

SAN DIEGO  
MESA COLLEGE



# Program Review

**Summary and Reflections with Unit Goals, Action Plans, and Updates**

Instructional Program - Geology (GEOL)

### Executive Summary

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**Describe the successes and challenges your unit has faced since the last comprehensive review.**

**If applicable, describe any major curricular or service changes your unit has engaged in and the impact of those changes since the last comprehensive review.**

The Geology program has continued to grow and adapt in the post-pandemic environment. General Education courses in the program have had success in the on-line environment (see Geology Program Review from 2020–2021 for more information). Students are beginning to come back to campus, but successful online courses continue to be popular, and a variety of modalities have been made available to students including fully on campus, hybrid, fully online, and 10-week online sessions. All Geology labs are back on campus in fully face-to-face formats. Oceanography has emerged in popularity as part of the overall Geology program. Oceanography is combined with Geology for this review because both disciplines serve similar student goals and faculty who teach Geology meet minimum qualifications to teach Oceanography and vice-versa. Two of our adjunct faculty teach both Oceanography and Geology classes. Oceanography is considered one of the Earth Sciences of which Geology is also a discipline.

Faculty from the Geology/Oceanography program participated in the Scripps Institution of Oceanography Geosciences Education and Opportunities Program, “Scripps-GEO.” The objectives of this program are (1) to strengthen faculty, institutional and public partnerships in geoscience workforce applications in our region, (2) initiate student-focused project components, specifically career-focused seminar courses and academic-year internship opportunities at Scripps, targeted at recruiting students early in their undergraduate education, i.e. first or second year students, and (3) critically evaluate our results and identify strategies that are most effective in preparing, advancing and retaining diverse students in degrees and careers in the geosciences. We are very proud to say that several of our program students were selected as Scripps-GEO scholars and successfully presented their research at the Mesa College Research Conference (MCRC) in 2022.

The STEM Lecture Series, led by our Geology faculty Don Barrie, has continued with both online and in person events by Physics Faculty member, James Hinton. Faculty continue to collaborate closely with the geoscience departments at SDSU and UCSD. The STEM Lecture Series occasionally hosts speakers from both institutions. Mesa Faculty were approached by Scripps Institute of Oceanography to be involved with their GEO Paths Internship for Spring 2024. This paid internship would allow Mesa students to complete research projects with Scripps faculty while learning about Geology career paths.

Faculty have been making the return to campus worthwhile to students through increased hands on and interactive learning. Students have been making regular visits to the Geogarden for instruction and to see the sedimentary rocks exposed south of campus, near A-100 Bldg. Being back on campus has also seen Geology Faculty Don Barrie on the quad doing his explosive liquid nitrogen volcano experiment. The AR Sandbox is nearly complete. The AR Sandbox, funded by the HSI STEM E3 grant, has the capability to show students real-time topographic images overlaid on sand that they are able to manipulate (see image). The AR Sandbox has the capability to greatly improve topographic map instruction, which is both difficult for students and essential to understanding geoscience phenomena. Also, in an effort to improve on campus learning and increase student engagement, faculty have increased the use of binoculars and polarizing microscopes in the lab. As part of the pandemic, many high quality rock/mineral sets were purchased for student at-home lab kits. These same kits are now used by students in lectures where each student has their own kit to explore rocks and minerals. Finally, Mesa College’s extensive sand collection has been an integral part of the GEOL 111 course, The Earth Through Time.

## Summary and Reflection

One of the greatest curricular improvements in the past year has been the return to field trips. Most San Diego students have not had access to geoscience education in high school and many are unaware of the rocks and formations around them. Geoscience faculty regularly provide field trips to Tourmaline Beach & Mt. Soledad, San Diego Natural History Museum, Torrey Pines, Lake Morena, Eagle/High Peak Gold Mine, Julian, Palm Springs Aerial Tramway & San Andreas Fault visit and Salton Sea & Mecca Hills (just north of Salton Sea) and the Anza-Borrego Desert. Geoscience faculty, led by Don Barrie, took 10 students on a Summer Field Experience this summer as part of a grant funded by the National Science Foundation that was won by Mesa College. Students camped out for this 10-day research field trip. Applications for the trip exceeded the number of spots available. Students used words like Amazed, Grateful, Educated, Happy, Inspired and Fascinated when describing the event.

Here are some other student comments:

"I would absolutely recommend this trip to other students. It was a wonderful experience that allowed me to meet many amazing people and learn awesome things."

"One of the things that this experience really helped me is being able to have the opportunity to have experience in the career that I plan to have, which is Geology. This experience helped me open my eyes more and be completely convinced that this is what I want for my career."

"I really enjoyed being about to meet other likeminded students from Mesa. You get all sorts of people at community college and sometimes I forget that I'm not alone in my pursuit of a highly academic career. It was good to talk to others on the same path and develop relationships with professors and experienced students who could help guide me and give hints as to where my next opportunity might be."

"I would absolutely recommend this trip to others. The people in the group were wonderful. Field instructions was the most impactful for me. Things out in nature are not at neat and easily classified as what we find in text book or lab."

Students were given an opportunity to continue their work with a research grant in the Spring 2024 semester and response has been greater than we expected.

In terms of Curriculum, the GEOL 111 course completed a six-year review as part of which the course title and description were updated. The course title and description were written to make the course subject matter clearer to students and to generate interest. GEOL 120 and GEOL 104 completed 6-year reviews as well and basic skills courses were removed from the GEOL 120 course due to AB1705.

**If applicable, describe the impact of any new resources (human, fiscal, etc) on the unit and/or action plan implementation.**

**If you assess OUTCOMES, please confirm that the outcomes have been reviewed for accuracy. If you do not assess Outcomes, skip this question.**

Reviewed & Accurate

**Related Documents for Charts and Graphs**

[AR Sandbox Image.docx](#)

**Executive Summary Complete**

Yes

## Summary and Reflection

### Data Reflection

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#### Trends observed in program/service area's data.

\*\*See attachment with graphs.

Geology and Oceanography enrollment has been healthy. As discussed previously, one of the most interesting observations that we have made centers on the growing popularity of online and Oceanography courses. The following graph shows the enrollment numbers for Geology (in blue) and Oceanography (in red). From this graph, we see that the enrollment for Geology has been decreasing somewhat over the last few semesters while the enrollment of Oceanography has begun to grow. However, both enrollments as a whole (in purple) are on an upward path exceeding enrollment prior to the pandemic.

Another way to look at this data is in the following. This graph shows the growth/decline trends in enrollment with respect to Fall 2019. The black line depicts enrollment during Fall 2019. Enrollment at Mesa College (ALL MESA in blue) shows small declines since 2019 (around 20% lower). Enrollment trends in Physical Sciences as a whole (ASTR, GEOL, OCEA, PHYN, ENGE, and PHYS shown in orange) show similar trends. However, enrollment in GEOL/OCEA (in purple) appears to be returning to pre-pandemic levels.

One other interesting set of data is related to transfer. Although the majority of students who take courses in geosciences are interested in fulfilling a GE requirement, there are students who transfer into geology programs. The numbers are not large, but they are larger than one might think. Numbers from the CSU Transfer Dashboards put the numbers close to the number of students transferring into Physics programs (See Graph below). The total number of CSU transfers into Physics programs was 29 and Geology was 25. This compares with Chemistry programs with 43 students. Transfers into UC programs are smaller, but that may be an avenue for change. Geoscience programs can be an excellent way to get students new to STEM into STEM careers. Geosciences tap into students' sense of community because they involve questions and problems that are relevant to specific regions and to deeper questions about the Earth and the world around us. Geoscience courses offer an opportunity to "center" Latinx/Chicano experience in the design and implementation of curriculum and outside of the classroom activities. This may especially be relevant to LatinX students where connection to the STEM fields is best established through the lens of serving/supporting the community (Chavarria and Knox, 2019).

#### **Describe any equity gaps in the data. Are there differences and/or patterns observed by demographics (e.g. race/ethnicity, gender, age, etc.)**

Success rates in all GEOL and OCEA courses remain high with averages across the years around 80%. Spring 2022, the last semester with available data, does show a slightly lower than average success rate for GEOL (around 73%) and OCEA (around 79%). We are seeing some equity gaps in GEOL and OCEA courses according to the dashboards in terms of both ethnicity and gender (please see Row 1 in Table below). These are similar to equity gaps seen in the campus as a whole (Row 2). This is not surprising since the Geology and Oceanography courses mostly attract students interested in fulfilling a Physical Science GE requirement which is close to the composition of the student body at Mesa as a whole. One other interesting outcome in the data is that some of the equity gaps shrink or disappear for students in Online only courses (Row 3). This is hard to explain and may be due to a different demographic choosing online instruction, but it is still something to investigate further.

See attached graphs for the following:

GEOL/OCEA

MESA

OnLINE

#### **Describe the discussion(s) that took place about the unit's learning outcomes assessment data.**

Faculty report satisfaction with students' achievement of course outcomes. As discussed previously, both Oceanography and Geology courses are taught in a variety of modalities. Faculty have not noticed strong gaps in terms of learning outcomes between any of the groups. However, faculty are aware of changes in student preparation as a result of AB 1705. Only GEOL 120 had to be updated to remove advisories and none of the courses have MATH prerequisites. Faculty in both lecture and lab have reported taking opportunities to explicitly reinforce math, reading and writing skills in their courses. Geology lab faculty, for example, have discussed giving

## Summary and Reflection

students real examples using proportional thinking. Lecture faculty have given scaffolded writing assignments to strengthen students' writing skills. Although faculty have not reported deficiencies in student learning outcomes, discussions have focussed on students' lack of science identity. Faculty recognize that these courses may be one of the last opportunities that students have to learn about what science is and how science is practiced. This is one of the reasons why field trips are integral to geoscience courses.

### Related Documents for Charts and Graphs

[Data Reflection graphs \(1. Describe trends\).docx](#)

[Data Reflection graphs \(2. Equity gaps\).docx](#)

### Data Reflection Complete

Yes

## Practice Reflection

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### **Describe current practices your program/service area has engaged in that you believe impact the above data trends and equity gaps.**

The increasing enrollment in Oceanography has been a bit of a surprise and we are still trying to determine the reason. Students can take any physical science course and we wonder why they are interested in Oceanography as opposed to Geology. One theory that we had is that it sounds more interesting. To that end, we changed the title of our GEOL 111 course to The Earth through Time in an effort to capture student interest. Faculty also advertised the course heavily during the Fall semester in order to get more enrollment and this paid off with a fully enrolled course. We are now also considering new courses in Natural Disasters and a lab for Oceanography. Presently, students can fulfill their physical science lecture requirement with the Oceanography course, but there isn't a lab. We would like to leverage student interest in this subject by developing and offering a lab that students could take as well. Natural Disasters is a very popular course at other institutions that fits well with general education students. It involves students in thinking about science and its impact on society. We consider that this might be more engaging to students in some underrepresented groups who may benefit from seeing science applied. We also wonder if this would have a positive impact on student science identity in terms of being able to see the value of science. Finally, courses in geosciences are ideal for the new Leaf program where courses that have learning outcomes related to climate change and sustainability are awarded a Leaf designation. We think that our courses are perfect for this program.

A second major emphasis in the geosciences program is on field experiences. We know that field experiences can positively impact student STEM identity in a variety of ways. Students interested in geosciences can learn important science skills and get involved in research. Through field trips, students not thinking about STEM as a career can become better acquainted with problems and questions that may ignite a passion for STEM. Students who may never be scientists can go on field trips to learn more about what scientists do and how it impacts their community and the region around them. Students explore how their personal, cultural and collective experience intersects with geosciences and what questions, issues and topics can be explored within this discipline that are relevant to their communities. For these reasons, field trips are a focus in the geoscience classroom. Faculty are working on making field trips more common in all of the courses, including those that are online. Online courses have had a poor reputation for not being able to engage students in the actual practice of science, but faculty have found that these students will participate in field trips when the opportunity is presented. As part of the NSF grant that geoscience faculty are involved in, we are exploring the different ways to use field experiences to get students interested in science and science careers.

### **What other factors (internal or external) might also impact the above data trends and equity gaps?**

We are less concerned about the impact of AB1705 on our general education courses since they don't currently have prerequisites. However, faculty have discussed ways to strengthen basic skills within the courses. This would mean intentionally adding basic math and writing assignments into the courses.

### Related Documents for Charts and Graphs

## Summary and Reflection

### Practice Reflection Complete

Yes

### Mid-Cycle Updates

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#### Are there any edits or updates to the Executive Summary above?

The Geology/Oceanography program is currently stressed. The sole contract faculty member for the program has retired and has not been replaced. The Geology Program continues to be sought after for grant and research opportunities, but participation is difficult without a steward for the program. Since the retirement of Don Barrie, we have been approached for two different grant opportunities. One was from Scripps Institute for Oceanography for their GEO Paths Internship. This paid internship would allow Mesa students to complete research projects with Scripps faculty while learning about Geology career paths. The second is the ZTC program. The college has applied for and won the grant that will allow for the development of low or no-cost materials for Physical Science courses with an emphasis on courses like Geology.

Geoscience faculty, led by Don Barrie, took 10 students on a Summer Field Experience in June of 2023 as part of a grant funded by the National Science Foundation that was won by Mesa College. Students camped out for this 10-day research field trip. Applications for the trip exceeded the number of spots available. Students used words like Amazed, Grateful, Educated, Happy, Inspired and Fascinated when describing the event.

Here are some other student comments:

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"I would absolutely recommend this trip to others. The people in the group were wonderful. Field instructions was the most impactful for me. Things out in nature are not at neat and easily classified as what we find in text book or lab."

Students were given an opportunity to continue their work with a research grant in the Spring 2024 semester and response has been greater than we expected. The NSF Grant with Field Trips and Research has continued with Don working only in the Spring Pro-Rata, but this is unsustainable. We can't grow these opportunities without a faculty member to lead.

#### Are there any edits or updates to the Data Reflection above?

Data is sufficient.

#### Are there any edits or updates to the Practice Reflection above?

Not at this time.

## Summary and Reflection

### Goal 1: Increase enrollment in Geoscience courses through outreach and curricular changes.

**Unit Goal:** Goal 1: Increase enrollment in Geoscience courses through outreach and curricular changes.

**Goal Status:** Active

**Beginning Year:** 2022 - 2023

**Projected Completion Year:** 2025 - 2026

#### Mapping

Mesa College Strategic Plan: Roadmap to Mesa2030: (X - Highlight the X to Align)

- Completion - Objective 1: X
- Completion - Objective 3: X

Action Plans	Action Plan Update
<p><b>Action Plan Status:</b> Active</p> <p><b>Action Plan:</b> Create an Oceanography Lab Course</p> <p><b>Action Plan Cycle:</b> 2022 - 2023, 2023 - 2024, 2024 - 2025, 2025 - 2026</p>	<p><b>Submission Date:</b> 01/12/2024</p> <p><b>Action Plan Update:</b> This goal is still active, but is not a priority until a new contract faculty member is hired.</p> <p><b>Update Year:</b> 2023 - 2024</p> <p><b>Action Plan Progress:</b> Barriers Encountered</p>
<p><b>Action Plan Status:</b> Active</p> <p><b>Action Plan:</b> Apply for Leaf Designation for 3 of the GEOL or OCEA courses.</p> <p><b>Action Plan Cycle:</b> 2022 - 2023, 2023 - 2024, 2024 - 2025, 2025 - 2026</p>	<p><b>Submission Date:</b> 01/12/2024</p> <p><b>Action Plan Update:</b> This goal is in progress.</p> <p><b>Update Year:</b> 2023 - 2024</p> <p><b>Action Plan Progress:</b> On Track</p>
<p><b>Action Plan Status:</b> Active</p> <p><b>Action Plan:</b> Create a Natural Disasters lecture course</p> <p><b>Action Plan Cycle:</b> 2022 - 2023, 2023 - 2024, 2024 - 2025, 2025 - 2026</p>	<p><b>Submission Date:</b> 01/12/2024</p> <p><b>Action Plan Update:</b> This goal is in progress. Course outline creation to begin in Spring 2024</p> <p><b>Update Year:</b> 2023 - 2024</p> <p><b>Action Plan Progress:</b> On Track</p>
<p><b>Action Plan Status:</b> Active</p> <p><b>Action Plan:</b> Create promotions for Geoscience courses</p> <p><b>Action Plan Cycle:</b> 2022 - 2023, 2023 - 2024, 2024 - 2025, 2025 - 2026</p>	<p><b>Submission Date:</b> 01/12/2024</p> <p><b>Action Plan Update:</b> This goal is in progress. Promotions were created for the Fall 2023 and Spring 2024 semesters. More work on their effectiveness is needed.</p> <p><b>Update Year:</b> 2023 - 2024</p> <p><b>Action Plan Progress:</b> On Track</p>

### Goal 2: Decrease equity gaps and increase science identity in Geoscience courses through increased participation in field trips and curricular changes.

## Summary and Reflection

**Unit Goal:** Goal 2: Decrease equity gaps and increase science identity in Geoscience courses through increased participation in field trips and curricular changes.

**Goal Status:** Active

**Beginning Year:** 2022 - 2023

**Projected Completion Year:** 2025 - 2026

### Mapping

Mesa College Strategic Plan: Roadmap to Mesa2030: (X - Highlight the X to Align)

- Completion - Objective 3: X
- Pathways and Partnerships - Objective 3: X
- Scholarship - Objective 4: X

Action Plans	Action Plan Update
<p><b>Action Plan Status:</b> Active</p> <p><b>Action Plan:</b> Complete Summer Field Experience in June 2023 with 10 students.</p> <p><b>Action Plan Cycle:</b> 2022 - 2023, 2023 - 2024</p>	<p><b>Submission Date:</b> 01/12/2024</p> <p><b>Action Plan Update:</b> This goal has been accomplished!</p> <p><b>Update Year:</b> 2023 - 2024</p> <p><b>Action Plan Progress:</b> Completed</p>
<p><b>Action Plan Status:</b> Active</p> <p><b>Action Plan:</b> Provide data to determine best practices for Field Experiences</p> <p><b>Action Plan Cycle:</b> 2022 - 2023, 2023 - 2024, 2024 - 2025, 2025 - 2026</p>	<p><b>Submission Date:</b> 01/12/2024</p> <p><b>Action Plan Update:</b> This goal is in progress. Data has been collected, but needs to be analyzed.</p> <p><b>Update Year:</b> 2023 - 2024</p> <p><b>Action Plan Progress:</b> On Track</p>
<p><b>Action Plan Status:</b> Active</p> <p><b>Action Plan:</b> Revise Field Experience for 2024 trip.</p> <p><b>Action Plan Cycle:</b> 2022 - 2023, 2023 - 2024</p>	<p><b>Submission Date:</b> 01/12/2024</p> <p><b>Action Plan Update:</b> This goal is in progress.</p> <p><b>Update Year:</b> 2023 - 2024</p> <p><b>Action Plan Progress:</b> On Track</p>
<p><b>Action Plan Status:</b> Active</p> <p><b>Action Plan:</b> Create at least one opportunity for a short/local field trip for students in online and on campus courses.</p> <p><b>Action Plan Cycle:</b> 2022 - 2023, 2023 - 2024, 2024 - 2025, 2025 - 2026</p>	<p><b>Submission Date:</b> 01/12/2024</p> <p><b>Action Plan Update:</b> This goal is in progress, but needs a Contract faculty member to make it a priority.</p> <p><b>Update Year:</b> 2023 - 2024</p> <p><b>Action Plan Progress:</b> Barriers Encountered</p>