earth

The effects of acid rain on the terrestrial system

Objectives:

- Recognize connections between the atmosphere, hydrosphere, lithosphere and biosphere.
- Develop hypotheses about the effects of pollution on the natural environment.
- Work collaboratively to design and conduct a scientific research project.
- Develop a research protocol for an experiment.

Calendar:

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				Discuss experiments to test the effects of acid rain on plants		Activity: Measuring pH
	Wrap Up: Research Plan and Predictions					

Materials for the Week:

There are a few other household items you will need for this week's investigation:

- **White vinegar**
- **Lemon juice**
- **Carbonated beverage (soda, tonic water, beer, whatever is in your fridge!)**
- **Distilled water**
- **Dixiecups for making the measurements (those five we sent you last week will be fine, but you may want to have your own supply).**

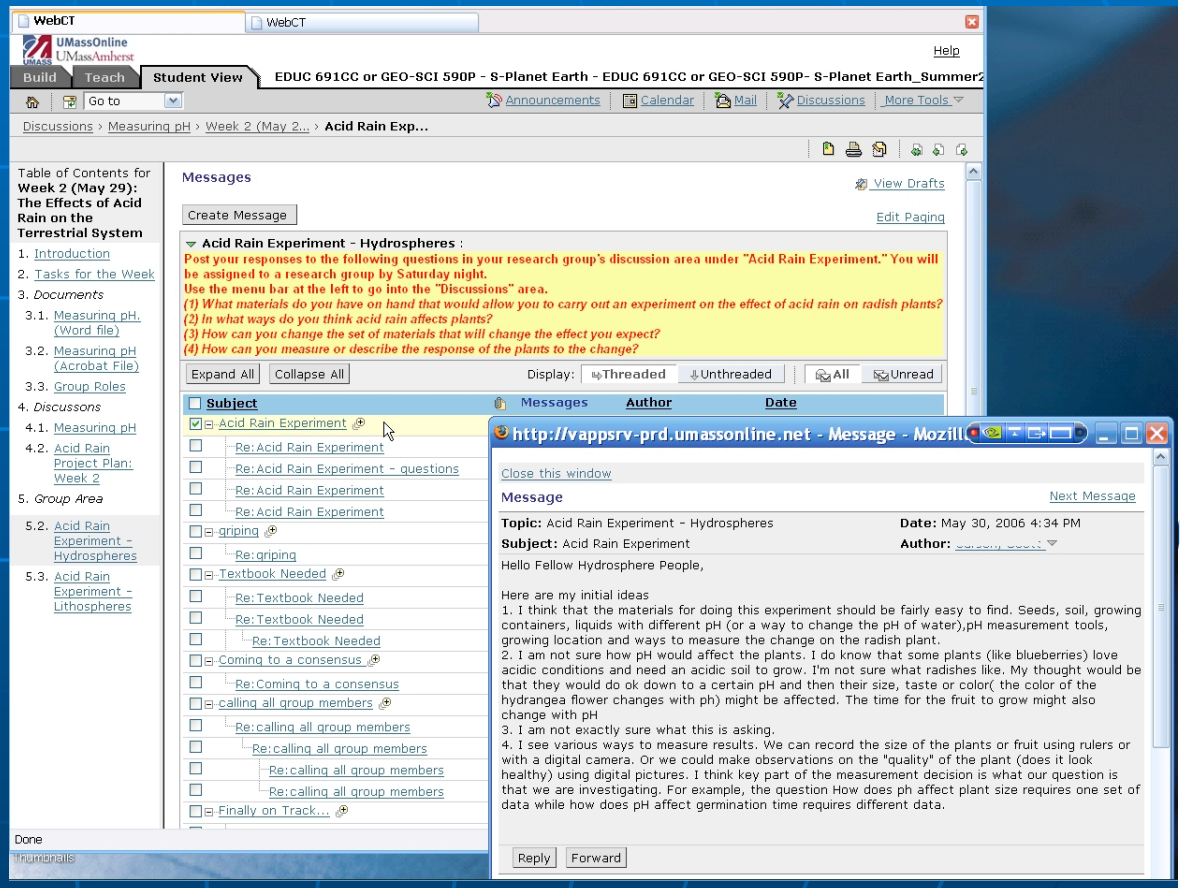
You will also be using the pH meter we sent you, so you should get it out of the box and make sure it's not broken. You will want to reuse your calibration solutions for future uses, so you should figure out how you're going to store them. Don't throw them all away just yet!

Done

- Environmentally relevant
- Frame scientific question
- Design a plan
- Interpret results
- Extensive collaboration
- Multiple repetitions

Extended-duration experiment

- Discussion board for planning and reporting results within the team



Extended-Duration Experiment

Acid Rain Radish Experiment – The Hydrospheres

Hypotheses

There would be a clear difference (size, health, appearance, speed of growth, interval to germination) between plants that grew in rainwater versus plants that grew in an acid environment; also that any acid pH lower than 5.5 would be harmful to the plants. The group anticipated dramatic differences between the plants grown in different pH conditions.

- Teams posted final report for all to read and give feedback

Inquiry Learning in an Online Science Course

- Good team size (4 or 5 ideal)
- Friendly forum for sharing ideas
  - Team discussion groups
  - Reports from whole team shared with other teams
- Data sharing
- Pictures

Lesson-Plan Capstone

Week of July 24, 2006

Introduction:

Planet Earth

Curriculum Project

Objectives:

- Adapt an activity from this course that will be suitable for your classroom
- Prepare a lesson plan for that activity
- Post this activity for discussion

dnesday	Thursday	Friday	Saturday
	Check-out: Preliminary Lesson Plan Outline		Final Lesson Plan Posting

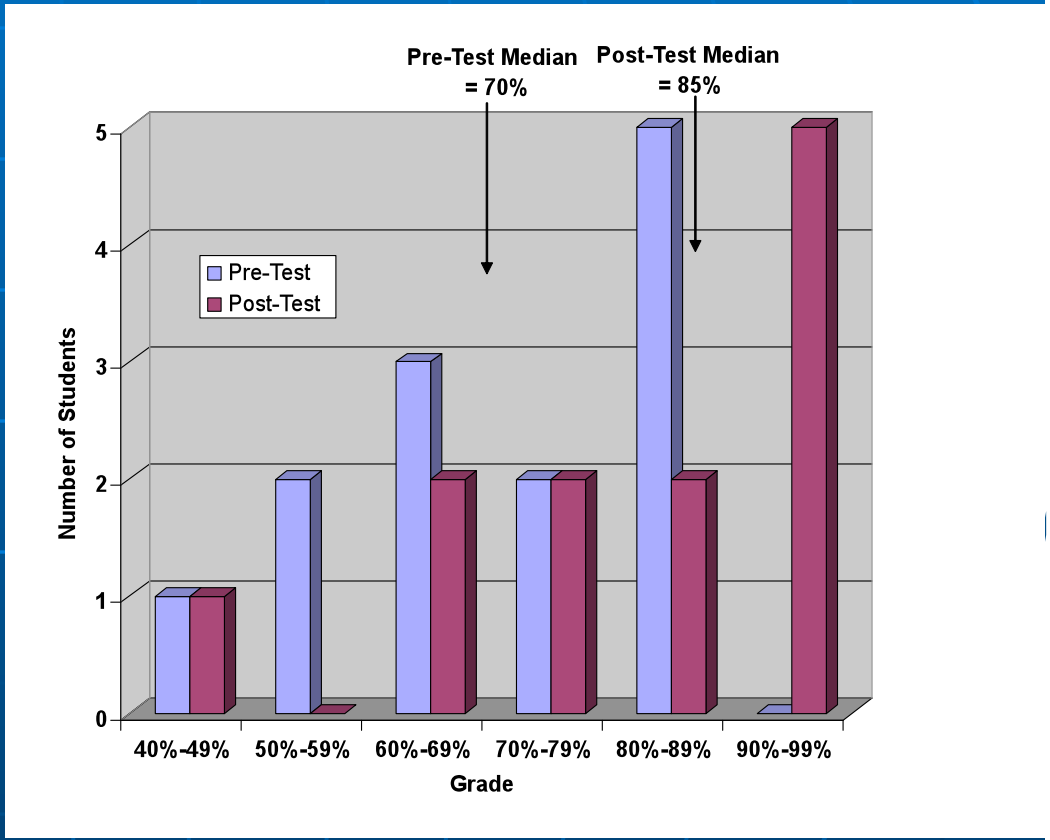
- Use activity from the course as a basis
- Post an outline for peer feedback

Semi-Asynchronous Learning

- NO chat room – participants told us they do not want to be locked into particular times
- Structured engagement 3-times per week
  - Check-in question (Thursday)
  - Hands-on experiment report (Saturday)
  - Reflective and cumulative work (Monday)
- Teams encouraged to use chat (phone, email) in smaller groups
- Instructor encouragement

Learning Outcomes

- Earth Science Knowledge Survey
- Pre-test/post-test comparisons show significant improvement in learning
- Statistically significant at 95% level



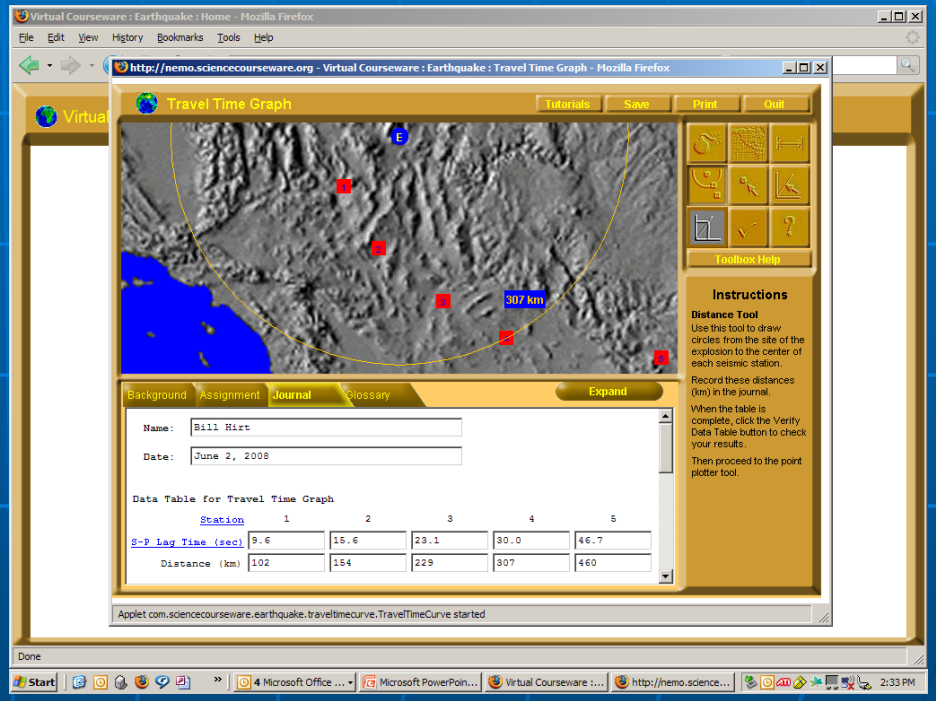
Learning Outcomes

	Pre-Test Average	Post-Test Average	Net Gain	N	t	p
Face-to-Face	52.7	63.5	10.8	30	-5.2598	0.000
Online	69.8	80.1	10.3	13	-1.6908	0.052

- Similar knowledge increase in comparable face-to-face courses
- Consistent with expected results of properly designed online courses.

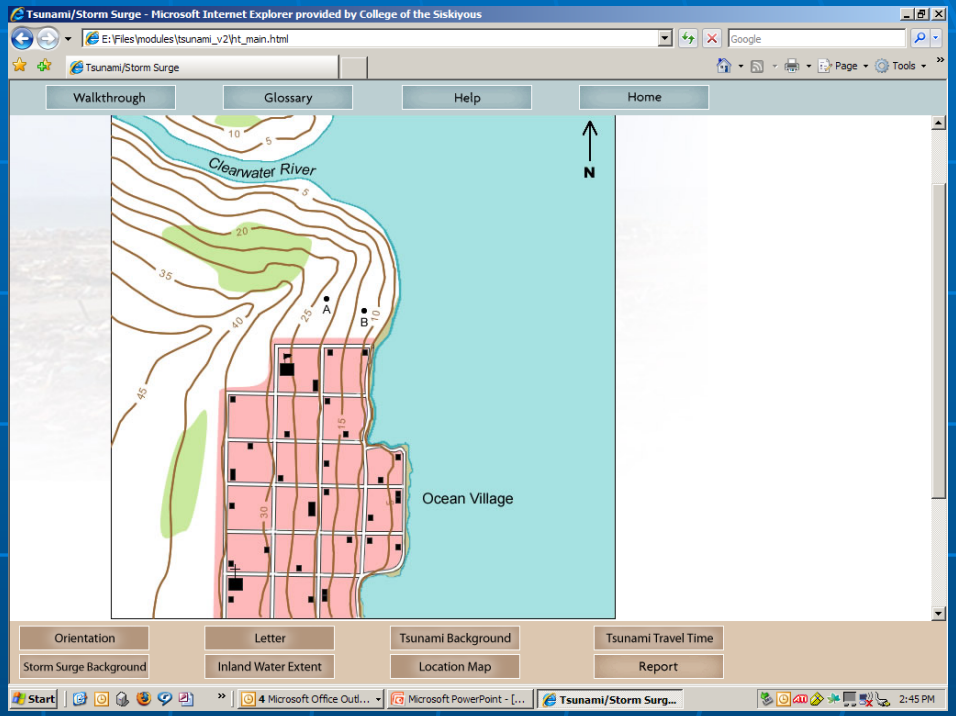
Interactive Online Activities

- *Earthquake* is an online activity that promotes quantitative reasoning and critical thinking
- It also includes an assessment



Interactive Online Activities

- *Hazard City* is a set of CD-based activities that promote critical thinking, quantitative reasoning, an application of basic principles to "real life" scenarios.



Conclusions

- Effective learning can be accomplished online through inquiry and investigation.
  - Need to establish realistic learning goals
  - Provide students with relevant materials
  - Design collaborative activities that exploit tools in learning management systems