

# Department of Earth and Space Sciences, Lamar University

## Assessment Results for the Geology 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 geology, as well as other areas associated with the geosciences.

#### Program Goals

Goal The goal of the Geology Program is to give students the skills they need to obtain employment in the field of the geosciences after they graduate with their B.S. degree, or to continue onto a graduate program in the geosciences.

#### 1.1 Student Learning Outcomes Outcome 1

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.

##### 1.1.1 Assessment

##### Assessing Outcome 1

Each year we will use input from the following courses if they are taught that year: GEOL 2471 (Mineralogy), GEOL 3420 (Structural Geology), GEOL 3450 (Petrology), GEOL 4330 (Geophysics), GEOL 4101 (Geophysics Lab), GEOL 4410 (Stratigraphy and Sedimentation), and GEOL 4420 (Paleontology) 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. Identification of hand specimens of minerals, rocks and fossils
2. Graphical representation and solutions of geologic data and problems
3. Mathematical analysis and solution of geologic problems
4. Use of computers in the analysis, display, and solution of geologic problems
5. Ability to record data in a laboratory notebook in the appropriate format

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. See the measurement rubric and description of the measurement process for Outcome 1 in the Project Attachments. 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 rubric 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.

### **1.1.2 Benchmark Expectation**

The target is an expectation of 75% Fair or better in each skill category when averaged for all courses assessed for this outcome.

### **1.1.3 Data Results**

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

Geol 3420 Structural Geology was not assessed because it was not taught due to staff vacancy. The vacancy has been filled and it will be assessed next round.

Geol 2471 Mineralogy met identification of hand samples which it had not last round of assessment. However, it did not meet use of graphical methods and use of mathematics skills.

Geol 3450 Petrology did not meet the ability to record data in a laboratory notebook skill.

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. Only a few students were available to do so. They are listed in the Outcome 1 percentages as an addition to values in parentheses. This change will be fully implemented in the 2024-2025 academic year.

### **1.1.4 Actions**

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

We will be meeting to discuss ways in which Geol 2471 can better meet requirements for use of graphical skills and use of mathematical skills this year. We will also discuss ways to improve the ability to record data in a laboratory notebook.

The difficulty for Geol 4420 Paleontology students identifying fossils appears to have been addressed adequately by the new faculty addition.

Will consider raising the target to 80% Fair or better in each listed skill in the 2024-2025 assessment plan.

## **1.2 Student Learning Outcomes Outcome 2**

Solving geologic problems using basic geologic principles in the field. Undergraduate Geology students will develop field skills as demonstrated by the ability to perform geologic mapping and data gathering. The rationale for this outcome is to determine if our students have the field skills necessary to gather geologic data, record this data, analyze it, and generate an interpretation.

### **1.2.1 Assessing Outcome 2**

Each year we will use input from the following courses if they are taught that year: GEOL 3420 (Structural Geology), GEOL 3600 (Summer Field Camp), GEOL 4101 (Physical Geography & Geomorphology Lab), GEOL 4101 (Geophysics Lab), and GEOL 4410 (Stratigraphy and Sedimentation) 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 material
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 construct geologic maps, cross sections, and stratigraphic sections
5. 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 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. See the measurement rubric and description of the measurement process for Outcome 2 in the Project Attachments. 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.

### **1.2.2 Benchmark Expectation**

The target is an expectation of 75% Fair or better in each skill category when averaged for all courses assessed for this outcome.

### **1.2.3 Data Results**

All Outcome 2 skills met the target of 75% Fair or better for the average for courses taught.

Geol 3420 Structural Geology, Geol 3600 Summer Field Camp, and Geol 4101 Physical Geography and Geomorphology Lab were not assessed because they were not taught due to staff vacancy. The vacancy has been filled and will be assessed next round.

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.

**1.2.4 Actions** The average of all courses taught showed that for all the skills assessed 75% of more of the students scored Fair or better, so no improvement plans are needed.

Will consider raising the target to 80% Fair or better in each listed skill in the 2024-2025 assessment plan.

### **1.3 Student Learning Outcomes Outcome 3**

Undergraduate Geology 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 Assessing Outcome 3**

Each year we will use input from the following courses if they are taught that year: GEOL 4101 (Physical Geography & Geomorphology Lab), GEOL 3420 (Structural Geology), GEOL 3450 (Petrology), GEOL 4420 (Paleontology), GEOL 4101 (Geophysics Lab) and GEOL 4301 (Geology Seminar) as a forum to evaluate the students' communication skills. A second measure of this outcome will come from faculty assessments of their student researchers.

#### **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. Technical correctness of graphics, maps, equations, notation, and symbols
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
5. Ability to record data in a laboratory or field notebook in the appropriate format
6. Technical and scientific merit of conclusions and/or results

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. The student researchers often write abstracts for professional meetings, co-author other publications, and present their research orally or as posters at national and local meetings. Faculty mentors will therefore be asked to complete the attached 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. See the measurement rubric and description of the measurement process for Outcome 3 in the Project Attachments. 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.

### **1.3.2. Benchmark Expectation**

The target is an expectation of 75% Fair or better in each skill category when averaged for all courses assessed for this outcome.

### **1.3.3. Data Results**

The average of all courses assessed showed that for all the skills assessed 75% or more of the students scored Fair or better for all the skills assessed except for Ability to Record Data in a Laboratory Notebook. It had an average of all classes for the skill of 64%.

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.

### **1.3.4 Actions**

No action plan is required for the skills in Outcome 3 for this year's assessment.

We will meet and discuss ways in which we can improve the skill Ability to record data in a laboratory notebook as this did not meet the target of 75% on all courses.

Will consider raising the target to 80% Fair or better in each listed skill in the 2024-2025 assessment plan except the skill Ability to record data in a laboratory notebook.

Attachments: Outcome 1, 2, and 3 Rubrics

### 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 3420 (Structural Geology) , GEOL 3450 (Petrology) , GEOL 4330 (Geophysics), GEOL 4101 (Geophysics Lab), GEOL 4410 (Stratigraphy and Sedimentation), and GEOL 4420 (Paleontology) 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
Identification of hand specimens of minerals, rocks, and fossils					
Use of graphical methods to display and solve geologic data and problems					
Use of mathematics in the analysis and solution of geologic problems.					
Use of computers in the analysis, display, and solution of geologic data and problems					
Ability to record data in a laboratory notebook in the appropriate format					

### 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 geologic problems using basic geologic principles in the field. Undergraduate Geology students will develop field skills as demonstrated by the ability to perform geologic mapping and data gathering. The rationale for this outcome is to determine if our students have the field skills necessary to gather geologic data, record this data, analyze it, and generate an interpretation.

### 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 3420 (Structural Geology), GEOL 3600 (Summer Field Camp), GEOL 4101 (Physical Geography & Geomorphology Lab), GEOL 4101 (Geophysics Lab), and GEOL 4410 (Stratigraphy and Sedimentation) 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 construct geologic maps, cross sections, and stratigraphic sections using standard geologic symbols					
Ability to accurately record field data on a computer or other field equipment					

**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 Geology 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.

### **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 3420 (Structural Geology), GEOL 3450 (Petrology), GEOL 4420 (Paleontology), GEOL 4101 (Geophysics Lab) and GEOL 4301 (Geology Seminar) as a forum to evaluate the students' communication skills. A second measure of this outcome will come from faculty assessments of their student researchers.

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.

<b>Skill</b>	<b>Very Poor</b>	<b>Poor</b>	<b>Fair</b>	<b>Good</b>	<b>Exemplary</b>
Technical correctness of graphics, maps, equations, notation, and symbols, including the use of computers in the generation of these products					
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					
Technical and scientific merit of conclusions and/or results					

### **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.

Attachments: spreadsheet with outcome results for Outcome 1, 2, 3

table of results - geology