

Unit-by-Unit Breakdown of How I Used the Materials

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Mineral Resources Module:

http://serc.carleton.edu/integrate/teaching_materials/mineral_resources/index.html

Unit	Activity	How implemented
Unit 1 - People, Products, and Minerals	1.1 Minerals and products	As part of an on-line pre-class assignment, students used google and Wikipedia to complete a table listing the uses of each mineral.
	1.2 Review of Minerals and Rocks	Students completed the concept map in groups during class. Correct answers were discussed. Students later completed the concept map again as part of an exam.
	1.3 Economic Development and Resource Use	Students worked in groups to complete the activity during class. They were given enlarged copies of illustrations because some illustrations were too small to read. Student answers were assessed with multiple choice and true/false clicker questions. Some activity graphs and related questions also appeared on the next exam.
Unit 2 - Boom and Bust: How Econ 101 Relates to Rocks	Activity Option 2.2 Rare Earth Elements: Supply, Demand, Consumption, Price	Students used an on-line assignment system to complete the REE reading and related multiple choice and true/false questions. Students worked in groups to complete the activity during class. For #6 (concept map), I provided students with a partially completed concept map. Students completed the concept map and then used clickers to answer related multiple choice questions. The graph (#1) and concept map (#6) were also on the exam.
Unit 3 - Mining and Mining	Activity Option 2.2 Ore Grades, Waste, and Remediation	Implemented in a limited way during Fall 2016, use of this activity was discontinued because of lack of time.

Mineral Resources Module:

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Unit	Activity	How implemented
Unit 4 – Mineral Resources Created by Sedimentary Processes	Activity 4.1 – Review of Sedimentary Processes	Students used an on-line assignment system to complete the reading and related multiple choice and true/false questions.
	Activity 4.2 – Mining Sand	Students working in groups completed “Mining Minerals from Sand” #1-6 in class and received feedback. Questions #1-2 also appeared on the exam. Students answered multiple choice and true/false questions related to Fig. 2 on an on-line homework assignment. During Fall 2016, students completed #7-14, but use of that part of the activity was discontinued because of lack of time.

Mineral Resources Module: http://serc.carleton.edu/integrate/teaching_materials/mineral_resources/index.html		
Unit	Activity	How implemented
Unit 4 – Mineral Resources Created by Sedimentary Processes	Activity 4.3 – Mining Salt	Students watched parts of “Discovery How Stuff Works: Salt” (https://www.youtube.com/watch?v=gI5qV-kvLeg) and parts of a video about an underground salt mine beneath Kansas. Students participated in a class discussion about the pro’s and con’s of surface mining vs. underground mining of salt. During class, students worked in groups to complete the concept map and answers were discussed. The students completed the concept map again as part of an on-line homework assignment.
Unit 5 – Resources Created by Igneous and Metamorphic Processes	Metallic Sulfide Deposits in Yellowstone and Near Lake Superior	Within the on-line assignment system, students completed background reading and answered related multiple choice and true/false questions. The classroom active learning activity was implemented during Spring and Fall 2016, but was discontinued because of time constraints.
Unit 6 – Mining, Society, and Decision Making	Option 1 - Phosphorous	Students used the on-line assignment system to complete the reading and answer related multiple choice and true/false questions. During Fall 2016, students completed Segment 1 as part of the pre-class assignment, and Segment 2 was a whole-class discussion. During Spring 2016, Segments 1 and 2 were not implemented because I was at a meeting on that day. Instead, students watched videos about phosphorous mining and answered related multiple choice and true/false questions.

Living on the Edge Module:

http://serc.carleton.edu/integrate/teaching_materials/living_edge/index.html

Unit	Activity	How implemented
Unit 1 – Hazards at Transform Plate Boundaries	San Francisco area student worksheet	Within the on-line assignment system, students completed the reading and answered related multiple choice and true/false questions. In class, students worked in groups to complete the San Francisco earthquake probability activity. They also completed a similar activity involving hazard in the New Madrid Seismic zone. The New Madrid exercise also appeared on an exam.
Unit 2 – Risk at Transform Plate Boundaries	San Francisco School Earthquake Risk Activity	Within the on-line assignment system, students used InTeGrate materials to learn about hazard and risk, ways to mitigate damage, etc. During Fall 2016, students calculated risk for 2 schools (Marina Middle and Garfield Elementary), discussed (as a class) the relative merits of retrofitting one as opposed the other, and described ways to mitigate damage. During Spring 2017, the in-class activity was not implemented because of time constraints.

Environmental Justice
[\(\[http://serc.carleton.edu/integrate/teaching_materials/freshwater/index.html\]\(http://serc.carleton.edu/integrate/teaching_materials/freshwater/index.html\) \)](http://serc.carleton.edu/integrate/teaching_materials/freshwater/index.html)
and A Growing Concern
[\(\[http://serc.carleton.edu/integrate/teaching_materials/sustain_agriculture/index.html\]\(http://serc.carleton.edu/integrate/teaching_materials/sustain_agriculture/index.html\) \)](http://serc.carleton.edu/integrate/teaching_materials/sustain_agriculture/index.html) **Modules:**

Unit	Activity	How implemented
Environmental Justice and Freshwater Resources Module/Unit 5 – Hazardous Waste and Love Canal	5.4 Getting the Concepts	During Fall 2016, students watched the “Lois Gibbs speaks” videos and answered related multiple choice and true/false questions within the on-line assignment system. In class, students completed the “Hazardous Waste and Love Canal Quiz” and received feedback. The quiz questions also appeared on an exam. This activity was not implemented during Spring 2017 because of time constraints.
A Growing Concern Module/Unit 3- Natural and Agricultural Erosion Rates	Geospatial Erosion Examination	During Fall 2016, students examined the “Geospatial Erosion Examination” slides and discussed answers as a class. Questions #1-2 from the Follow-Up Assignment were discussed during class, and these questions also appeared on an exam. This unit was not implemented during Spring 2017 because of time constraints.

Climate of Change Module:
http://serc.carleton.edu/integrate/teaching_materials/climate_change/index.html

Unit	Activity	How implemented
Unit 3 – Anomalous Behavior	Case Study 3.1 Predicting Patterns	Within the on-line assignment system, students used InTeGrate materials to learn about ENSO. In class, students completed #6 and #7 on the student handout, and they received feedback. Related multiple choice and true/false questions appeared on the exam.
	Case Study 3.2 Exploring Patterns	Within the on-line assignment system, students used InTeGrate materials to learn about ENSO. No in-class activity was implemented because of time constraints.

Hurricanes Module:

http://serc.carleton.edu/integrate/teaching_materials/hazards/index.html

Unit	Activity	How implemented
Unit 1 – Hazard and Risk	1.1	The class discussed the cartoon.
	1.2	Within the on-line assignment system, students read the Diamond article and answered related multiple choice and true/false questions.
	1.3	Within the on-line assignment system, students examined the Unit 1 PowerPoint and answered related multiple choice and true/false questions. In class, students calculated risk.
Unit 2 – Hurricane Formation	Student Activity Sheet	Within the on-line assignment system, students examined the video and PowerPoint and answered related multiple choice and true/false questions. Working in groups, students completed the Student Activity Sheet in class. Answers were discussed as a class.
Unit 3 – Hurricane Tracks and Energy	3.1	Working in groups, students plotted the track of the hurricane during class, and they received feedback. Those who plotted the track incorrectly had the opportunity to improve their track for additional points. The plotting problem was included on the Final exam.
	3.3	Working in groups, students completed the Student handout during class and received feedback. Related questions appeared on the Final exam.
Unit 4 – Hurricane Impacts	4.1	Within the on-line assignment system, students examined the PowerPoint and answered related multiple choice and true/false questions.

Hurricanes Module: http://serc.carleton.edu/integrate/teaching_materials/hazards/index.html		
Unit	Activity	How implemented
Unit 5 – Hurricane Risk and Coastal Development	5.1	Working in groups, students completed the worksheet during class, and they received feedback. Related questions and graphing problems appeared on the Final exam.
	5.2	Working in groups, students completed the worksheet during class. There was a whole-class discussion of answers.
Unit 6 – Predictions and Evacuation	Student handout	Within the on-line assignment system, students examined the video and New York Times article, and they answered related multiple choice and true/false questions. Working in groups, students completed the student handout during class. There was a whole-class discussion of answers.
Unit 6 – Mining, Society, and Decision Making	Option 1 - Phosphorous	Students used the on-line assignment system to complete the reading and answer related multiple choice and true/false questions. During Fall 2016, students completed Segment 1 as part of the pre-class assignment, and Segment 2 was a whole-class discussion. During Spring 2016, Segments 1 and 2 were not implemented because I was at a meeting on that day. Instead, students watched videos about phosphorous mining and answered related multiple choice and true/false questions.