2015-2016 Assessment Annual Report

Public for this Department and lower

Title: 2015-2016 Assessment Annual Report
Start: 7/1/2016
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Progress: Completed
Providing Department: BA/BS

1. What are your current degree-level learning outcomes? Have the learning outcomes been modified over the last year? :

Broadly speaking, our learning goals remain the same as last year:

1. Students will be able to identify major rock and mineral types, will be able to describe the conditions under which each of them formed and, using this information, will be able to draw conclusions about the geological history of a region.

2. Students will be able to apply spatial and temporal reasoning, physics, chemistry and biology to understand Earth systems, cycles and the role of humans in geologic processes.

3. Students will be able to collect, analyze, and interpret geological and environmental data using a variety of techniques to test hypotheses. Students will become comfortable qualifying their answers to problems by stating assumptions and caveats.

4. Students will be able to effectively communicate ideas, research results, and interpretations using written, oral, and analytical skills both on a formal and extemporaneous basis.

However, over the past year we have broken these goals down into their component pieces (see Updated Departmental Learning Outcomes file attached), to make assessment more accurate, as the original goals were quite broad. By separating these goals into smaller pieces, we were able to begin mapping our curriculum to these goals with more accuracy (see below for more). Additionally, we then used these granular pieces to create a department-wide rubric, drawing heavily from various American Association of Colleges and Universities VALUE rubrics (see attached file).

Geology_LO_rubric

Updated Departmental Learning Outcomes

2. What evidence of student learning was collected in the past year? Which learning outcomes does the evidence address? :

Continuing our work from last year, we collected assessment data at two levels: data across the curriculum and in individual courses to assess student learning.

Last year, we began our assessment by asking faculty to self-assess the level to which their class(es) allow students to meet each Learning Outcome: not applicable, Beginner, Intermediate, or Advanced. This year, our more granular Learning Outcomes meant that we could map the level at which these learning outcomes are addressed across our curriculum in more detail. This is an ongoing process, as we have been meeting with different groups within the department to begin the process of mapping the learning outcomes across the curriculum (see the Mapping Learning Goals_Initial file attached). In addition to the learning outcomes, we are also mapping activities across the curriculum, so we can understand where our students are learning computer skills, writing, mapping, and making presentations. The end goal of this project is not only to assess student learning across the curriculum, but also to make sure that students are being scaffolded through the degree program correctly.

For last year's report, we assessed student learning in Geol 101, the first course our majors take. This year we assessed student learning in Geol 311 (Mineralogy) and Geol 512 (Petrology), two of the courses students take in their second year as a geology major. Geol 311 is a fall course, and thus it was assessed before we had broken our Learning Outcomes (LO) down into smaller pieces. This assessment was done by mapping the two exams in the class, a midterm and final, against our learning outcomes; given the nature of the class, only LO1 and LO3 were relevant. As these exams were multiple choice, it was decided that a wrong answer would be counted as "failed to attain" the LO, and a correct answer would be counted as the "basic" level, as that was the instructor's view of the difficulty of the material being examined.

Geol 512 is a spring class and it has a term paper, so it was assessed using our new department-level assessment rubric, which provided a more useful indication of student learning. The entire scored rubric is attached but in general the majority of students achieve "milestone 1", which is about where we would want students to be in a second-year majors course. The big exception to that, though, was in the dimensions that assess critical thinking (9, 10, 11 on the rubric), as the majority of students were still at the benchmark level.

Geol311_assessment

Mapping Learning Goals_initial

Rubric - Petrology

3. What have you learned from the evidence you collected? :

Thus far we have learned that:

1. In Mineralogy (Geol 311), ~3/4 of students attained basic competence in the third learning goal (interpreting geological environments), only about 1/2 attained basic competence in the first learning goal (identifying rocks and minerals). This was of some concern, as this is a mineralogy class, but the instructor is in the process of transforming the class from lecture style to active learning, so the hope is that the student learning will continue to increase. Additionally, some of these results might be a result of how we assessed the learning; mapping the instructor's exam to our learning goals, especially such broad learning goals, makes it difficult to assess the learning on a detailed level. We have a plan to address this (see #3 below), which should allow us to determine the degree to which these results reflect student learning and to the degree they reflect imperfect assessment.
2. On of the reasons we wanted to assess Petrology (512) was that last year, in the faculty self-assessment, this course was listed as a being taught at the "advanced" level (as opposed to the "basic" or "intermediate"). This was of some concern, as the only prerequisites for the course were Geol 101, Geol 311, and a semester of calculus, which meant that students can, and do, enroll in the class very early on in their degree progress. However, for the curricular level assessment the instructional team indicated this material was being taught to an intermediate level, and the student assessment data revealed that disciplinary content was being mastered at a lower intermediate level. However, the data did reveal that the students are not being scaffolded through the process of researching and writing about scientific materials: it is not being introduced systematically before this class and the students are only performing at benchmark, the introductory level.
3. It takes a lot of work to assess work across a multitude of different classes. Our new rubric helps, as it provides some standardization, but it still is a great deal of time and effort on the part of a few faculty. To provide more consistency, as well as the ease the burden, once we finish our curriculum map, we plan to have faculty on connected courses work together to create questions testing material students should be learning in their classes and material students should know before they can take their classes. These questions will then be combined to create a pretest/post-test that will be given in all required courses, which should let us assess student learning with more reliability and ease.
4. In general, our students do seem to be scaffolded through the required courses in the curriculum in a way that builds their knowledge, although there are courses that will need adjusting in either the level at which the material is taught or the timing when students take the course.

4. What recommendations have been generated from discussions of assessment results among the faculty? :

The major change we are considering based on these assessment details involves the math classes we are making students take. We discovered that many of our students are repeatedly failing their required math classes (MAT 121 and MAT 122), delaying their graduation and depressing their GPAs, but our curriculum mapping revealed that none of our required classes actually involve calculus. Thus, we have recommended that calculus is either added into our classes, which will allow students to understand why they are taking these math classes, or that we lower the math requirement for our students. Now that we are meeting with individual faculty members about their courses, this is an issue that we hope to resolve in the coming year.

Similarly, we are trying to formalize the scaffolding of research and writing across the curriculum, and are discussing either changing the expectations in petrology or adding more prerequisites, so the expectations and the student learning more closely align.

5. What changes did you make as a result of these assessments in the past year? :

As a result of our previous assessment, we refined our Learning Outcomes and created a department-wide general rubric, the better to assess learning across the curriculum. We also rearranged (and will continue to rearrange) teaching assignments to better support student learning and faculty development.

Last year, we indicated that we were going to renumber courses to create a more logical flow for students. However, after our modified learning goals, we decided it made sense to collect more data at a more detailed level before we made this change. Long term, some renumbering and reordering will likely occur, but we realized we still did not have a clear enough understanding of student learning across the curriculum.

a. Please provide your candid feedback on the degree-level assessment process for the Provost's Office and The University Assessment Committee to help make the process more efficient and useful for academic units. (Optional):

Although time consuming, this has been a very useful procedure for our department. Many of our courses had existed as individual stand-alone units, with no sense of connection or flow to other classes. This made it very difficult for students to synthesize their learning across the curriculum, as it was not clear to them how different subjects connected. As a result of the conversations between and among faculty members that were required to complete this process, our curriculum and instruction is becoming much more uniform and cohesive, which supports student learning and success, and, we hope, retention in the field.

b. Would you like to receive peer feedback on your report? (Optional):

Feedback from the Assessment Specialist

c. Reviewers' feedback on the report upon request (available for units to view in the following spring

semester):

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		Capstone	Milestone		Benchmark		
	VALUE category	4	3	2	1	AACU Value Rubric Used:	
1. Graduates will be able to identify major rock and mineral types.		Student demonstrates an exceptional grasp of both general and discipline-specific concepts.	Student has a firm grasp of both general and discipline-specific concepts, but is missing some key ideas.	Student shows adequate mastery of general knowledge, but discipline-specific knowledge has significant gaps.	Student shows poor knowledge of both general and discipline-specific concepts.	Quantitative Literacy Rubric	Critical thinking
2. Graduates will be able to describe the conditions under which major rocks and minerals formed.						Problem solving	Integrative Learning
3. Graduates will be able to interpret the geological history of a region using knowledge of rock type and structural formation.							
4. Graduates will be able to identify the mechanisms and results of plate tectonics.							
5. Graduates will be able to describe and classify the evolution of life on Earth through time .							
6. Graduate will be able to differentiate between natural and human roles in geologic processes and understand the impact of these processes on human lives and communities.							
Problem-Solving Skills	Problem-Solving Skills						
7. Graduates will be able to apply the following to understand Earth's systems, cycles, and evolution:	7. Graduates will be able to apply the following to understand Earth's systems, cycles, and evolution:						
a. Physics	Connections toDiscipline Sees (makes) connections across disciplines, perspectives	Independently creates wholes out of multiple parts (synthesizes) or draws conclusions by combiningexamples, facts, or theories from more than one field of	Independently connects examples, facts, or theories from more than one field of study or perspective.	When prompted, connects examples, facts, or theories from more than one field of study or perspective.	When prompted, presents examples, facts, or theories from more than one field of study or perspective.		
b. Chemistry							
c. Biology							

		Capstone	Milestone		Benchmark		
	VALUE category	4	3	2	1	AACU Value Rubric Used:	
d. Mathematics	Interpretation Ability to explain information presented in mathematical forms (e.g., equations, graphs, diagrams, tables, words)	Provides accurate explanations of information presented in mathematical forms. Makes appropriate inferences based on that information. For example, accurately explainsthe trend data shown in a graph and makesreasonable predictions regarding what the data suggest about future events.	Provides accurate explanations of information presented in mathematical forms. For instance, accurately explainsthe trend data shown in a graph.	Provides somewhat accurate explanations of information presented in mathematical forms, but occasionally makes minor errors related to computations or units. For instance, accurately explainstrend data shown in a graph, but may miscalculate the slope of the trend line.	Attempts to explain information presented in mathematical forms, but draws incorrect conclusions about what the information means. For example, attemptsto explain the trend data shown in a graph, but will frequently misinterpret the nature of that trend, perhaps by confusing positive and negative trends.		
e. Spatial Reasoning Skills							
8. Graduates will be able collect, analyze, and interpret geological and environmental data including: a. Collecting data in the field b. Graphing numerical data	Application / Analysis Ability to make judgments and draw appropriate conclusions based on the quantitative analysis of data, while recognizing the limits of this analysis	Uses the quantitative analysis of data as the basis for deep and thoughtful judgments, drawing insightful, carefully qualified conclusions from this work.	Uses the quantitative analysis of data as the basis for competent judgments, drawing reasonable and appropriately qualified conclusions from this work.	Uses the quantitative analysis of data as the basis for workmanlike (without inspiration or nuance, ordinary) judgments, drawing plausible conclusions from this work.	Uses the quantitative analysis of data as the basis for tentative, basic judgments, although is hesitant or uncertain about drawing conclusions from this work.		
9. Graduates will be able to formulate hypotheses and qualify their results by stating assumptions and caveats.	ProposeSolutions/Hypotheses	Proposes one or more solutions/hypotheses that indicates a deep comprehension of the problem. Solution/hypotheses are sensitive to contextual factors as well as all of the following: ethical, logical, and cultural dimensions of the problem.	Proposes one or more solutions/hypotheses that indicates comprehension of the problem. Solutions/hypotheses are sensitive to contextual factors as well as the one of the following: ethical, logical, or cultural dimensions of the problem.	Proposes one solution/hypothesis that is “off the shelf” rather than individually designed to address the specific contextual factors of the problem.	Proposes a solution/hypothesis that is difficult to evaluate because it is vague or only indirectly addresses the problem statement.		
10. Graduates will be able to use a variety of techniques to test hypotheses.	Student's position (perspective, thesis/hypothesis)	Specific position (perspective, thesis/hypothesis) is imaginative, taking into account the complexities of an issue. Limits of position (perspective, thesis/hypothesis) are acknowledged. Others' points of view are synthesized within position (perspective, thesis/hypothesis).	Specific position (perspective, thesis/hypothesis) takes into account the complexities of an issue. Others' points of view are acknowledged within position (perspective, thesis/hypothesis).	Specific position (perspective, thesis/hypothesis) acknowledges different sides of an issue.	Specific position (perspective, thesis/hypothesis) is stated, but is simplistic and obvious.		
Communication Skills			Communication Skills				

		Capstone	Milestone		Benchmark		
	VALUE category	4	3	2	1	AACU Value Rubric Used:	
11. Graduates will be able to evaluate critically fundamental Earth science: a. Literature, and b. Spatial data (e.g., photographs, maps, remotely sensed images.)	Evidence Selecting and using information to investigate a point of view or conclusion	Information is taken from source(s) with enough interpretation/evaluation to develop a comprehensive analysis or synthesis. Viewpoints of experts are questioned thoroughly.	Information is taken from source(s) with enough interpretation/evaluation to develop a coherent analysis or synthesis. Viewpoints of experts are subject to questioning.	Information is taken from source(s) with some interpretation/evaluation, but not enough to develop a coherent analysis or synthesis. Viewpoints of experts are taken as mostly fact, with little questioning.	Information is taken from source(s) without any interpretation/evaluation. Viewpoints of experts are taken as fact, without question.		
12. Graduates will be able to present, both formally and extemporaneously, geological information clearly in: b. Written form, b. Graphically, and b. Orally.	Integrated Communication	Fulfills the assignment(s) by choosing a format, language,or graph (or other visual representation) in ways that enhance meaning, making clear the interdependence of language and meaning, thought,and expression.	Fulfills the assignment(s) by choosing a format, language, or graph (or other visual representation) to explicitly connect content and form, demonstrating awareness of purpose and audience.	Fulfills the assignment(s) by choosing a format, language,or graph (or other visual representation) that connects in a basic way what is being communicated (content) with how it is said (form).	Fulfills the assignment(s) (i.e. to produce an essay, a poster, a video, aPowerPoint presentation, etc.) in an appropriate form.		

Degree-Level Learning Outcomes	Component Pieces of these Learning Goals
1. Students will be able to identify major rock and mineral types, will be able to describe the conditions under which each of them formed and, using this information, will be able to draw	1. Graduates will be able to identify major rock and mineral types. 2. Graduates will be able to describe the conditions under which major rocks and minerals formed. 3. Graduates will be able to interpret the geological history of a region using knowledge of rock type and structural formation.
2. Students will be able to apply spatial and temporal reasoning, physics, chemistry and biology to understand Earth systems, cycles and the role of humans in geologic processes.	4. Graduates will be able to identify the mechanisms and results of plate tectonics. 5. Graduates will be able to describe and classify the evolution of life on Earth through time . 6. Graduate will be able to differentiate between natural and human roles in geologic processes and understand the impact of these processes on human lives and communities. 7. Graduates will be able to apply the following to understand Earth's systems, cycles, and evolution: a. Physics b. Chemistry c. Biology d. Mathematics e. Spatial Reasoning Skills
3. Students will be able to collect, analyze, and interpret geological and environmental data using a variety of techniques to test hypotheses. Students will become comfortable qualifying their answers to problems by stating assumptions and caveats.	8. Graduates will be able collect, analyze, and interpret geological and environmental data including: a. Collecting data in the field b. Graphing numerical data 9. Graduates will be able to formulate hypotheses and qualify their results by stating assumptions and caveats. 10. Graduates will be able to use a variety of techniques to test hypotheses.

4. Students will be able to effectively communicate ideas, research results, and interpretations using written, oral, and analytical skills both on a formal and extemporaneous basis.	11. Graduates will be able to evaluate critically fundamental Earth science: a. Literature, and b. Spatial data (e.g., photographs, maps, remotely sensed images.) 12. Graduates will be able to present, both formally and extemporaneously, geological information clearly in: b. Written form, b. Graphically, and b. Orally.

	Required Courses													Semi-Required Courses (need to take at least one from each category)							
														Life				Rocks		Water	
Credit Hours	3	2	2		3	3	1	4	3	1	4	3	3	3	3	1	3	4	3	3	3
ACTIVITIES	GEOL 101 Introduction to the Earth	GEOL 103 Geology Fundamentals Lab	GEOL 360 Intro Field Methods	GEOL 370 Study Abroad	GEOL 304 Historical Geology (F)	GEOL 311 Mineralogy (F)	GEOL 312 Optical Mineralogy (F)	GEOl 331 Sed/Strat (S)	GEOL 512 Igneous and Metamorphic Petrology	GEOL 513 Petrology Laboratory	GEOL 562 Structural Geology	GEOL 560 Field Camp	GEOL 561 Field Camp II	GEOL 316 Geochemistry	GEOL 521 Paleontology	GEOL 523 Paleo Lab	GEOL 591 Geobiology	GEOL 535 Petroleum Geology and Subsurface Geology	GEOL 572 Geophysics	GEOL 552 Intro to Hydro	GEOL 592 Climate
Computer Methods	Yes - GE	Yes - GE									Yes - GIS, stereonet	Yes - GIS, stereonet	Yes					Yes		Excel	
Writing Assignment	Yes		Yes					Yes - labs/exam	Yes		Yes - Labs, sometimes paper	Yes	Yes					Yes			
Poster Presentation																					
Oral Presentation						Yes	Yes			Yes		Yes	Yes					Yes?			
Group Projects	Yes - 3		Yes			Yes	Yes	Yes - labs				Yes	Yes					Yes		Yes	
Mapping	Yes	Yes	Yes								Yes - MHT does	Yes	Yes							Water table	
Graphing	Yes	Yes						Yes			Yes	Yes	Yes							yes	
Field Skills		Yes	Yes					Yes	Yes		Yes	Yes	Yes							Once	
Discipline Specific Knowledge																					
1. Graduates will be able to identify major rock and mineral types.	Introduced	Introduced	Introduced		Introduced	Enriched	Enriched	Enriched	Reinforced	Reinforced	Reinforced	Reinforced	Reinforced					Enriched			
2. Graduates will be able to describe the conditions under which major rocks and minerals formed.	Introduced	Introduced	Introduced		Enriched	Enriched	Enriched	Enriched	Reinforced	Reinforced	Reinforced	Reinforced	Reinforced					Enriched			
3. Graduates will be able to interpret the geological history of a region using knowledge of rock type and structural formation.	Introduced	Introduced	Introduced		Enriched	Enriched	Enriched	Enriched (dataset, not region)	Reinforced	Reinforced	Reinforced	Reinforced	Reinforced					Enriched			
4. Graduates will be able to identify the mechanisms and results of plate tectonics.	Introduced	Introduced	Introduced		Enriched			Enriched	Reinforced	Reinforced	Reinforced	Reinforced	Reinforced					Enriched			
5. Graduates will be able to describe and classify the evolution of life on Earth through time .		Introduced	Introduced		Enriched			Enriched			Reinforced	Reinforced	Reinforced		Enriched	Enriched					
6. Graduate will be able to differentiate between natural and human roles in geologic processes and understand the impact of these processes on human lives and communities.		Introduced			Introduced?	Enriched	Enriched	Enriched			Reinforced	Reinforced	Reinforced					Enriched	Enriched	Reinforced	
Problem-Solving Skills																					
7. Graduates will be able to apply the following to understand Earth's systems, cycles, and evolution:																					
a. Physics	Introduced	Introduced			Enriched	Enriched	Enriched	Enriched			Reinforced	Reinforced	Reinforced					Enriched	Enriched	Reinforced	
b. Chemistry	Introduced	Introduced			Enriched	Enriched	Enriched	Enriched	Reinforced	Reinforced	Reinforced	Reinforced	Reinforced							Reinforced	
c. Biology		Introduced			Enriched			Enriched				Reinforced	Reinforced		Enriched	Enriched		Enriched		Enriched	
d. Mathematics	Introduced	Introduced						Enriched			Reinforced	Reinforced	Reinforced					Enriched	Enriched	Reinforced	
e. Spatial Reasoning Skills	Introduced	Introduced	Introduced		Enriched	Introduced		Enriched			Reinforced	Reinforced	Reinforced					Enriched			
8. Graduates will be able collect, analyze, and interpret geological and environmental data including: a. Collecting data in the field b. Graphing numerical data			Introduced		Introduced	Enriched	Enriched	canned data		Reinforced	Enriched	Reinforced	Reinforced					Enriched		Reinforced	
9. Graduates will be able to formulate hypotheses and qualify their results by stating assumptions and caveats.	Introduced				Introduced	Enriched	Enriched		Reinforced	Reinforced	Reinforced	Reinforced	Reinforced					Enriched		Reinforced	
10. Graduates will be able to use a variety of techniques to test hypotheses.	Introduced				Introduced	Enriched			Reinforced	Reinforced	Reinforced	Reinforced	Reinforced					Enriched		Reinforced	
Communication Skills																					
11. Graduates will be able to evaluate critically fundamental Earth science: a. Literature, and b. Spatial data (e.g., photographs, maps, remotely sensed images.)	Introduced	Introduced	Introduced		Introduced				Enriched		Reinforced	Reinforced	Reinforced					Enriched		Reinforced	
12. Graduates will be able to present, both formally and extemporaneously, geological information clearly in: b. Written form, b. Graphically, and b. Orally.	Introduced		Introduced			Introduced	Introduced	Enriched	Enriched	Enriched	Reinforced	Reinforced	Reinforced					Enriched		Reinforced	

		Midterm LO1 %	Midterm LO3 %	Final LO1 %	Final LO3 %	Average LO1 %	Average LO3 %
All Students	Basic:	80%	80%	21%	74%	50%	77%
	Failed to attain:	17%	17%	79%	26%	48%	22%
Majors	Basic:	85%	81%	19%	77%	52%	79%
	Failed to attain:	15%	19%	81%	23%	48%	21%
Non-Majors	Basic:	83%	83%	17%	67%	50%	75%
	Failed to attain:	17%	17%	83%	33%	50%	25%
Graduate students	Basic:	50%	100%	50%	50%	50%	75%
	Failed to attain:	50%	0%	50%	50%	50%	25%

Petrology (Geol 512)	Capstone	Milestone 2	Milestone 1	Benchmark	Not at Benchmark
	4	3	2	1	0
1. Graduates will be able to identify major rock and mineral types.	0%	10%	60%	10%	20%
2. Graduates will be able to describe the conditions under which major rocks and minerals formed.	0%	10%	60%	20%	10%
3. Graduates will be able to interpret the geological history of a region using knowledge of rock type and structural formation.	0%	20%	60%	20%	0%
4. Graduates will be able to identify the mechanisms and results of plate tectonics.	0%	10%	50%	30%	10%
5. Graduates will be able to describe and classify the evolution of life on Earth through time .	Not Applicable				
6. Graduate will be able to differentiate between natural and human roles in geologic processes and understand the impact of these processes on human lives and communities.					
Problem-Solving Skills					
7. Graduates will be able to apply the following to understand Earth's systems, cycles, and evolution:					
a. Physics	Not Applicable				
b. Chemistry	0%	0%	40%	60%	0%
c. Biology	Not Applicable				
d. Mathematics	0%	20%	40%	20%	20%
e. Spatial Reasoning Skills	0%	10%	50%	20%	20%

Petrology (Geol 512)	Capstone	Milestone 2	Milestone 1	Benchmark	Not at Benchmark
	4	3	2	1	0
8. Graduates will be able collect, analyze, and interpret geological and environmental data including: a. Collecting data in the field b. Graphing numerical data	Not Applicable				
9. Graduates will be able to formulate hypotheses and qualify their results by stating assumptions and caveats.	0%	0%	40%	60%	0%
10. Graduates will be able to use a variety of techniques to test hypotheses.	0%	0%	40%	60%	0%
Communication Skills					
11. Graduates will be able to evaluate critically fundamental Earth science: a. Literature, and b. Spatial data (e.g., photographs, maps, remotely sensed images.)	0%	0%	40%	60%	0%
12. Graduates will be able to present, both formally and extemporaneously, geological information clearly in: b. Written form, b. Graphically, and b. Orally.	0%	0%	60%	40%	0%