

Heads & Chairs Summit on the Future of Geoscience Undergraduate Education

*Overcoming Barriers, Finding Solutions, Creating Incentives
& Rewards*

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Marine, Earth, & Atmospheric Sciences

NC STATE UNIVERSITY

NC State context

- “All spheres” geoscience department at R1 institution
 - 31 tenured/tenure track faculty (2 searches in progress)
 - all but 1 research active (grad students & grants)
 - Very limited use of provisional faculty
 - 2 faculty in GeoEd
- Majors
 - Geology – 80 (increasing)
 - Marine Sciences (mostly biological) – 67 (flat)
 - Meteorology – 88 (decreasing)

Geology major*

- Major courses
 - Earth System Science
 - Physical
 - Historical
 - Min/pet
 - Sed/pet/strat
 - Structure
 - Marine sed, coastal field camp, or geomorph
 - Geo electives (2)
 - Field camp
- Cognate courses
 - Chem & lab (2 terms)
 - Calc (2 terms)
 - Physics (calc-based, 2 terms)

*focus of today's remarks

How “reformed” are we?

- *Not very* – most courses still taught using instructor-centric formats & methods
- But there *has* been progress
 - *Earth-system science* required for all geosci majors redesigned with significant use of think-pair-share, in-class exercises, clickers, inquiry based labs
 - *Physical geology* redesigned (including on-line version) using reformed methods
 - *Exploration and Engineering Geophysics* converted to flipped model
 - Spotty infiltration of reformed methods throughout curriculum

Embraced curricular focus on competencies?

- No
 - Included in learning outcomes for institution/accreditation mandated assessment
 - A “go through the motions” exercise

What are the barriers to progress?

- “Good” barriers
 - Happy students: geology majors express greatest satisfaction among departments programs
 - Dedicated faculty: relatively effective teaching in traditional formats
 - *Le Bourgeois gentilhomme** effect: Senior faculty who discover and employ reformed methods without labeling them as such
- “Bad” barriers
 - Denialism: faculty rejection of evidence from DBER
 - Patriarchy: students most comfortable in authoritarian setting
 - Resources: faculty lack time & energy

* who was amazed to learn he had been speaking in prose all along

What helps?

- Training for new faculty
 - Cutting Edge Early Career Workshop (2 faculty in 2015)
 - NC State new faculty workshop (all recent hires)
- GeoEd faculty (2)
 - Resource for faculty wanting to improve teaching
 - Teaching by them and their groups
 - Educating & training graduate students
- Participation in the GeoEd Rendezvous
 - Last year sent 2 non-GeoEd faculty; 2 non-GeoEd grad students
- Expectations for quality of instruction in job ads

Foster a normative culture of excellent, learner-centric instruction
Grad students are key

Incentives & rewards? (meh)

- Effective instruction is its own reward
 - If it ain't, find another job
 - Teaching awards tend to be a lottery
- *Enable* reforms
 - Respond to faculty requests
 - TA support, technology, etc.
 - Not inclined to lay out incentives & rewards *a priori*
- Discuss instruction during annual evaluations

Curricular reform

- Harder than instructional reform
- Experience with only incremental reforms
 - 3rd-year seminar
 - Required 1st-year Earth system course
 - Eliminated Geology B.A./ changed reqs for B.S.
 - Even small changes have complex consequences
- Goals of this Summit demand systemic changes
 - Require persistent collaboration among faculty
 - R1 faculty commit collaboration time to research
 - Retreats are (or can be) fun, but how to maintain momentum?

Summing up...

- Better/reformed instruction *slowly* becoming part departmental culture
 - Many small steps
 - One course at a time
 - Grad students and GeoEd faculty are key
- Curricular change is needed
 - I look forward to learning how to do it