

# Department of Earth and Space Sciences, Lamar University

## Assessment Results for the Earth Science Program

2023-2024

### Stage 1 Plan

#### Department Learning Outcome

The primary mission of the Geology Program is to provide students with an in-depth education in the areas of earth science, as well as other areas associated with the geosciences.

#### Program Goals

Goal The Goals of the Earth Science B.S degree is to give majors a solid foundation in the Earth Sciences so that they understand the ongoing processes operating in the Lithosphere, Hydrosphere, and Atmosphere of the Earth. This will enable them to go on for advanced training in graduate school or in industry.

#### 1.1 Student Learning Outcomes Outcome 1 Critical Thinking

Solving Earth Science problems using basic scientific principles in the laboratory and elsewhere, Undergraduate Earth Science majors will develop proficiency in critical thinking as demonstrated by the use of the scientific principles while solving Earth Science problems using various techniques such as map reading, using principles of chemistry and physics as related to the atmosphere, hydrosphere, and lithosphere, and identification of minerals. The rationale behind this outcome is to determine if our students have the skill set needed to critically evaluate earth science data and solve earth science problems.

##### 1.1.1 Assessment

##### Assessing Outcome 1

Each year we will use input from the following courses if they are taught that year: GEOL 2471 (Mineralogy), Geol 3390 (Environmental Geography and Geology), Geol 4360 (Field Geology of Texas), Geol 4370 (Meteorology), and Geology 4380 (Oceanography) to assess the students' geologic problem solving skills (including critical thinking) in lab and elsewhere using the various techniques and data sets mentioned in Outcome 1.

#### METHODOLOGY\*

Participating faculty members teaching the above courses will be asked to complete the attached rubric at the end of their courses. These skills are:

1. Explanation of problem
2. Graphical representation and solutions of earth science data and problems
3. Mathematical analysis and solution of earth science problems
4. Use of computers in the analysis, display, and solution of geologic problems
5. Summary and conclusions

Results from each class will be changed to the percentage of students falling into each quality category (Very Poor, Poor, Fair, Good, Exemplary). These percentages will be averaged for each skill and each category to determine the total percentage scores for each skill and quality category.

### **1.1.2 Benchmark Expectation**

The target is an expectation of 75% Fair or better in each listed category. This would occur for example with a distribution of 5% Very Poor, 20% Poor, 40% Fair, 25% Good, and 10% Exemplary. The rationale behind this is that if 70% of the students are considered Fair to Exemplary in the given skills we are assessing in this outcome, then the course content and grading is sufficiently rigorous and most of the students are learning the skills that are expected of them. If the score for any of the categorized skills fall below the target, then the faculty know that more effort or different teaching methods need to be employed in the failed category to bring the score above the targeted expectation. If the score for any of the categorized skills is at or near 100%, then more rigorous course content or grading may need to be employed in that skill area.

The department also plans to do a student survey of giving the students the same skill sets and asking them to evaluate how they think they did on each of those skills. The data will be averaged and compared with the instructor values.

Finally, the department is planning on doing an exit interview for graduating seniors.

### **1.1.3 Data Results**

All Outcome 1 skills met the target of 75% Fair or better for the average for all courses taught.

Geol 4360 (Field Geology of Texas), Geol 4370 (Meteorology), and Geology 4380 (Oceanography) were not assessed because they were not taught due to staff vacancy. The vacancies have been filled and it will be assessed next round.

Geol 2471 Mineralogy met identification of hand sample which it had not last round of assessment. However, it did not meet use of mathematics skills with a total of 50%. As there were only 2 earth science majors in the class, one having a bad score caused the failure.

Because the Assessment Plan for Geology Program was not completed before the end of the spring 2024 semester, we were not able to get most of the students to fill out the Outcome rubric for the semester in this report. This change will be fully implemented in the 2024-2025 academic year.

### **1.1.4 Actions**

Previous actions implemented for identification of handsamples seem to be working for both Geol 2417 Mineralogy and Geol 3450. We are still evaluating this change.

The lack of data for Geol 4360 (Field Geology of Texas), Geol 4370 (Meteorology), and Geology 4380 (Oceanography) make it difficult to make meaningful conclusions.

## **1.2 Student Learning Outcome Outcome 2 Geology field skills**

Solving Earth Science problems using basic earth sciences principles in the field. Undergraduate Geology students will develop field skills as demonstrated by the ability to use geologic and topographic maps and gather data. The rationale for this outcome is to determine if our students have the field skills necessary to gather geologic and other data, record this data, analyze it, and generate an interpretation.

### **1.2.1 Assessment**

#### **Assessing Outcome 2**

Each year we will use input from the following courses if they are taught that year: GEOL 4101 (Physical Geography and Geomorphology lab), GEOL 4360 (Field Geology of Texas), Geol 4370 (Meteorology), as a forum to evaluate the students' field geology skills.

#### **METHODOLOGY\***

Participating faculty members teaching the above courses will be asked to complete the attached rubric at the end of their courses. The skills are:

1. Field recognition of geologic landforms, structures, and materials
2. Ability to employ appropriate field techniques of data gathering
3. Ability to record field observations in the field notebook in the appropriate format
4. Ability to accurately record field data on a computer or other field equipment

Results from each class will be changed to the percentage of students falling into each quality category (Very Poor, Poor, Fair, Good, Exemplary). These percentages will be averaged for each skill and each category to determine the total percentage scores for each skill and quality category. See the measurement rubric and description of the measurement process for Outcome 2 in the Project Attachments.

### **1.2.2 Benchmark Expectation**

The target is an expectation of 75% Fair or better in each listed category. This would occur for example with a distribution of 5% Very Poor, 20% Poor, 40% Fair, 25% Good, and 10% Exemplary. The rationale behind this is that if 75% of the students are considered Fair to Exemplary in the given skills we are assessing in this outcome, then the course content and grading is sufficiently rigorous and most of the students are learning the skills that are expected of them. If the score for any of the categorized skills fall below the target, then the faculty know that more effort or different teaching methods need to be employed in the failed category to bring the score above the targeted expectation. If the score for any of the categorized skills is at or near 100%, then more rigorous course content or grading may need to be employed in that skill area.

The department also plans to do a student survey of giving the students the same skill sets and asking them to evaluate how they think they did on each of those skills. The data will be averaged and compared with the instructor values.

Finally, the department is planning on doing an exit interview for graduating seniors.

### **1.2.3 Data Results**

There are no results for this outcome this year because Geol 4101 (Physical Geography and Geomorphology Lab, Geol 4360 (Field Geology of Texas), and Geol 4370 (Meteorology) were not taught due to faculty vacancies. The vacancies have since been filled.

### **1.2.4 Actions**

There are no actions to be taken because Geol 4101 (Physical Geography and Geomorphology Lab, Geol 4360 (Field Geology of Texas), and Geol 4370 (Meteorology) were not taught.

### **1.3 Student Learning Outcomes Outcome 3 Oral and Written Communication**

Undergraduate Earth Science students will develop proficiency in oral and written communication of scientific thinking applied to geologic concepts as demonstrated through oral presentations and technical writings. The rationale for this outcome is to determine if our students have the ability to effectively communicate their geologic research to other geologists, as well as non-specialists, orally and in writing.

#### **1.3.1 Assessment**

Assessing Outcome 2

Each year we will use input from the following courses if they are taught that year: GEOL 2377 (Physical Geography & Geomorphology), Geol 3390 (Environmental Geography and Geology), GEOL 4360 (Field Geology of Texas), as a forum to evaluate the students' communication skills. These percentages will be averaged for each skill and each category to determine the total percentage scores for each skill and quality category.

#### **METHODOLOGY\***

Participating faculty members teaching the above courses will be asked to complete the attached rubric at the end of their courses. The skills are:

1. Organization and clarity of lab assignments and other expectations of lab students
2. Organization and neatness of the presentation, and/or software skills
3. Writing skills (clarity, sentence structure, spelling, reference citations)
4. Ability to communicate orally (diction, elocution, and body language)
5. Ability to record data in a laboratory or field notebook in the appropriate format

#### **1.3.2 Benchmark Expectation**

Results from each class will be changed to the percentage of students falling into each quality category (Very Poor, Poor, Fair, Good, Exemplary). These percentages will be averaged for each skill and each category to determine the total percentage scores for each skill and quality category. The target is an expectation of 75% Fair or better in each listed skill category for the course rubric. This will also be the target for the undergraduate researcher rubric. This would occur for example with a normal distribution of 5% Very Poor, 20% Poor, 40% Fair, 25% Good, and 10% Exemplary. The rationale behind this is that if 75% of the students are considered Fair to Exemplary in the given skills we are assessing in this outcome, then the course content and grading is sufficiently rigorous and most of the students are learning the skills that are expected of them. If the score for any of the categorized skills fall below the target, then the faculty know that more effort or different teaching methods need to be employed in the failed category to bring the score above the targeted expectation. If the score for any of the categorized skills is at or near 100%, then more rigorous course content or grading may need to be employed in that skill area. The same rationale is used for the second measure of undergraduate researchers, but the implications are for the faculty and their mentoring of the students.

The department also plans to do a student survey of giving the students the same skill sets and asking them to evaluate how they think they did on each of those skills. The data will be averaged and compared with the instructor values.

Finally, the department is planning on doing an exit interview for graduating seniors.

#### **1.3.3 Data Results**

Only one of the classes, GEOL 2377 (Physical Geography & Geomorphology), was taught this year. All of the outcome skills that were assessed in this class met the 75% Fine or better goal.

Geol 3390 (Environmental Geography and Geology) and GEOL 4360 (Field Geology of Texas) were not taught this year due to staff vacancy, so there is no assessment for them.

### 1.3.4 Actions

Because GEOL 2377 (Physical Geography & Geomorphology) was the only class taught this year, it is difficult to make any action plans.

Enclosures: Rubrics for Outcomes 1,2, and 3

## Outcome 1

### 1.a State the Outcome:

Solving geologic problems using basic geologic principles in the laboratory and elsewhere. Undergraduate Geology students will develop proficiency in critical thinking as demonstrated by the use of geologic principles while solving geologic problems using various techniques such as microscopy, mathematics, graphical representations, computational interpretations, and identification of minerals, rocks, and fossils. The rationale behind this outcome is to determine if our students have the skill set needed to critically evaluate geologic data and solve geologic problems.

### 1.b. Means of Assessment for Outcome 1:

Each year we will use input from the following courses if they are taught that year: GEOL 2471 (Mineralogy), Geol 3390 (Environmental Geography and Geology), Geol 4360 (Field Geology of Texas), Geol 4370 (Meteorology), and Geology 4380 (Oceanography) to assess the students' geologic problem solving skills (including critical thinking) in lab and elsewhere using the various techniques and data sets mentioned in Outcome 1.

Participating faculty members teaching the above courses will be asked to complete the following rubric at the end of their courses. Results from each class will be changed to the percentage of students falling into each quality category (Very Poor to Exemplary). These percentages will be averaged for each skill and each category to determine the total percentage scores for each skill and quality category.

Skill	Very Poor	Poor	Fair	Good	Exemplary
Explanation of problem					
Graphical representation and solutions of earth science data and problems					
Use of mathematics in the analysis and solution of earth science problems.					
Use of computers in the analysis, display, and solution of geologic data and problems					

Summary and conclusions					
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**How will results be reviewed? (update if subsequent review occurs):**

The summaries of assessments from the above individual courses and the totals will be combined and discussed in SACS-specific terms in meetings with faculty. Any action plans needed to improve performance will also be discussed in these meetings.

**1.c. Decision rule to be used to determine successful performance for Outcome 1:**

The target is an expectation of 75% Fair or better for each listed skill. This would occur for example with a distribution of 5% Very Poor, 20% Poor, 40% Fair, 25% Good, and 10% Exemplary.

## Outcome 2

**2.a State the Outcome:**

Solving Earth Science problems using basic scientific principles in the laboratory and elsewhere, Undergraduate Earth Science majors will develop proficiency in critical thinking as demonstrated by the use of the scientific principles while solving Earth Science problems using various techniques such as map reading, using principles of chemistry and physics as related to the atmosphere, hydrosphere, and lithosphere, and identification of minerals. The rationale behind this outcome is to determine if our students have the skill set needed to critically evaluate earth science data and solve earth science problems.

**2.b. Means of Assessment for Outcome 2:**

Each year we will use input from the following courses if they are taught that year: GEOL 4101 (Physical Geography and Geomorphology lab), GEOL 4360 (Field Geology of Texas), Geol 4370 (Meteorology), as a forum to evaluate the students' field geology skills.

Participating faculty members teaching the above courses will be asked to complete the following rubric at the end of their courses. Results from each class will be changed to the percentage of students falling into each quality category (Very Poor to Exemplary). These percentages will be averaged for each skill and each category to determine the total percentage scores for each skill and quality category.

Skill	Very Poor	Poor	Fair	Good	Exemplary
Field recognition of geologic landforms, structures, and materials					
Ability to employ appropriate field techniques of data gathering					
Ability to record field observations in a field notebook in the appropriate format					

Ability to accurately record field data on a computer or other field equipment					
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**How will results be reviewed? (update if subsequent review occurs):**

The summaries of assessments from the above individual courses and the totals will be combined and discussed in SACS-specific terms in meetings with faculty. Any action plans needed to improve performance will also be discussed in these meetings.

**2.c. Decision rule to be used to determine successful performance for Outcome 2:**

The target is an expectation of 75% Fair or better in each listed skill category. This would occur for example with a distribution of 5% Very Poor, 20% Poor, 40% Fair, 25% Good, and 10% Exemplary.

## Outcome 3

**3.a State the Outcome:**

Undergraduate Earth Science students will develop proficiency in oral and written communication of scientific thinking applied to geologic concepts as demonstrated through oral presentations and technical writings. The rationale for this outcome is to determine if our students have the ability to effectively communicate their geologic research to other Earth Scientists, as well as non-specialists, orally and in writing.

**3.b.i. First Means of Assessment for Outcome 3:**

Each year we will use input from the following courses if they are taught that year: GEOL 2377 (Physical Geography & Geomorphology Lab), Geol 3390 (Environmental Geography and Geology), GEOL 4360 (Field Geology of Texas), as a forum to evaluate the students' communication skills. These percentages will be averaged for each skill and each category to determine the total percentage scores for each skill and quality category.

Participating faculty members teaching the above courses will be asked to complete the following rubric at the end of their courses. Results from each class will be changed to the percentage of students falling into each quality category (Very Poor to Exemplary). These percentages will be averaged for each skill and each category to determine the total percentage scores for each skill and quality category.

Skill	Very Poor	Poor	Fair	Good	Exemplary
Organization and clarity of lab assignments and other expectations of lab students					
Organization and neatness of the presentation, including the use of computer software in the presentation					
Writing Skills (clarity, sentence structure, spelling, grammar, reference citation)					
Ability to communicate orally (diction, elocution, body language, graphics)					

Ability to record data in a laboratory or field notebook in the appropriate format					
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### **3.b.ii. Second Means of Assessment for Outcome 3:**

A second measure of this outcome will come from faculty assessments of their student researchers. Faculty mentors will therefore be asked to complete the above rubric for their students at the end of each semester. Each skill from these individual student rubrics will then be summarized like it was a single course, then averaged with the skills of the individual courses mentioned previously to assess Outcome 3.

#### **How will results be reviewed? (update if subsequent review occurs):**

The summaries of assessments from the above individual courses and the totals will be combined and discussed in SACS-specific terms in meetings with faculty. Any action plans needed to improve performance will also be discussed in these meetings.

### **3.c. Decision rule to be used to determine successful performance for Outcome 3:**

The target is an expectation of 75% Fair or better in each listed skill category. This would occur for example with a distribution of 5% Very Poor, 20% Poor, 40% Fair, 25% Good, and 10% Exemplary.

Tables for assessment outcomes for Outcomes 1, 2, and 3 spreadsheet

Table of results – earth science