Measuring Active Learning in the Geosciences:
- Instructor Surveys
- Classroom Observations

**Geoscience Teaching Practices Survey**

| Q15.1 In the "lecture portion" of your course, please estimate the percentage of class time spent on student activities, questions, and discussion. Your response must be between 0 and 100. |
| Q16.1 In the "lecture portion" of your course, please indicate how frequently you used the following teaching strategies: (1) Never (2) Once or twice (3) Several times (4) Weekly (5) Nearly every class |
| Q16A.1: Traditional lecture |
| Q16B.1: Lecture with demonstration |
| Q16C.1: Lecture in which questions posed by instructor are answered by individual students (e.g. professor calls on individual students) |
| Q16D.1: Lecture in which questions posed by instructor are answered simultaneously by the entire class (e.g. students vote using cards or electronic response systems) |
| Q16E.1: Small group discussion or think-pair-share |
| Q16F.1: Whole-class discussions |
| Q16G.1: In-class exercises |

Response rate: 32-49%
Survey Populations: 5700-7813 geoscience instructors

Instructors who spend >20% of class time on student activities, questions, and discussions

- Introductory courses
- Majors courses

Manduca et al., 2017; K. Viskupic, pers. comm., 2018

Geoscience Teaching Practices Survey Results

<table>
<thead>
<tr>
<th>Year</th>
<th>Percentage of Instructors Reporting (%)</th>
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<tbody>
<tr>
<td>2004</td>
<td>n=1566/1568</td>
</tr>
<tr>
<td>2009</td>
<td>n=1566/1568</td>
</tr>
<tr>
<td>2012</td>
<td>n=2030/2017</td>
</tr>
<tr>
<td>2016</td>
<td>n=2030/2017</td>
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Manduca et al., 2017; K. Viskupic, pers. comm., 2018
Instructors who spend >20% of class time on student activities, questions, and discussions

Instructors who report using discussions, think-pair-share, in-class exercises weekly or in nearly every class

- n=1566/1568
- n=2030/2017
- n=1766/1741
- n=2090/2058

Geoscience Teaching Practices Survey

Reformed Teaching Observation Protocol

Describes teaching process on five subscales

- Lesson design by instructor
- Propositional knowledge of instructor
- Procedural knowledge (what students do)
- Student-Student Interactions
- Student-Teacher Interactions

- Five statements per subscale

Measuring Active Learning in the Geosciences

Sawada et al., 2002; MacIsaac and Falconer, 2002

Budd et al. (2013)

Teasdale et al., 2017

Most Teacher Centered

- No student interactions
- Lecture only
- No student questions

Most Student Centered

- Peer interactions/group work
- Discussion
- Students read graphs, maps, use data
- Lesson adjustments based on student feedback
- Assessment of student knowledge
- No/little lecture

Active Learning Features in the Geosciences

Predict how many of these statements were TRUE.

A. RTOP scores were statistically different for different types of academic institutions (e.g., two-year colleges, research institutions).
B. RTOP scores were statistically different for classes of different sizes.
C. RTOP scores were statistically different for introductory courses and majors courses.
D. RTOP scores were statistically different by gender of the instructor.
None of these statements were TRUE.

Summary: Instructional Reform in the Geosciences

- Instructors reported progressively greater use of research-based instructional strategies in geoscience courses over the last two decades
- Self-report survey data are supported by observations across more than 200 classrooms
- Instructional changes are more likely when the instructor has participated in professional development and made use of related online resources
- No difference in the character of instruction on the basis of type of institution, size of class, class content or instructor gender
- Change more likely driven by robust PD program that reaches a relatively large proportion of geoscience faculty than more limited footprint of Geoscience Education Research