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 formulating 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).

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.
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 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.

a. Please provide your candid feedback on the 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):

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

Feedback from the Assessment Specialist
<table>
<thead>
<tr>
<th>VALUE category</th>
<th>Capstone</th>
<th>Milestone</th>
<th>Benchmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>AACU Value Rubric Used:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Graduates will be able to identify major rock and mineral types.</td>
<td>Student demonstrates an exceptional grasp of both general and discipline-specific concepts.</td>
<td>Student has a firm grasp of both general and discipline-specific concepts, but is missing some key ideas.</td>
<td>Student shows adequate mastery of general knowledge, but discipline-specific knowledge has significant gaps.</td>
</tr>
<tr>
<td>2. Graduates will be able to describe the conditions under which major rocks and minerals formed.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Graduates will be able to interpret the geological history of a region using knowledge of rock type and structural formation.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Graduates will be able to identify the mechanisms and results of plate tectonics.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Graduates will be able to describe and classify the evolution of life on Earth through time.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Problem-Solving Skills</td>
<td>Problem-Solving Skills</td>
<td>Problem-Solving Skills</td>
<td>Problem-Solving Skills</td>
</tr>
<tr>
<td>7. Graduates will be able to apply the following to understand Earth's systems, cycles, and evolution:</td>
<td>Independently creates wholes out of multiple parts (synthesizes) or draws conclusions by combining examples, facts, or theories from more than one field of study or perspective.</td>
<td>Independently connects examples, facts, or theories from more than one field of study or perspective.</td>
<td>When prompted, presents examples, facts, or theories from more than one field of study or perspective.</td>
</tr>
<tr>
<td>a. Physics</td>
<td>Connections to Discipline Sees (makes) connections across disciplines, perspectives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Chemistry</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Biology</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VALUE category</td>
<td>Capstone</td>
<td>Milestone</td>
<td>Benchmark</td>
</tr>
<tr>
<td>----------------</td>
<td>----------</td>
<td>-----------</td>
<td>-----------</td>
</tr>
<tr>
<td>d. Mathematics</td>
<td>Provides accurate explanations of information presented in mathematical forms. Makes appropriate inferences based on that information. For example, accurately explain the trend data shown in a graph and makes reasonable predictions regarding what the data suggest about future events.</td>
<td>Provides accurate explanations of information presented in mathematical forms. For instance, accurately explains the trend data shown in a graph.</td>
<td>Provides somewhat accurate explanations of information presented in mathematical forms, but occasionally makes minor errors related to computations or units. For instance, accurately explains the trend data shown in a graph, but may miscalculate the slope of the trend line.</td>
</tr>
<tr>
<td>e. Spatial Reasoning Skills</td>
<td>Application / 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 deep and thoughtful judgments, drawing insightful, carefully qualified conclusions from this work.</td>
<td>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 deep and thoughtful judgments, drawing insightful, carefully qualified conclusions from this work.</td>
<td>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 deep and thoughtful judgments, drawing insightful, carefully qualified conclusions from this work.</td>
</tr>
<tr>
<td>8. Graduates will be able</td>
<td>Propose 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.</td>
<td>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.</td>
<td>Proposes one solution/hypothesis that is &quot;off the shelf&quot; rather than individually designed to address the specific contextual factors of the problem.</td>
</tr>
<tr>
<td>9. Graduates will be able</td>
<td>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).</td>
<td>Specific position (perspective, thesis/hypothesis) takes into account the complexities of an issue. Others’ points of view are acknowledged within position (perspective, thesis/hypothesis).</td>
<td>Specific position (perspective, thesis/hypothesis) acknowledges different sides of an issue.</td>
</tr>
<tr>
<td>10. Graduates will be able</td>
<td>Communication Skills</td>
<td>Communication Skills</td>
<td></td>
</tr>
<tr>
<td>VALUE category</td>
<td>Capstone</td>
<td>Milestone</td>
<td>Benchmark</td>
</tr>
<tr>
<td>----------------</td>
<td>----------</td>
<td>-----------</td>
<td>-----------</td>
</tr>
<tr>
<td>11. Graduates will be able to evaluate critically fundamental Earth science: a. Literature, and b. Spatial data (e.g., photographs, maps, remotely sensed images.)</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Evidence</td>
<td>Information is taken from source(s) with enough interpretation/evaluation to develop a comprehensive analysis or synthesis. Viewpoints of experts are questioned thoroughly.</td>
<td>Information is taken from source(s) with enough interpretation/evaluation to develop a coherent analysis or synthesis. Viewpoints of experts are subject to questioning.</td>
<td>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.</td>
</tr>
<tr>
<td>Selecting and using information to investigate a point of view or conclusion</td>
<td>Integrated Communication</td>
<td>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.</td>
<td>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.</td>
</tr>
<tr>
<td>12. Graduates will be able to present, both formally and extemporaneously, geological information clearly in: b. Written form, b. Graphically, and b. Orally.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree-Level Learning Outcomes</td>
<td>Component Pieces of these Learning Goals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------------</td>
<td>------------------------------------------</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 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.
<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Credits</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOL 101</td>
<td>Introduction to the Earth Science</td>
<td>3</td>
<td>GEOL 101 Introduction to the Earth Science</td>
</tr>
<tr>
<td>GEOL 103</td>
<td>Geology Fundamentals Lab</td>
<td>3</td>
<td>GEOL 103 Geology Fundamentals Lab</td>
</tr>
<tr>
<td>GEOL 360</td>
<td>Intro Field Methods</td>
<td>2</td>
<td>GEOL 360 Intro Field Methods</td>
</tr>
<tr>
<td>GEOL 370</td>
<td>Study Abroad</td>
<td>2</td>
<td>GEOL 370 Study Abroad</td>
</tr>
<tr>
<td>GEOL 304</td>
<td>Enriched Mineralogy (F)</td>
<td>3</td>
<td>GEOL 304 Enriched Mineralogy (F)</td>
</tr>
<tr>
<td>GEOL 312</td>
<td>Optical Mineralogy (F)</td>
<td>1</td>
<td>GEOL 312 Optical Mineralogy (F)</td>
</tr>
<tr>
<td>GEOL 331</td>
<td>Sediment/Stratigraphy</td>
<td>4</td>
<td>GEOL 331 Sediment/Stratigraphy</td>
</tr>
<tr>
<td>GEOL 513</td>
<td>Petrology</td>
<td>3</td>
<td>GEOL 513 Petrology</td>
</tr>
<tr>
<td>GEOL 562</td>
<td>Structural Geology</td>
<td>3</td>
<td>GEOL 562 Structural Geology</td>
</tr>
<tr>
<td>GEOL 561</td>
<td>Field Camp II</td>
<td>3</td>
<td>GEOL 561 Field Camp II</td>
</tr>
<tr>
<td>GEOL 316</td>
<td>Paleontology</td>
<td>1</td>
<td>GEOL 316 Paleontology</td>
</tr>
</tbody>
</table>

**ACTIVITIES**

- **Introduction to the Earth Science**: Yes - GE
- **Geology Fundamentals Lab**: Yes
- **Intro Field Methods**: Yes
- **Study Abroad**: Yes
- **Enriched Mineralogy (F)**: Yes
- **Optical Mineralogy (F)**: Yes
- **Sediment/Stratigraphy**: Enriched
- **Petrology**: Enriched
- **Field Camp II**: Enriched
- **Paleontology**: Yes

**Skills**

- **Problem-Solving**: Yes
- **Critical Thinking**: Yes
- **Scientific Communication**: Yes

**Knowledge**

- **Fundamental Earth Systems, Cycles, and Processes**: Yes
- **Understanding Earth's Geologic Processes**: Yes
- **Classifying the Earth through time**: Yes
- **Forming major rock and mineral formation**: Yes
- **Describing and interpreting environmental data**: Yes
- **Differentiating between natural and human roles in communities**: Yes
- **Applying the impact of these processes on human lives and societies**: Yes

**Group Projects**

- **Oral Presentation**: Yes
- **Writing Assignment**: Yes
- **Computer Methods**: Yes
- **Writing Assignment**: Yes
- **Semi-Required Courses (need to take at least one from each category)**

**Life**

- **Laboratory**: Yes
- **Field**: Yes
- **Elective**: Yes
- **Camp**: Yes
- **Service-Learning**: Yes
- **Summer**: Yes
- **Capstone**: Yes

**Rocks**

- **Geologic**: Yes
- **Mineral**: Yes
- **Organic**: Yes
- **Environment**: Yes
- **Human**: Yes
- **Other**: Yes

**Semi-Required Courses (need to take at least one from each category)**

- **Introduction to the Earth Science**: Yes
- **Geology Fundamentals Lab**: Yes
- **Intro Field Methods**: Yes
- **Study Abroad**: Yes
- **Enriched Mineralogy (F)**: Yes
- **Optical Mineralogy (F)**: Yes
- **Sediment/Stratigraphy**: Enriched
- **Petrology**: Enriched
- **Field Camp II**: Enriched
- **Paleontology**: Yes

**Skills**

- **Problem-Solving**: Yes
- **Critical Thinking**: Yes
- **Scientific Communication**: Yes

**Knowledge**

- **Fundamental Earth Systems, Cycles, and Processes**: Yes
- **Understanding Earth's Geologic Processes**: Yes
- **Classifying the Earth through time**: Yes
- **Forming major rock and mineral formation**: Yes
- **Describing and interpreting environmental data**: Yes
- **Differentiating between natural and human roles in communities**: Yes
- **Applying the impact of these processes on human lives and societies**: Yes

**Group Projects**

- **Oral Presentation**: Yes
- **Writing Assignment**: Yes
- **Computer Methods**: Yes
- **Writing Assignment**: Yes
- **Semi-Required Courses (need to take at least one from each category)**

**Life**

- **Laboratory**: Yes
- **Field**: Yes
- **Elective**: Yes
- **Camp**: Yes
- **Service-Learning**: Yes
- **Summer**: Yes
- **Capstone**: Yes

**Rocks**

- **Geologic**: Yes
- **Mineral**: Yes
- **Organic**: Yes
- **Environment**: Yes
- **Human**: Yes
- **Other**: Yes
<table>
<thead>
<tr>
<th></th>
<th>Midterm LO1 %</th>
<th>Midterm LO3 %</th>
<th>Final LO1 %</th>
<th>Final LO3 %</th>
<th>Average LO1 %</th>
<th>Average LO3 %</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>All Students</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basic</td>
<td>80%</td>
<td>80%</td>
<td>21%</td>
<td>74%</td>
<td>50%</td>
<td>77%</td>
</tr>
<tr>
<td>Failed to attain</td>
<td>17%</td>
<td>17%</td>
<td>79%</td>
<td>26%</td>
<td>48%</td>
<td>22%</td>
</tr>
<tr>
<td><strong>Majors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basic</td>
<td>85%</td>
<td>81%</td>
<td>19%</td>
<td>77%</td>
<td>52%</td>
<td>79%</td>
</tr>
<tr>
<td>Failed to attain</td>
<td>15%</td>
<td>19%</td>
<td>81%</td>
<td>23%</td>
<td>48%</td>
<td>21%</td>
</tr>
<tr>
<td><strong>Non-Majors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basic</td>
<td>83%</td>
<td>83%</td>
<td>17%</td>
<td>67%</td>
<td>50%</td>
<td>75%</td>
</tr>
<tr>
<td>Failed to attain</td>
<td>17%</td>
<td>17%</td>
<td>83%</td>
<td>33%</td>
<td>50%</td>
<td>25%</td>
</tr>
<tr>
<td><strong>Graduate students</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basic</td>
<td>50%</td>
<td>100%</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
<td>75%</td>
</tr>
<tr>
<td>Failed to attain</td>
<td>50%</td>
<td>0%</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
<td>25%</td>
</tr>
<tr>
<td>Capstone</td>
<td>Milestone 2</td>
<td>Milestone 1</td>
<td>Benchmark</td>
<td>Not at Benchmark</td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>-------------</td>
<td>-------------</td>
<td>-----------</td>
<td>-----------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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.  
   - Not Applicable

### 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%
<table>
<thead>
<tr>
<th>Capstone</th>
<th>Milestone 2</th>
<th>Milestone 1</th>
<th>Benchmark</th>
<th>Not at Benchmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

8. Graduates will be able to 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%

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%