This work is supported by a National Science Foundation (NSF) collaboration between the Directorates for Education and Human Resources (EHR) and Geosciences (GEO) under grant DUE-1125331.

InTeGrate: Rethinking Geoscience Instruction with the Development of Free Customizable Resources to Address Earth’s Grand Challenges in Introductory Courses

David McConnell (North Carolina State University)
Anne E. Egger (Central Washington University)
Sean P. Fox (Science Education Resource Center)
Ellen Iverson (Science Education Resource Center)
Cathryn Manduca (Science Education Resource Center)
David N. Steer (University of Akron)

InTeGrate: An NSF STEP Center in the Geosciences

http://serc.carleton.edu/integrate

Introductory Geoscience/Env Science Modules

Teams of three authors from multiple institutions, propose topic, attend intro workshop

Teams work with:
- InTeGrate team leader
- Assessment consultant
- Web-team consultant
- Create 2-week modules
- Evaluate learning/processing

Materials Development Process

Assessment Rubric
1. Overarching Goals (5)
2. Learning Objectives & Outcomes (5)
3. Assessment & Measurement (5)
4. Resources & Materials (6)
5. Instructional Strategies (5)
6. Alignment (2)
Two-year InTeGrate Materials Development Timeline

Phase 1: Authors create detailed instructional materials that are checked against a standard rubric. Summer, Fall Y1

Phase 2: Authors pilot materials in their own classroom and collect data to support evaluation of the materials and the project's goals. Spring Y1

Phase 3: Authors use data collected to make meaningful revisions to module materials prior to publication. Summer/Fall Y2

Sample Module Format

Module Information

Front Page

Overview Page

Unit 1
Activity 1.1
Activity 1.2

Unit 2
Activity 2.1
Activity 2.2

Unit 3
Activity 3.1
Activity 3.2

Unit 4
Activity 4.1
Activity 4.2

Unit 5
Activity 5.1
Activity 5.2

Unit 6
Activity 6.1
Activity 6.2

Instructional Materials

Resources

Student Materials
Assessments
Adaptation Stories

PowerPoints, Handouts, Instructor Notes

Module Development Timeline

Courses

A. Climate of Change
B. Human's Dependence on Earth’s Mineral Resources
C. Natural Hazards and Risks: Hurricanes
D. Sustainable Agriculture
E. Environmental Justice and Freshwater Resources
F. Living on the Edge: Building resilient societies on active plate margins
G. Carbon, Climate and Energy Resources
H. Coastal Vulnerability

http://serc.carleton.edu/integrate
Summary

- Two-week (6 unit) modules developed for introductory courses with geoscience components to address grand challenges and links of science and society.
- Modules can be combined and/or deconstructed to create a customized fit for different types of classes.
- Modules have been carefully created to support empirically validated instructional practices that have been shown to improve student learning.
- First full modules (Climate of Change, Mineral Resources, Hazards: Hurricanes) will be available soon.

Questions?

http://serc.carleton.edu/integrate

Image Sources

Earthquake damage, USGS
http://earthquake.usgs.gov/earthquakes/eqinthenews/2013/ark130921/

Sea level trends, NOAA

Louisiana highway flooding
http://www.nola.com/hurricane/index.ssf/2013/06/109955814119.html

Red Devil mine, Alaska
http://www.blm.gov/pgdata/etc/medialib/blm/ak/afo/hazmat/red_devil_mine_/media/images.Par.95407.Image.1.1.1.1.gif

Louisiana highway flooding
http://www.noaa.gov/features/climate/sealevelchanges.html

Sea level trends map, NOAA
http://tidesandcurrents.noaa.gov/sltrends/sltrends.html

Temp anomaly map, NASA

Houston, land use trends
http://earth.rice.edu/mtpe/bio/biosphere/hot/urbanization/houston2_class.html

Crowd photo
http://www.flickr.com/photos/jamescridland/613445810/

Earthquake damage, USGS
http://earthquake.usgs.gov/earthquakes/eqinthenews/2013/ark130921/

Looking for a graduate program in geoscience education? Positions available @ NCSU

See David McConnell or Karen McNeal

Marine, Earth & Atmospheric Sciences, North Carolina State University