



Observing and Assessing Student Learning: A Workshop Report

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In May 2005, the NSF funded "On the Cutting Edge" professional development program brought together 42 leaders in cognition, education, assessment, and geoscience education to improve our ability to design and use effective assessments of student learning in the geosciences.

Workshop participants recommended

- opportunities for collaboration between geoscience faculty and those with expertise in assessment;
- sharing of existing assessment activities and instruments and the strategies for use and adaptation
- professional development regarding development of assessments and their use.

To Learn More:

Observing and Assessing Student Learning
First advice for evaluating student learning, information on how to use different assessment methods in different learning environments, and information or researching teaching and learning.
In 2005, *Workshop on Student Learning: Observing and Assessing* met at Carleton College to discuss assessing student learning. These pages grew out of the activities of the workshop.

Assessment Tools and Techniques

- [Primer on Assessment in the Geosciences](#) for introductory courses from the Starting Point site.
- [Assessment Tools](#)
- [Assessing learning in different Learning Environments](#)
- [Additional References](#)

Assessment in Geoscience Classes
Learn how geoscience courses are assessed by your colleagues.

- [Geoscience Concepts Assessment](#)
- [Geoscience Attitude Assessment](#)
- [Geoscience Assessment Resources and Examples](#)

Assessment in the Design and Development of Courses

- Learn how to incorporate assessment in to the design of a course through the [On-line Course Design Tutorial](#)

Cognitive Theory and Research on Teaching

- Learn about cognitive theory and the links to learning from the 2002 workshop, [Bringing Research on Learning to the Geosciences](#)

Resources for Using your Classroom to Research Learning in the Geosciences

Assessment Tools

The following links will take you to lists of resources (both print and online) providing information about using different assessment types in class.

- **Concept Maps** - A diagramming technique for assessing how well students see the "big picture".
- **ConceptTests** - Conceptual multiple-choice questions useful in large classes.
- **Multiple-Choice Exams** - Find tips on how to make multiple-choice exams better assessment instruments.
- **Oral Presentations** - Tips for evaluating student presentations.
- **Peer Review** - Having student assess themselves and each other.
- **Portfolios** - A collection of evidence to demonstrate mastery of given set of concepts.
- **Rubrics** - A set of evaluation criteria based on learning goals and student performance.
- **Written Reports** - Tips for assessing written reports.
- **Other Assessment Types** including concept sketches, case studies, seminar-style courses, mathematical thinking and performance assessments.

Assessment Using Concept Mapping

What are Concept Maps?

A concept map is a diagram with hierarchical nodes, labeled with concepts. The nodes are linked together with directional lines and are arranged from general to specific. For more information on why and how to use concept maps, see [Starting Point: Concept Maps](#).

- For step-by-step instructions, further explanation and examples see [Classroom Assessment Techniques: Concept Mapping](#)

Geoscience Examples

- Dave Dempsey, and Katherine O'Sullivan, San Francisco State University, [An Application of Concept Mapping for Instruction and Assessment](#) (PDF 1118 Mw10 05), poster from the [Understanding What Our Geoscience Students Are Learning: Observing and Assessing](#) Workshop.
- Stacy Rebach and Catherine Gaultier, University of California-Santa Barbara [Assessing Student Knowledge about Global Climate Change Using Concept Maps](#) (PDF 7218 Mw10 05) from the [Understanding What Our Geoscience Students Are Learning: Observing and Assessing](#) Workshop.
- Daniel Murray, University of Rhode Island, [The Role of E-Portfolios and Concept Maps in Outcome- and Assessment-Based Geoscience Curriculum](#) (PDF 7918 Mw11 05), from the [Understanding What Our Geoscience Students Are Learning: Observing and Assessing](#) Workshop.

Additional Resources

- Rebach, S. and C. Gaultier, In Press, [Concept Mapping to Reveal Prior Knowledge and Conceptual Change in a Mock Summit Course on Global Climate Change](#), *Journal of Geoscience Education*
- This preprint of an article accepted for publication in the *Journal of Geoscience Education* describes the authors' use of Concept Maps in a Mock Summit Course on Global Climate Change.
- Novak, J. D., & D. B. Gowin. (1984). *Learning How to Learn*. New York and Cambridge, UK: Cambridge University Press.
- Off-referenced book on using concept maps in instruction. Important complement to references on using concept maps for assessment, because concept mapping has a (modest) learning curve and is best used for assessment if it is also used for instruction.
- Ruiz-Primo, M. and Shavelson, R. (1996). Problems and issues in the use of concept maps in science assessment. *Journal of Research in Science Teaching*, 33 (6) 559-600.
- Perhaps the first significant analysis of the use of concept maps for assessment.

The Role of Assessment in Teaching

Understanding what our students are learning is fundamental to good teaching. Within a class, this understanding guides our next steps with each student. On the scale of a course, it allows us to assess where our methods and materials are achieving the desired outcome and when they need revision. On the one hand, assessing student understanding lies at the heart of grading. However, on a larger scale, understanding what students are learning is fundamental to researching how students learn in the geosciences

Why are we assessing student learning?

Workshop participants noted that assessment is used for a number of different purposes including

- promoting and understanding learning
- informing teaching
- assigning grades
- institutional or professional evaluation as the basis for faculty rewards and recognition.

What are we assessing?

To be successful in these roles, assessments need to gather information about student mastery of content, concepts, and skills attitudes.

How do we develop assessments?

To be most effective, an integrated and iterative approach to development of assignments, goals, methods and assessments must be coupled with a firm grounding in cognitive research and theory, scholarship of teaching and learning, and assessment research and practice.

<http://serc.carleton.edu/NAGTWorkshops/assess>