Crossing Traditional Curricular Barriers/Borders

Department of Earth & Climate Sciences
San Francisco State University

Dave Dempsey & Petra Dekens
(meteorologist) (paleoceanographer)
Our Story:

• What we did to our B.S. programs
• Why we did it
• How we did it (well and not so well)
• How we’re improving the result
# of Earth science courses shared in common (required by both B.S. programs): 0
Number of faculty members who taught in both programs: 1-2 (of ~12 total)

Programs were siloed
Department of Earth & Climate Sciences
B.S. Degree Programs 2013

- B.S. Geology
- B.S. Atmospheric & Oceanic Sciences
  - Oceanography Concentration
  - Meteorology Concentration
Department of Earth & Climate Sciences
B.S. Degree Program from 2015 to now

B.S. Geology

B.S. Atmospheric & Oceanic Sciences

B.S. Earth Sciences

Common Core
(5 classes)

Oceanography Concentration

Meteorology Concentration
Department of Earth & Climate Sciences
B.S. Degree Program from 2015 to now

- B.S. Geology
- B.S. Atmospheric & Oceanic Sciences
- B.S. Earth Sciences
  - Common Core (5 classes)
  - Geology Emphasis (3.5 faculty)
  - Hydrology Emphasis (2 faculty)
  - Ocean, Weather, & Climate Emphasis (5 faculty)
  - Oceanography Concentration
  - Meteorology Concentration

(3.5 faculty) (2 faculty) (5 faculty)
Department of Earth & Climate Sciences
New Earth Sciences B.S. Program, 2015 to now

B.S. Earth Sciences

- Science & Math Foundation (4 classes)
- Common Core (5 classes)
- Geology Emphasis (6 classes)
- Hydrology Emphasis (6 classes)
- Ocean, Weather, & Climate Emphasis (6 classes)
- Emphasis Electives (3-4 classes)
- Culminating Experience (2-3 classes)
Department of Earth & Climate Sciences
Earth Sciences B.S. Program, 2015 to now

• Earth science courses required of all students: 6 (up from 0)
• Number of faculty members who teach in core or across emphases: 4+ (of 12 total) (up from 1 or 2) (including 1 or 2 people from each emphasis)

Programs are now significantly integrated
Why did we do this?

1. B.S. in Atmospheric & Oceanic Sciences always lightly enrolled (though Geology B.S. enrollments were healthy)

2. Great Recession (2008+) led to 30% budget cut

   → University warned of consequences if we didn’t increase ratio of #graduates/degree: existential threat?
Our thinking: Threat? Opportunity?

• Improve #grads/degree ratio by:
  1) Increasing number of students
  2) Decreasing number of degree programs

• Increase number of students by:
  1) Attracting more students
  2) Retaining them better
(1) **Attract more students:**

- offer more flexible degree options
- offer more interesting & relevant GE classes (Global Warming, California Water)
- offer individual, mentored research project as culminating experience option
- communicate better with community college feeder schools
- Also: wait anxiously for next really big earthquake, serious drought, record-breaking winter rainfall and flooding, gas crisis, etc.
(2) **Retain students better:**

- Create a less rigidly hierarchical degree structure (shorter prerequisite sequences)
- Offer required courses every year
  - (Price: fewer electives, offered less often)
- Establish mandatory advising each semester,
- More Department-wide semi-social events
- Create more scholarship opportunities for majors
- Create freshman/sophomore Earth sciences seminar
• **Decrease number of degree programs**, by:
  
  • Integrating ("de-siloing") our (2 or 3) siloed B.S. programs into a single Earth Sciences B.S. program
    • common core, with emphasis options
Additional advantages of program integration:

- Students get a more multi- and interdisciplinary education
  - Better equipped to tackle emerging, multifaceted problems (e.g., climate change)
  - Better able to collaborate with people across disciplines
Additional advantages of program integration (cont’d):

• Students in different emphases interact with each much more
• All current faculty members contribute to the new program
• More interaction among faculty members about curriculum
Drawbacks of program integration:

- Somewhat less depth with electives
  - Can still become a geologist
  - Can now become a hydrologist
  - Can’t become a meteorologist any more

- Three faculty members rue loss of purity of their disciplinary degree program
  - They take repeated opportunities to express their dismay (in classes, faculty meetings)
Current efforts (Teagle grant):

- Develop SLOs for each core course, aligned with program SLOs
  - Most T/TT faculty involved

- Modify core courses consistent with the SLOs.
  - Collaborative
  - Pay people for this (including lecturers)

- Try to assess and evaluate progress
  - Hard!
2014 survey of ~400 Earth scientists in academia and industry about the relative importance of learning about nine basic topics in Earth sciences.

#1 and #5 are prominent in the core of our new Earth Sciences B.S. program.
Drawbacks of program integration (de-siloing) (cont’d):

• More interaction among faculty about curriculum
  • Drafting program learning objectives revealed distinct cultural and epistemological differences among Earth science disciplines
  • Requires both advocacy and compromise to define student learning objectives (SLOs) in required core courses