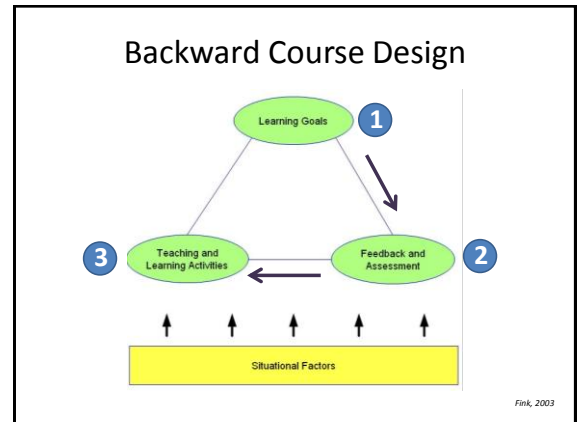


Aligning Learning Goals & Measures of Learning Outcomes

David McConnell
Sheila Roberts
Suki Smaglik

<http://www.incidentakomics.com/2012/04/book-of-future.html>



Linking Goals, Assessment, Activities

- **Identify clear learning goals**
 1. Goals should focus on the work of the students, not the teacher
 2. What will students learn and be able to do? (SWBAT)
 3. Goals should clearly demonstrate student learning.
 4. For major goals, focus on higher order thinking skills and/or authentic tasks
- **Create tasks (assessments) associated with learning objectives.**
- **Provide students opportunity to practice tasks or task components during class (formative assessment, active learning).**
- **Match measurable summative assessments to learning goals as directly as possible.**

Feedback & Assessment

Assessment - activities that are undertaken to provide information to be used as feedback to modify teaching and learning practices

Formative assessment - evidence used to measure student learning to identify how well they are learning and to help the teacher to improve ongoing instruction

Summative assessment - the use of data, assembled at the end of particular sequence of activities, to provide an overview of learning

"When the cook tastes the soup, that's formative; when the guests taste the soup, that's summative."

Feedback & Assessment

"FIDELity" Feedback

- **Frequent** – where possible give (formative) feedback daily or weekly
- **Immediate** – provide summative feedback soon after student work is completed
- **Discriminating** – clearly explain differences between high/low scoring work
- **Empathy** – show empathy for students when delivering feedback

Fink, 2003

Assessment for Intellectual Growth

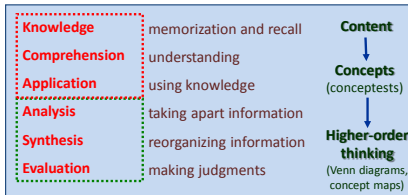
Teaching and learning goals can be ordered using **Bloom's Taxonomy**

Bloom's Taxonomy Comprehension Survey

- A. I have heard of BT but can't explain much about it.
- B. I can name the six categories of BT.
- C. I can classify exercises into the six BT categories.
- D. I can make up questions representative of the six categories of BT.

Setting Learning Goals

Learning goals can be ordered using **Bloom's Taxonomy** – but how do you assess student work?



Open-ended questions can be used for all categories.

Scaffolding Student Learning

Plate Tectonics Comprehension Survey: Review the following statements and identify which best describe your understanding of the material in this section.

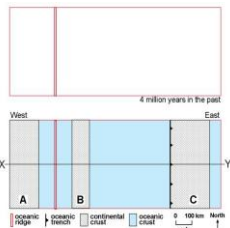
Level 1: I can identify how many plates are present on a map showing plate boundaries.

Level 2: I can sketch and label a cross section to illustrate the characteristics of a plate boundary.

Level 3: I can compare and contrast the features associated with divergent and convergent plate boundaries.

Level 4: I can interpret how plate configurations change over time.

Monitor Student Learning



A and B are traveling at 5 cm/yr; C is traveling west at 2 cm/yr.

1. How many plates are present in the central figure?
2. Sketch and label a cross section along X-Y.
3. Fill in the upper and lower templates to show past and future plate configurations.

Complete the table below by circling the abbreviation of the appropriate taxonomy class.

Exercise	Bloom's Taxonomy Level					
Venn Diagram A (Hurricanes vs. Tornadoes)	K	C	Ap	An	S	E
Venn Diagram B (Coal vs. Oil resources)	K	C	Ap	An	S	E
Evaluation Rubric (Groundwater Resources)	K	C	Ap	An	S	E
Student Answer Analysis A (Global Warming)	K	C	Ap	An	S	E
Student Answer Analysis B (Atmosphere)	K	C	Ap	An	S	E
Concept Map	K	C	Ap	An	S	E
Concept Sketches	K	C	Ap	An	S	E
Online Discussions	K	C	Ap	An	S	E

Concept Sketches

Concept Sketches – Using Student- and Instructor-generated, Annotated Sketches for Learning, Teaching, and Assessment in Geology Courses

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ABSTRACT
To promote active learning and increase student engagement in geology courses, we have developed a concept sketching activity. This activity involves students creating a concept sketch of a geological process or concept, which is then annotated by the instructor. The concept sketching activity is designed to be used in a variety of geology courses, from introductory to advanced. The activity is designed to be used in a variety of ways, including as a pre-class activity, a class activity, and a post-class activity. The activity is designed to be used in a variety of ways, including as a pre-class activity, a class activity, and a post-class activity.

INTRODUCTION
Concept sketches are a useful tool for assessing student understanding of a concept. They are also a useful tool for teaching a concept. Concept sketches can be used in a variety of ways, including as a pre-class activity, a class activity, and a post-class activity. Concept sketches can be used in a variety of ways, including as a pre-class activity, a class activity, and a post-class activity.

CONCEPT SKETCHES
A concept sketch is a simplified sketch of a concept. It is a sketch of a concept that is designed to be used in a variety of ways, including as a pre-class activity, a class activity, and a post-class activity.

An Introduction to Concept Sketches

John K. Johnson, Stephen J. Reynolds, Michael R. Kelly

This sketch illustrates some of the processes occurring in the geosphere, hydrosphere, and atmosphere. The sketch is designed to be used in a variety of ways, including as a pre-class activity, a class activity, and a post-class activity.

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Concept Sketches

Concept Sketch Questions for Exam 4 – Cha. 10, 12, 13 & 14

This list is intended to help you prepare for the exam. To prepare for the exam, develop an answer to each question before looking at the list of questions. Each question must be answered before the exam and will be collected on the day of the test.

Chapter 10: Water Resources

1. Sketch, label and describe what the water table represents. In addition, describe the controls on water flow through rocks, including porosity and permeability, providing examples of materials with high and low values of each. In addition, describe some of the problems associated with groundwater pumping.

2. Sketch, label and describe the hydrologic cycle, summarizing the processes that will water from one part to another including the different settings where freshwater occurs, describing what settings control the most water, summarizing where most of Earth's total water resides. In addition, describe some of the ways that surface and groundwater basins are connected.

3. Sketch, label and describe the many ways that surface water and groundwater can interact. Sketch a diagram of groundwater flow. Describe some ways in which hydrogeologists investigate groundwater concentrations. Sketch how chemical analysis defines a plume of contamination, and one way a plume could be remediated.

Chapters 12 & 13: Mineral & Energy Resources

1. Sketch, label and describe the processes of mineral formation, including the different types of ore, ranking them from lowest quality to highest quality, and also including the formation of coal bed methane. List and explain the effects of 20 years of mining and processing. In addition, summarize some of the environmental consequences of using coal for energy.

2. Sketch, label and describe how nuclear fission releases energy and is used to generate electricity. Sketch, label and describe some aspects of nuclear energy production. Summarize positive and negative aspects of the use of nuclear energy.

3. Sketch, label and describe production of alternative energies geothermal, wind, solar and others. In addition, discuss some of the rapidly evolving aspects of the various energy sources.

4. Sketch, label and describe why the plate-tectonic setting of a region is an important consideration for mineral exploration.

5. Summarize or sketch the geologic history of the United States, including the distribution of oil, gas, coal, and other resources, and the geologic history of the United States.

Chapter 14: Atmospheric Resources and Climate Change

1. Sketch, label and describe the processes of water evaporation and condensation, including the formation of raindrops and snowflakes. Also, sketch and describe how water enters, moves in, and leaves the atmosphere causing rainfall using a mountain front and a rain shadow. Then, summarize how large-scale atmospheric circulation affects precipitation and climate.

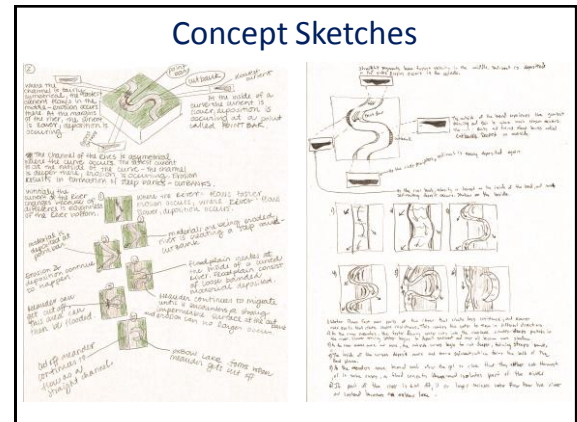
2. Sketch, label and describe the main flow of surface currents in the Northern and Southern Hemispheres and how this influences sea surface temperatures. In addition, describe the thermohaline conveyor and summarize how the ocean currents influence temperature and precipitation on adjacent lands.

3. Describe the evidence for present global warming and the major factors, including both natural and anthropogenic, that influence atmospheric temperature. In addition, summarize the major lines of both direct measurements and proxy evidence indicating global warming in the last 100 years.

4. Sketch, label and describe the greenhouse effect. Summarize the major factors, both natural and anthropogenic, that influence atmospheric temperature. Describe the difference for increasing greenhouse gas concentrations in the atmosphere, and for correspondence between increases in these gases and increases in temperature.

GEOL 1470 Exam 3 FA2011

- Sketch and describe the role that gravity plays in slope stability, including the concept of the angle of repose and its landscape expressions. What are some factors that control slope stability, and events that trigger slope failure? **OR**
- Describe how earthquakes can cause destruction, both during and after the main earthquake. Sketch and label a few examples. Discuss some ways to limit our risk and reduce personal injury during a quake
- Sketch, label, and describe how flow velocity and channel profile vary in a meandering river, and what features form along different parts of bends. In addition, use a series of sketches to describe how meanders in a river form and move.



Concept Sketches Grading Rubric

General Rubric (50 points possible)

Content	Essential concepts all shown; important relationships correctly portrayed; no conceptual errors or evidence of misunderstanding (40 pts)	Most concepts and relationships shown correctly; some aspects left out; minor conceptual errors or misunderstandings (39-25 pts)	Essential concepts left out; relationships not correctly portrayed; major conceptual errors or misunderstandings (24-0 points)
Detail and Presentation	Sketch detailed and clearly drawn and labeled (10 pts)	Sketch lacks some detail or not clearly drawn or labeled (9-6 pts)	Sketch lacks detail or is illegible; difficult to interpret (1-5 pts)

Adapted from Johnson & Reynolds

Online Discussions

Learning outcomes

- Utilize geological concepts to evaluate relevant societal issues
- Find and evaluate relevant geological information
- Communicate clearly, in writing, to an identified audience

Online Discussions

Criteria	Unacceptable 0 Points	Acceptable 1 Point	Good 2 Points	Excellent 3 Points
Frequency Weight: 3	Participates not at all.	Participates 1-2 times on the same day. Postings may not be made in time for others to read and respond.	Participates 3-4 times but postings not distributed throughout week. Postings are made in time for others to read and respond.	Participates 4-5 times throughout the week. Postings are made in time for others to read and respond.
Initial Assignment Posting Weight: 1	Posts no assignment.	Posts adequate assignment with superficial thought and preparation; doesn't address all aspects of the task.	Posts well developed assignment that addresses all aspects of the task; lacks full development of concepts.	Posts well developed assignment that fully addresses and develops all aspects of the task.
Follow-Up Postings Weight: 1	Posts no follow-up responses to others.	Posts shallow contribution to discussion (e.g., agrees or disagrees); does not enrich discussion.	Elaborates on an existing posting with further comment or observation.	Demonstrates analysis of others' posts; extends meaningful discussion by building on previous posts.

Online Discussions

Criteria	Unacceptable 0 Points	Acceptable 1 Point	Good 2 Points	Excellent 3 Points
Content Contribution Weight: 3	Posts information that is off-topic, incorrect, and/or irrelevant to discussion.	Repeats but does not add substantive information to the discussion.	Posts information that is factually correct; lacks full development of concept or thought.	Posts factually correct, reflective and substantive contribution; advances discussion.
Clarity & Mechanics Weight: 1	Posts long, unorganized and/or rude content that may contain multiple errors and/or may be inappropriate.	Communicates in friendly, courteous and helpful manner with some errors in clarity and/or mechanics.	Contributes valuable information to discussion with minor clarity and/or mechanics errors.	Contributes to discussion with clear, concise comments formatted in an easy to read style that is free of grammatical and/or spelling errors.
General Weight: 1	Posts long, unorganized and/or rude content.	Communicates in friendly, courteous and helpful manner.	Contributes valuable information to discussion.	Contributes to discussion with clear, concise comments formatted in an easy to read style.

Your
Examples