

# SMALL-GROUP ACTIVE-LEARNING MODULES AND THEIR IMPACTS ON STUDENT ATTITUDES AND ACHIEVEMENT IN A LARGE INTRODUCTORY GEOLOGY COURSE



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## Project Goals:

1. Improve student engagement and attainment of course learning objectives in large lecture (65 – 115 student) course.
2. Provide students with better understanding of scientific methods and processes.
3. Give students hands-on experience in “doing geology”.

## Research Questions:

1. Are small-group active-learning modules effective at increasing introductory geology learning objectives?
2. What is the impact of small-group active-learning modules on student attitudes towards science and the geosciences in particular?

## Implementation:

GEOL 1121 is large-lecture course that fulfills university science requirements; many students are freshmen who are not STEM majors

Accompanying lab course (GEOL 1121L) is recommended but not required

Self-contained exercises offered during semester outside class meeting hours; students sign up for activity session (session sizes capped)

**Pre-test Activity** Administered during module  
**Post-Test**

**Survey** Administered online

Each activity takes 60-90 minutes to complete

Incentives for student participation:  
2014 – post-test, survey part of course grade  
2015 – participation bonus (extra-credit)

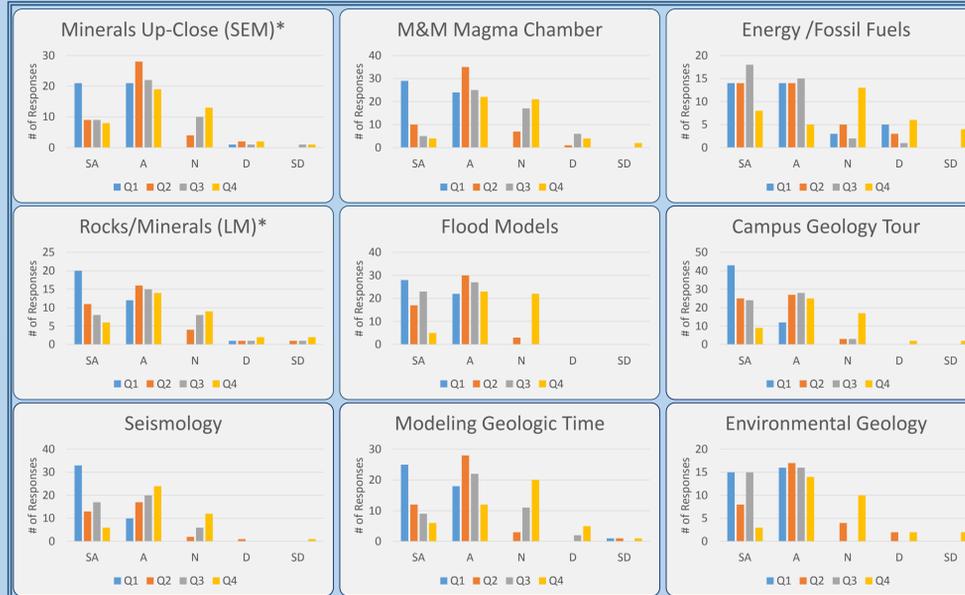
Comparison of student scores to assess module effectiveness across multiple timescales:

1. Activity pre-post tests (short-term)
2. Class exams (medium-term)
3. Course pre-post tests (long-term)



Module	Course Concepts	2014	2015
Minerals Up-Close (SEM)	Minerals – ID & properties	X	X*
M&M Magma Chamber (Modified from Wirth, 2003)	Igneous rocks and processes	X	X
Energy Resources & Fossil Fuels (Screening of Switch (Lynch, 2012))	Carbon cycle, natural resources	X	X
Rocks & Minerals Up-Close (Light Microscopy)	Minerals – ID & properties, rock cycle	X	X*
Flood Models	River systems, flood hazards & mitigation	X	X
Campus Geology Tour	Rock cycle, landform development, urbanization, soils	X	X
Seismology	Earthquakes, Earth's internal structure	X	X
Modeling Geologic Time	Geologic timescale, principles of numerical and relative dating	X	X
Environmental Geology	Natural hazard processes, human impacts		X

\* Activities combined into single module



## Post-Activity Survey (Combined Data)

Answers to Likert questions reflect student attitudes immediately following activity.

Q1: Topics discussed as part of this module activity match course topics.

Q2: My level of understanding of course material is higher than it was prior to this activity.

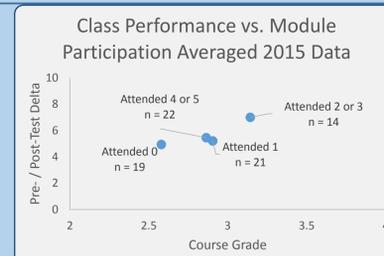
Q3: After participating in this activity, I have a better understanding of the relevance of geology to my daily life.

Q4: This activity increased my interest in geology.

Participant responses to activities and their impact on learning and attitude toward geology are generally positive.

\* Combined as single module in 2015; includes 2014 and 2015 data

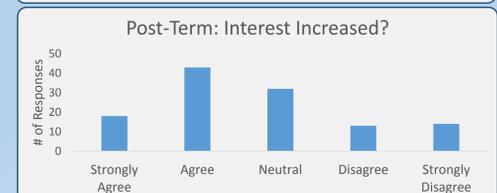
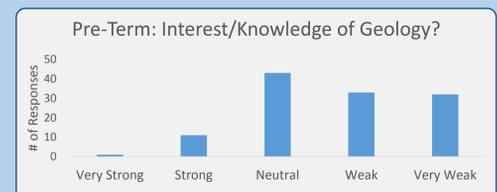
## Semester-Scale Impacts on Learning and Attitudes: Course Grades, Pre-/Post-Test Data, End-of-Course Surveys



Mixed results for 2015 data (participation voluntary) – reflects student motivation along with student achievement?

Comparison of pre-course survey (top) and post-course survey (bottom), combined 2014-15 data.

Ongoing work:  
- Tracking student attitudes (longitudinal study)  
- Measuring impacts on student recruitment into geosciences  
- Implementation of InTeGrate resources into course (2015-16)



## Acknowledgements

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## Selected References:

Wirth, K. (2003) Using an M&M magma chamber to illustrate magmatic differentiation: Geological Society of America Abstracts with Programs, v. 34 (7), p. 250.

Materials available at: <http://tinyurl.com/naxfrfu>

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