ON-RAMPS
to more effective teaching in tectonics

Compelling discussions

A powerful way to involve students in exploring the complexity of a topic by talking things through with their peers.

A simple example

SCENARIO: Rather than lecturing on climate-tectonic interactions, have students discuss whether climate played a role in development of the Himalaya-Tibetan Plateau region:

1. Divide the class into two or more viewpoints or research perspectives.
2. For homework, have students compile evidence supporting their perspective from a number of articles that you provide.
3. Have students bring their compiled evidence to class.
4. In class, have students exchange evidence, discuss their sense of the current state of knowledge, and compile a list of the major uncertainties and outstanding questions.

Why add discussions to your course?

- Discussions build students' critical scientific skills by improving oral communication, increasing confidence in supporting a position using evidence, and practicing synthesis.
- Students play a major role in influencing the direction of the conversation, possibly even formulating questions, which leads to a self-built framework for knowledge and understanding.
- Students practice evaluating a range of interpretations.
- Students have ownership of the group's final conclusions or plans.
- Discussions increase class participation and foster interaction.

How much class time does it take?

- Discussions can range from 15-20 minutes to an entire class period or more.

Tips for success

- Clarify what you want students to gain from a discusssion, and design your discussion specifically to achieve that.
- Prepare students for discussion by giving them specific tasks (*e.g.,* coming to class prepared to comment on implications of the reading for topics/issues covered earlier in the course), rather than simply asking them to be ready to discuss the reading.
- Ensure that students prepare for and engage in the discussion by grading their performance using a clear assessment rubric provided ahead of time.
- If you plan to have regular discussions, involve students at the beginning of the course in developing ground rules for discussion, rather than imposing them.
- Foster a safe, collegial environment in your course so that all students can feel free to speak their minds.
- Consider gender and cultural differences that make participating in discussions harder for some students. Ensuring that all students are prepared, or stopping discussion to let students write down their thoughts, may engage quieter/shyer students.
- Arrange the room in a way that encourages discussion (*e.g.*, have students sit in a circle).
- Consider sitting in the back of the room so that students take center stage. Avoid talking or interjecting, and tolerate pauses and silences. When you do talk, ask open-ended questions to keep the discussion on a productive path. Summarize student responses without taking a stand one way or another.
- Consider tasking a student with keeping a record of the discussion that students can refer to later in the course.

The On-Ramps Project provides quick-start guides for faculty interested in incorporating successful and easily implemented teaching strategies to improve student learning in the broad field of tectonics. The Project was funded by NSF grant EAR1841227 and grew out of a recommendation in the 2018 community vision document Challenges and Opportunities for Research in Tectonics.

More examples & variations on compelling discussions

- **From the primary literature.** Assign a topic/paper, and ask students to generate questions that will be discussed in class. Alternatively, assign questions directly, and ask students to identify resources to address them. Students rotate through being discussion leaders.
- **In the field.** Upon arriving at an outcrop, do not start with a lecture. Instead, have students make observations independently and discuss their interpretations and observations with each other.
- **Within a larger project.** Use discussion to help students progress through part of a larger class project. In a field course undertaking a survey of a fault scarp, for example, engage students in a discussion of the pros/cons of different strategies to arrive at a consensus survey plan.
- **Data interpretation.** Have students discuss data interpretations (see examples in the Quantitative skill-building On-Ramp) rather than just prepare a lab write up. For example, give students a variety of GPS time series from different regions to review at home, some with clear tectonic interpretations and others not. In class, ask students to compare and discuss their interpretations.
- **Review panel.** Have students read anonymized research proposals, develop a list of merits and limitations based on given criteria, and rank the proposals during an in-class "panel-style" discussion.
- **Societal connections** can lead to greater student engagement. Have students discuss risks to an affected community (*e.g.*, from a volcanic eruption) and ways that monitoring could help inform societal decisions.
- **Starting with shorter discussions.** If you are new to teaching with extended discussions, start with shorter formats such as interactive lectures and brainstorming. Other teaching formats with discussion are jigsaws and case studies.
- **Online discussions** can be an excellent tool to engage students. Students may find them less intimidating and think more critically about what they write, knowing that comments are permanent. A precursor online discussion can be used as a springboard and often leads to better in-class follow-up discussions.
- **Large classes.** Holding effective, engaging discussions in large classes can be a challenge. Break up large classes into smaller groups to focus the discussion (*e.g.*, with two TAs, divide the class into three groups for separate discussions). Then ask small groups to report to the entire class.

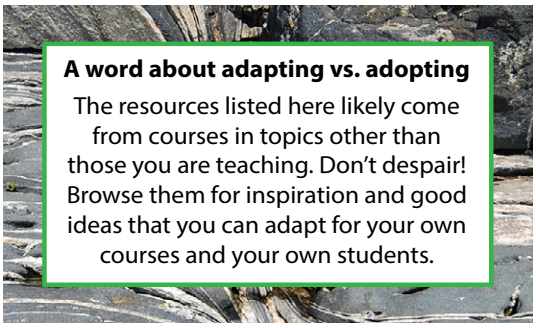
Resources on leading discussions

From NAGT's *Teach the Earth*

- Students lead discussions of journal articles in Friday Forum: Reading from the Primary Literature.
- Students discuss, explain, and defend the geologic maps they developed from Google Earth.
- In a Structured Academic Controversy, groups of students are assigned specific roles in the debate.

From the Web

- From Washington University in St. Louis: Teaching with discussions.
- From Princeton University: ideas for what to do when class discussion stalls.



A word about adapting vs. adopting

The resources listed here likely come from courses in topics other than those you are teaching. Don't despair! Browse them for inspiration and good ideas that you can adapt for your own courses and your own students.

Research on compelling discussions

Brookfield, Stephen D. and Preskill, Stephen, 2005, Discussion as a way of teaching: Tools and techniques for democratic classrooms (2nd ed.): Jossey-Bass, San Francisco, 336 p.

More On-Ramp pdfs & resources: serc.carleton.edu/onramps/index.html

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