Geoscience | 2017-2018 Assessment Report

1. Please give a brief overview of the assessment data you collected this year.

We assessed three outcomes this year:

Outcome #5: Students will demonstrate an understanding of the various landscape-forming processes that act on the Earth's surface (agents of weathering and erosion) and those that act from the planet's interior (mountain building. volcanism, earthquakes).

Outcome #8: Students will demonstrate an understanding of the genesis of Earth resources including fossil fuels, metals, and non-metallic minerals and in this way they will appreciate their finite nature.

Outcome #9: Students will analyze, interpret, and report on laboratory and field findings using appropriate statistical techniques and computer applications.

Outcome #5 was assessed in Geoscience 202 - Physical Geology during Spring 2018. Physical Geology is a required course for Geoscience Majors and Minors. It is required for Environmental Science majors, Environmental Engineering Technology majors, and students seeking Broadfield Science Certification. It also satisfies the Natural Sciences component of the General Education program. This outcome was assessed by Dr. Ryan Currier on the Spring 2018 final exam using an embedded essay question. See attached document from Dr. Currier, dated May 2018.

Outcome 8 was assessed in Geoscience 450 - Ore Deposits during Spring 2018. Ore Deposits is an upper level elective course for Geoscience Majors and Minors that is occasionally taken by graduate students in the Environmental Science & Policy Program. This outcome was assessed by Dr. Ryan Currier on the Spring 2018 final exam using an embedded essay question. See attached document from Dr. Currier, dated May 2018.

Outcome 9 was assessed in Geoscience 402 - Sedimentology & Stratigraphy during Fall 2017. Sedimentology & Stratigraphy is an upper level elective course for Geoscience Majors and Minors that is occasionally taken by graduate students in the Environmental Science & Policy Program. This outcome was assessed by Dr. John Luczaj during Fall 2017 using a course project and presentation. See attached document from Dr. Luczaj that outlines the results from the fall project.

2. How will you use what you've learned from the data that was collected?

All three assessments showed that there is an acceptable to above expectation performance with respect to the stated goals of the three Learning Outcomes. In one case (Outcome #8), the results will lead an adjustment in how material will be presented throughout the semester the next time the course is taught. In another case (Outcome #9), the results, in conjunction with student comments, will lead to a change in project communication requirements to ensure students are adequately communicating throughout the semester. The data suggest that big changes are not needed in either course and that there are no major deficiencies in the Geoscience program with respect to attaining programmatic Learning Outcomes #5, 8, and #9.

GEOSCIENCE ASSESSMENT: OUTCOME #5

Ryan Currier
May 2018

I. INTRODUCTION

Outcome #5

Students will understand the various landscape-forming processes that act on the Earth's surface (agents of weathering and erosion) and those that act from the planet's interior (mountain building, volcanism, earthquakes).

Course Assessed

GEOSCI 202—Physical Geology. Physical Geology is a lower level course designed to introduce many aspects of the geosciences to major and non-major students. The course explores the building materials of Earth (rocks and minerals), some Earth history, and dynamic processes that shape and reshape the Earth—including some natural hazards.

Nature of Assessment

Embedded Final Exam question. The question was essay based.

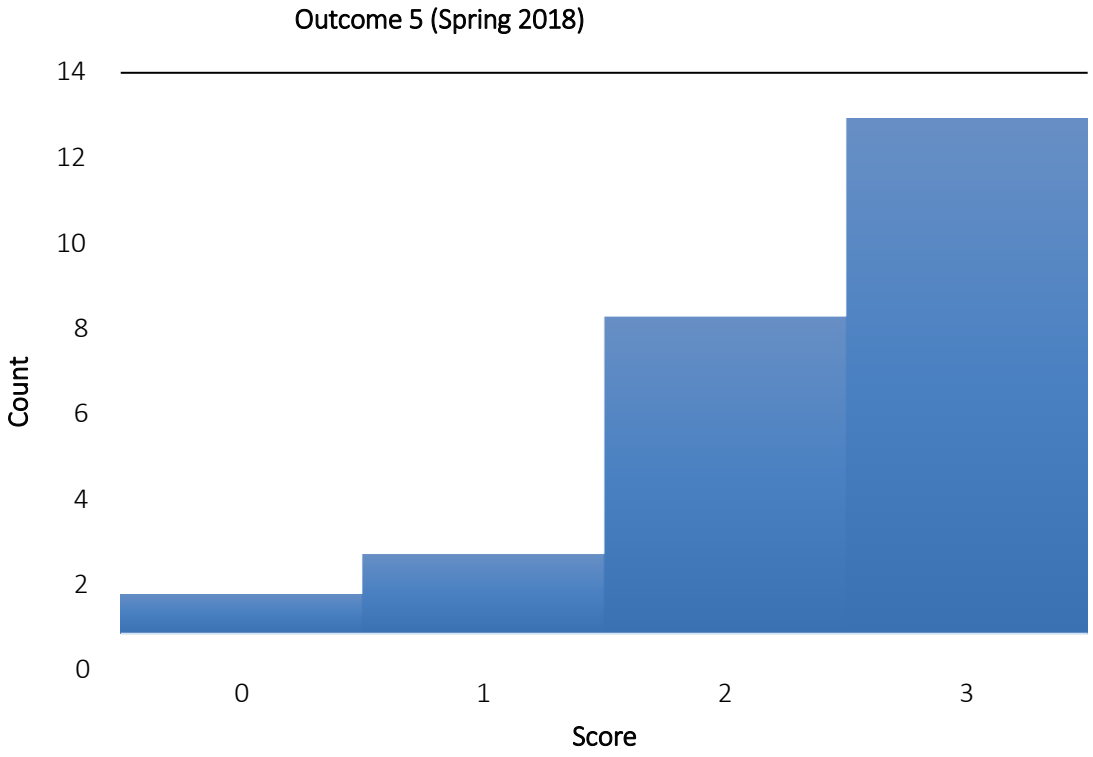
59. A deep thought question: How does plate tectonics affect Earth's hydrologic cycle? Possible considerations might include (but is not limited to) mountain building, volcanism, streams, landslides, and glaciation. Figures to aid in your explanation will be appreciated.

This question is designed such that students must explain both interior and exterior landscape-forming processes in order to adequately address their interplay.
Assessment of Outcome #5 utilized the rubric provided below.

II. ASSESSMENT

0 = Unacceptable	1 = Below Expectations	2 = Acceptable	3 = Exceeds Expectations
Off topic or otherwise incorrect	Considers either internal or external processes, but not both	Considers both internal and external processes, but the connection is surficial, weak	Considers both internal and external processes, connection is detailed, with multiple connections considered

III. RESULTS



n=24; μ=2.375

IV. DISCUSSION

I am generally pleased with the results of the assessment. The distribution of student scores is heavily left-skewed, with a high average (2.375), well above the acceptable threshold. These results indicate that Geoscience Learning Outcome #5 is being met in GEOSCI 202. When designing the question, I was unsure how this question would be received by students, because it is a question that relies upon synthesizing multiple concepts from the course. We had not explicitly discussed this connection in class either, so I am very happy to see evidence of critical thinking. Throughout the semester, I make a point of emphasizing connections between various Earth systems, which I believe is a major component of the Geosciences. This assessment has got me thinking: it might be nice to develop a worksheet, to be done at the end of the semester, that summarizes and reviews the course by exploring more of these interconnections.

GEOSCIENCE ASSESSMENT: OUTCOME #8

Ryan Currier
May 2018

I. INTRODUCTION

Outcome #8

Students will understand the genesis of Earth resources including fossil fuels, metals, and non-metallic minerals and in this way, they will appreciate their finite nature.

Course Assessed

GEOSCI 450—Ore Deposits. Ore Deposits is an upper level course designed to integrate many aspects of the geosciences. The course explores environmental, economic, and political ramifications of mining in addition to the core material of the course—how ore deposits form.

Nature of Assessment

Embedded Final Exam question. Essay based question.

2. Discuss whole Earth differentiation and the main reservoirs of chalcophiles, siderophiles, lithophiles, and atmophiles, and the nature of potential ore bodies.

This is a broad question, designed for students to consider the chemical behavior of different elements, and how they can naturally partition into different materials via geologically relevant processes. The rubric below was utilized for the assessment.

II. ASSESSMENT

Criterion	0 = Unacceptable	1 = Acceptable	2 = Exceeds Expectations
A. Described the differentiation of Earth	Did not discuss, or deeply flawed	Generally correct, but vague or containing few errors	Thorough description, perhaps including solar system context
B. Described the behaviors and/or reservoirs of the different elements	Did not discuss, or deeply flawed	Generally correct	Thorough description, with additional treatment of context within periodic table and or atomic model
C. Describes ore bodies	Did not discuss, or weekly flawed	Generally correct	Specific ores, minerals, a number of examples

III. RESULTS

	Student 1	Student 2	Student 3	Student 4	Student 5	Student 6	Student 7	Avg.
A	0	0	1	2	1	2	1	1.0
B	0	1	1	2	1	1	2	1.1
C	1	1	0	1	0	1	2	0.9
Avg.	0.3	0.7	0.7	1.7	0.7	1.3	1.7	1.0

IV. DISCUSSION

The averages of all assessed criteria are near the acceptable threshold (A=1; B=1.1; C=0.9). In general, students were able to describe how various materials can be sequestered via natural refinement processes. Most students were able to adequately describe elemental behaviors that set up the potential for partitioning effects. Several students correctly identified why we have access to functionally unlimited reserves of stone and aggregate, and very limited quantities of precious metals like gold and platinum group elements. I would accept these results as being indicative that Geoscience Learning Outcome #8 is being met in GEOSCI 450.

There is certainly room for improvement. Criteria A and B assessed in this question largely draws upon material from the beginning of the course (Earth differentiation and the various -philes). One easy way to improve scores, should this assessment be done again, is to communicate this material multiple times over the semester. It would provide very broad context for each of the units investigated in the course. Criteria C, which assesses the student's ability to connect chemistry with ore bodies, was the lowest assessed score (C=0.9). I suspect the gap was too large for most students to bridge on their own. In the next offering of the course, I will provide more opportunities for students to make this connection between chemical reservoirs and minerals (which comprise ore bodies). Upon personal reflection of the course, this component is lacking. I will have students keep tables of minerals and mineral formulae for each of the various types of ore deposits, and make a point of assessing retention on quizzes and/or exams.

GEOSCIENCE ASSESSMENT: OUTCOME #9

John Luczaj
December 2017

I. INTRODUCTION

Outcome #9

Students will analyze, interpret, and report on laboratory and field findings using appropriate statistical techniques and computer applications.

Course Assessed

Geoscience 402 - Sedimentology & Stratigraphy. Geoscience 402 is an upper level elective course that all Geoscience majors are encouraged to take. It is also taken by Geoscience minors and occasionally by graduate students in the Environmental Science & Policy Program. This learning outcome was addressed through a final course project and presentation on December 11, 2017, that together were worth approximately 17% of the course grade.

Nature of Assessment

Sedimentology and Stratigraphy is a course that deals with the deposition, composition, layering geometries, and paleoenvironmental characteristics of sedimentary systems at Earth's surface. In groups of two, students were assigned a portion of the stratigraphic column of rocks that occur in northeastern Wisconsin. Each team was responsible for analyzing one or more rock drill cores (hundreds of feet long each) representing their stratigraphic interval. The goal was to apply knowledge acquired during prior lecture, lab, and field activities to identify and classify sedimentary rocks, structures, fossils, stratigraphic relationships, and chemical alteration features and place them into a regional context.

Students were responsible for constructing a stratigraphic column using computer- based drafting, along with a 20 minute PowerPoint presentation to the class presenting their results.

II. ASSESSMENT OF STRATIGRAPHIC COLUMN COURSE PROJECT

Criterion	0 = Unacceptable	1 = Acceptable	2 = Exceeds Expectations
A. Provided sufficient background and context for research	Did not discuss or provided incorrect regional and stratigraphic context.	Identified correct context, with limited detail or without citing literature source.	Identified correct regional and stratigraphic context and cited literature source(s).
B. Description and photography of the rock drill cores	Weak treatment or incorrect interpretations.	Adequately photographed and described rocks.	Accurately described and photographed multiple intervals.

C. Facies analysis and interpretation of depositional environments.	Did not provide any significant analysis.	Provided limited analysis of the facies type or paleoenvironment.	Correctly described facies and provided reasonable interpretation of environment.
D. Construction of stratigraphic column.	Column missing or not representative of interval studied.	Column is basic and correct, but with limited detail.	Column is correct and includes details of all units and subunits in literature, along with observed structures, etc.
E. Presentation Quality	Authors gave unclear presentation and could not communicate effectively or answer questions.	Authors gave clear presentation and answered questions.	Authors gave clear presentation and answered questions, but also showed evidence of attention to detail, eye contact with audience, and gave detailed answers to questions.

III. RESULTS

Results of Assessment of Mass Extinction Question (G=Group of two students)

Criterion	G1	G2	G3	G4	G5	Average
A	2	1	2	2	1	1.6
B	2	2	2	2	2	2.0
C	1	2	2	2	1	1.6
D	1	2	2	1	2	1.6
E	2	1	1	1	1	1.2

IV. DISCUSSION

The results of the Spring 2018 evaluation are very encouraging. All assessed criteria were either acceptable or above expectations. The assessment had a bit of difficulty in weighting the contributions of each member of the team. Based on later student feedback, the students appeared to enjoy the process and found the project to be meaningful. However, they did indicate that intermediate due dates for portions of the project could have kept them on track throughout the process.

This project was relatively new and has only been attempted twice. The results of the assessment do not suggest that any changes to course content or faculty development are necessary at this time. In fact, I believe the assessment reinforces the idea that this capstone-style project is a good idea in this particular course.