# Bring Your Major to Class

## *And Other Methods to Enhance Learning in a General Education Science Course*

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## Introduction

Severe & Unusual Weather is a 3-credit general education course that covers about nine topics. It uses Rauber, Walsh, and Charlevoix's Severe & Hazardous Weather text. Each instructor has flexibility to choose topics they cover and some latitude for the style in which they teach (it is nominally a "lecture" course).

Teaching this course provided several challenges:

- *Expected*:
  - Help students overcome poor self-efficacy about learning science
  - Teach science in a conceptual way (challenging!)
- *Unexpected*:
  - Motivate non-majors to study for a required course
  - Deal with students who essentially refused to participate in anything beyond listening to a lecture

Course objectives evolved to:

- Explain several key, underlying physical processes behind severe weather
- Explain both the typical occurrences and range of possibility for how extreme the weather can be in place and time.
- Understand your and others' risk from severe and unusual weather.

## Primary Teaching Methods

**Lecture:** Knowing that lectures are not very effective for learning, lectures are made energetic, with frequent interaction and time for questions. Frequent and deliberate linkages of content to daily and past experiences. Visual-rich and using videos whenever possible.

**Team Teaching:** Motivate students to take charge of their learning. You learn best when you have to teach! It becomes active engagement with a goal in mind! Teams are formed around majors and assignments link to careers in most cases. (See next.)

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**Linking Course Content to Their Majors:** Help students engage more deeply and learn content useful to their future careers.

**Mocking the Peer Review:** Motivate students to explore a connection between class content with their future career or life in general.

**A new approach to writing (Spring 2014):** I really liked the peer review assignment, as did many of the students and my graders. But grading these was very time consuming. After a semester of less advanced writers I wanted a change. I am hoping this strategy will help me catch conceptual misunderstandings faster and help students engage in tough concepts (e.g., phase changes and latent heat) more deeply.

## Findings

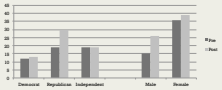
IRB approval was obtained and permission asked to publish selected information from class. The climate poll was given on a class day prior to covering climate change and repeated on the day of the final exam. Only two students declined to allow their climate poll data to be used.

Questions were drawn from polling by Brookings, Pew Research, and Gallup, with one question added at the request of a student (that semester data not included; question added: "If yes, was that warming primarily caused by humans?").

## Participant Demographics

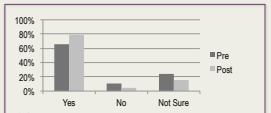
| | Pre (N*=49) | Post (N*=63) |
|---|---|---|
| **Democrat** | 24% | 20% |
| **Republican** | 37% | 46% |
| **Independent** | 37% | 32% |
| | | |
| **Male** | 29% | 40% |
| **Female** | 71% | 60% |
| | | |
| **Consented** (*to have data published) | 96% | 97% |
| **Did not consent** (data not included, N=2) | 4% | 3% |

Participant pool was students enrolled in METR 2603.001 during the Fall of 2013.



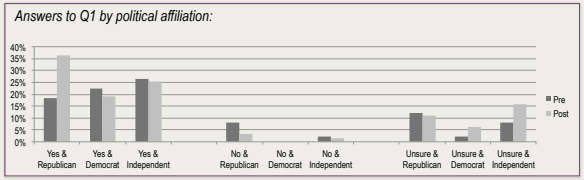
Males and Republicans were under-represented in the pre-poll sample.

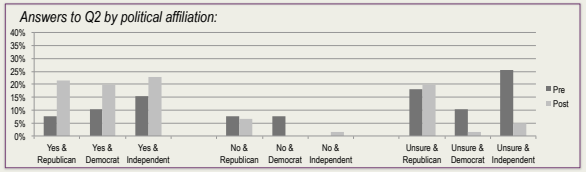
## Changes in Knowledge & Attitudes

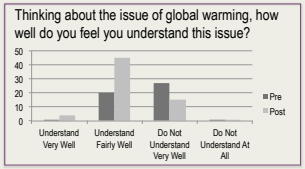


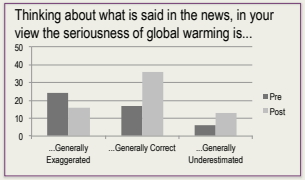

Q1: Is there solid evidence that the average temperature on Earth has been getting warmer over the past four decades?

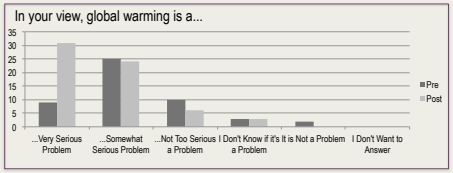

Q2: IF YES, was that warming primarily caused by humans?




Source of the first two questions was a Gallup poll. Source of the last question was a Pew Research poll.

## Example: Teaching Climate (5 classes)

**Strategy:** in lower left; and cover the science *and* the controversy around it. Use climate change to reiterate key aspects of science.

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- Topic introduction w/video:
  - Rising Tide in Norfolk, VA
  - Earth: The Operator's Manual
  - James Balog's TED Talk
- Team teaching <u>on</u> the science:
  - Natural drivers
  - Anthropogenic drivers
  - Measuring climate
- Team teaching <u>around</u> the science (using majors):
  - Media coverage
  - Psychology of reception/response to vague threats
  - Climate intersection with public policy
  - How faith groups have responded to climate change
- Also addressed:
  - The role of skepticism in science

E.g.: Journalism
Communications
Psychology
Political Science

Michael Shermer's Piece "I am a sceptic, but I'm not a denier"

## Discussion

It is no surprise that education changes knowledge and attitudes. Gains were seen in all categories, and across political lines. Interestingly, initial answers to Q1 were similar to Brookings Institution's Fall 2011 national results (not shown), except that the percentage of "Not sure" and "No" were reversed.

Outstanding questions: Would similar gains be seen with different educational strategies? What amount of the change was due to instructional strategies and content, versus simply having the opportunity to learn about climate change?

This study was approved by the University of Oklahoma's Institutional Review Board. Thanks go to Dave Parsons and Susan Powstawko of the OU School of Meteorology for the opportunity to teach one of the sections of METR 2603.