

Delivering and Assessing Data Rich Assignments in a General Education Oceanography Course

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<http://oceanography.geol.ucsb.edu/~gs4/>

Learning goals:

- Facts about oceanography
 - ocean basins and plate tectonics
 - atmosphere and climate
 - waves and beaches
 - life in the ocean, global fisheries
- Science process
- Implications for the future

Approach:

- Learning the facts:
 - lectures
 - reading
 - online, auto-graded homeworks
- Science process
 - investigations using real Earth data
 - writing in science format
- Logistics and motivation
 - on demand grade computation
 - auto-grading homework, for immediate feedback
 - online writing, "hand-in," grading, and return

Advantages of assigning writing:

- improves student learning by going beyond fact memorization
- active participation in the science process
- teaches how to argue from data, rather than opinion

Challenges:

- faculty/TA workload
- posing an effective assignment
- managing TA skills, feedback, and grading
- paper shuffling logistics
- avoiding grading "burnout"

EarthEd Online is:

- Authored with Macromedia Director
- A stand-alone browser, delivered on CDROM
- connected to a web server through the internet
- automatically upgraded from server
- cross platform: Macintosh and PC
- modular: new modules can be added easily
- easily configured for the needs of a variety of courses. Assignments are stored on the class web server.

The Guided Writing Assignment:

- The paper assignment has defined "headings"
- Each heading has a set of score "items"
- Each heading has a prompt specifying the required content
- Headings and prompts are specified by the teacher
- Text is entered directly into the "Writer" or pasted in from a text editor.
- An integrated graphics editor can import or create, and link images to the text.

Peer grading (Calibrated Peer Review):

- The model was developed at UCLA (<http://cpr.molsci.ucla.edu/>)

Elements of a CPR assignment:

- 1) assignment description
- 2) scoring rubric to be used by peer graders
- 3) 3 "calibration" papers, scored by the instructor
- 4) other instructional resources
- 5) data resources that can create images of data plots or other representations

To do the assignment, the student:

- 1) carefully reads the assignment description
- 2) writes the paper using EarthEd Online
- 3) Hands in paper before the due date/time (click the "hand-in" button)
- 4) Reviews 3 "calibration" papers, beginning 24 hrs after the hand-in due date. Students are prompted if their average item grade for a particular heading is greater than a preset value.
- 5) Reviews 3 peer papers, randomly assigned and anonymous
- 6) Reviews her/his own paper.

The paper grade is computed from:

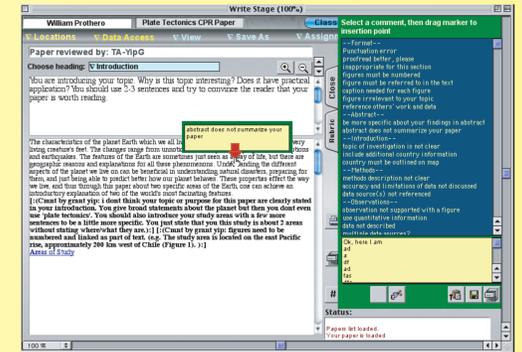
- 1) the 3 peer grades weighted by each reviewer's rms variation from the calibration paper item scores.
- 2) Prof or TA grade if student requests it. This grade over-rides the peer grade.

The reviews grade is computed from:

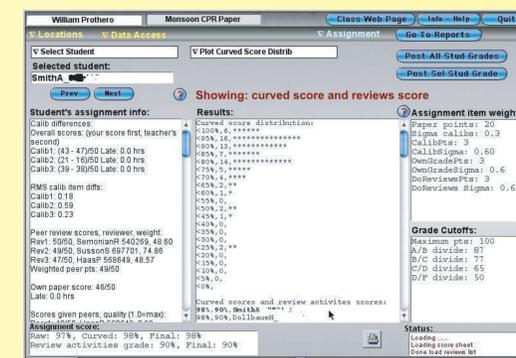
- 1) difference between grade given peers and final grade each peer received
 - 2) difference between final grade for own paper and self-score for own paper
 - 3) RMS deviation of calibration paper scores relative to "correct" scores
- All weights and point settings are configured by the instructor

Please see the paper handout for more evaluation and assessment details

Online writing in EarthEd:



Monsoon CPR Assignment Grade Distribution:



Student feedback example question:

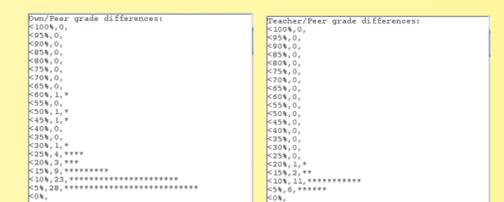
"Compared to a normal writing assignment where the paper is handed in on paper, graded by a teacher or TA, then returned, do you think the calibrated peer review system helps you learn the subject matter better? (comments welcome)"

- Learned more responses: 25
- About the same responses: 8
- Learned less responses: 8
- Completely ineffective: 11

Example positive comments:

- "More classes need to be software supported such as this one."
- "It's a great format."
- "It's nice to have immediate content with peer reviews, as well as being able to compare the paper to the rubric on hand."

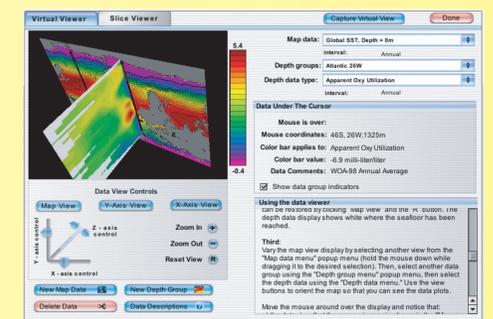
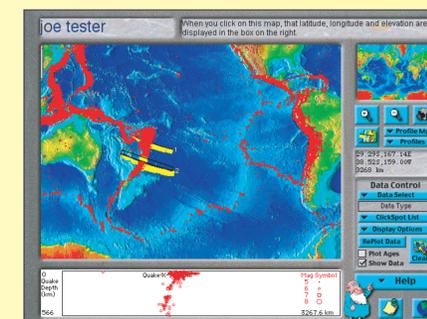
Grade consistency:



Distribution of Peer grade - Author grade vs. Tchr grade - Peer grade

Papers with large discrepancies between peer and author grades were scored by TA's or the Prof. In general, TA grades were somewhat lower than peer grades.

Plug-in Earth data modules



Our Dynamic Planet:

This provides the student with access to earth data in support of plate tectonics. Elevation, seafloor age, volcanoes, heat flow, island ages, and other data can be displayed, captured, and images uploaded to the student's personal graphics library.

World Ocean Data Viewer:

This displays data from the World Ocean Atlas-98. It uses the ESRI imaging engine to create images using IDL programs. It was a cooperative project with New Media Studio. The figure above shows a 3D display of a depth slice.