SAN DIEGO MESA COLLEGE

Program Review

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

Instructional Program - Engineering (ENGE)

2022 - 2026

Executive Summary

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

The Engineering Program is beginning a new era. A new contract faculty member was added to the department in Spring 2023 to help to plan and enact the future of the program. Engineering faculty have been involved in many curricular reforms and updates and have specific future plans to increase enrollment, shrink equity gaps and preserve the health of the program.

In terms of curriculum, Engineering faculty have been meeting with the HSI-STEM E3 curriculum group. The Curriculum Workgroup has been tasked with clarifying STEM pathways. This work has involved aligning content with other STEM disciplines, especially Physics and Math. Engineering faculty have been working with Physics and Math instructors to review math and physics prerequisites to verify that they are appropriate for the Engineering courses. The Engineering program awards Certificate of Achievement, Associate of Arts and Associate of Science degrees. These degrees were updated this past semester to remove MATH 141 since it is being deactivated. At this time, faculty also reviewed the 2-Year pathway to make sure that it was achievable for students. Engineering also took advantage of the transfer of outcomes review to Nueventive to revise their PLO's. The PLO's are more applicable to Engineering and include an objective regarding technology.

In terms of enrollments, Engineering program enrollments are fluctuating but it is mostly indicated an upward trends. Engineering enrollments for the spring 2024 has gone up significantly for all the courses being offered. In the fall of 2023 ENGE 250 had low enrolments, and this is due to the number of engineering students transferring to a four-year institutions.

The engineering workshops has gained popularity among engineering students, the surveys conducted is presented below:

In Spring 2023, 31 students enrolled in, 29 students received a Certificate of Completion. The students who are eligible to receive a Certificate were who; 1) attended 8 or more workshops out of 10; 2) have caught up with Dr. Truong after the workshops if they missed one or two workshops. 29 students received a Certificate of Completion (15 students attended 10 workshops, 9 students attended 9 workshops, 5 students attended 8 workshops and 1 student attended 6 workshops, 1 student attended none).

Here is the students' post-workshop survey result:

https://www.sdmesa.edu/academics/stem/irl/documents/SP23%20IRL%20Robotics%20and%20Programming%20Engineering%20Post%20Workshop%20Survey%20Result.pdf

Mesa Physical Sciences Faculty have also been meeting with faculty and administrators from transfer partners to revise curriculum to make it easier for students to transfer. After a long contentious period, ENGE 151 has been updated and approved to transfer to San Diego State. As part of the agreement, we are updating to Solid Works and including use of our new 3D printers. The 3D printers were purchased from the HSI-STEM E3 grant and are integral to the advancement of the Engineering program. Currently, faculty are learning how to use and best integrate the printers into their curriculum. As a result of meetings with our transfer partners and changes to enrollment at City College, Engineering faculty have decided to activate ENGE 240: Digital Systems. This year, CRC has also approved a new lab course: ENGE 211: Properties of Materials Lab. We hope to develop this lab more fully to offer it in Fall 2024. Finally, our Engineering Workshops, also sponsored by the HSI-STEM E3 grant, continue to be popular with students. We are entering a new phase of the workshops with them being taught by a

Summary and Reflection

new faculty member. Students in the workshops increase interest in Engineering and gain valuable skills that enhance transfer and get hired for internships.

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.

No changes

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

No changes

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

Executive Summary Complete

Yes

Data Reflection

Trends observed in program/service area's data.

Enrollment in ENGE courses has dipped since the pandemic as can be seen in the graph at left below (please keep in mind that only Fall and Spring enrollments are shown in the graph). ENGE courses are beginning to rebound but are not at the level that they had been pre-pandemic. We do not think that this enrollment trend is based on modality since the enrollment drop occurred during semesters when courses were still online. However, we have put in petitions for Distance Education online approvals to have the options of offering online and hybrid options. We suspect that this will be particularly helpful for Summer courses. The drop in enrollment for some ENGE courses could be due to a “kink” in the pipeline leading students to these courses. Many ENGE courses have prerequisites that also have prerequisites. A drop in new student enrollment during the pandemic would cause a delay for when new students would be able to take these upper-level courses. We are seeing a rebound in Spring 2023 and are hoping that this trend will continue. Finally, a different look at these losses can be seen in the Enrollment change graph below right. This graph compares the enrollment changes since Fall 2019 for Engineering (Grey), all Math, Science, and Engineering courses (in Orange), and Mesa College (in Blue) as a whole. The Engineering courses follow the same trends as the college itself, which means that the enrollment decline may not be specific to Engineering courses.

*See Graphs attached below for this section.

There are several types of Engineering courses with different audiences and purposes. Success rates in ENGE courses overall are fairly high (above 70%) with the exception of ENGE 101 and ENGE 200. ENGE 101 is a course to introduce students to the Engineering profession. The low success rates are concerning, but we noticed that they declined during the pandemic and have begun to rise again. ENGE 200 has both a Physics and Mathematics prerequisite. This is a course in which students begin to apply the science and math that they’ve learned to engineering problems. It is typically a difficult course for students because of this higher-level thinking. We notice that success rates in subsequent courses are much higher.

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

Data Dashboards show few overall equity gaps in success data as seen below. Engineering struggles with the success of Latinx students according to these data. Other gaps are not reported as significant, however, the gap for Black/African American students is larger than we would like. Comparison of success by gender also shows insignificant differences.

Summary and Reflection

*See Data Dashboards attached below for this section.

This data may be slightly misleading. Whereas there are few equity gaps in terms of student success, there are equity gaps in relations to student enrollment. This can be seen in the success rates for Female students in ENGE 101 (top) and ENGE 200 (bottom). The interesting trend here is not the success rates themselves (which are pretty good!), but the fact that for the terms listed (Fall 17, Spring 18, Fall 18, etc.. until Fall 22) that there are only three terms in which there were female students in the course. ENGE 116 shows no female students for any of the semesters listed. Similarly, there are no African American/Black students listed for most of the ENGE courses in the last 5 years.

*See Graphs attached below for this section.

This is very problematic. We know that Female and Black/African American students are underrepresented in the Engineering program. We addressed this issue in Program Review last year. This is an equity issue but is also an enrollment issue for Engineering. Engineering can't rely on the enrollment of male students to maintain the health of the program and must attract a more diverse student body.

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

Discussions of SLO's focused primarily on the skills that students bring into the classroom. Engineering is not the first course that a student will take on their pathway. Most courses currently have Math prerequisites and/or corequisites. Those math courses often have prerequisites of their own. Students do not usually come to us without some success in STEM courses. We see very high success rates in some upper-level courses for this reason. However, math and physics continue to be a roadblock for courses such as ENGE 200. This discussion is not particularly new, but faculty have reported a decrease in math skills in terms of basic algebra and calculus. It is not clear if this is due to courses taken during the pandemic or impacts from AB1705. Something new is that faculty are reporting seeing problems with students' reading skills. Often students need to read and identify information from problems descriptions with multiple sentences. It appears that students are having trouble focusing and extracting the information that they need. It appears to go beyond the expected problem of students having difficulty translating written language into mathematical formulas. These are big concerns for Engineering and Physics students.

Related Documents for Charts and Graphs

Engineering 2023 Program Review Graphs.docx

Data Reflection Complete

Yes

Practice Reflection

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

Engineering faculty are beginning to address these issues by way of curricular changes, outreach, and student support. To support students in the pathway, Engineering faculty participate in Peer Mentoring for many of their courses. Student participation in Peer Mentoring has been strong as a whole this past year. ENGE faculty have also been working at different outreach events such as Jump Start and STEM Success days to encourage students to enroll in Engineering at Mesa College. The Engineering Club has returned to campus to keep students interested in the engineering pathway. In association with Mesa College's new STEM E3 grant, we have expanded upon Mesa's three existing pilot experiential learning workshops: the Engineering Simulation Virtual workshops, the Mechatronics Virtual workshops, and the Python Workshop Series; each is a series of ten workshops designed for sequential learning. The workshops provide students with the opportunity to learn about the software that is in demand in the STEM industry and are taught by STEM industry leaders and attended by current working STEM professionals, allowing students to network with STEM professionals. Students who complete all ten workshops in each series receive a Certificate of Completion, which greatly improves their chance at landing further work based internship opportunities offered by our four-year college partners.

Summary and Reflection

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

We expect that there will be strong implications on physics courses from AB1705. As discussed previously, Engineering courses rely heavily on math prerequisites. Any change in math curriculum will directly affect Engineering success. This is why engineering faculty are working closely with math faculty. To clarify, this alliance is to ensure that math faculty understand what engineering faculty expect students to know and for engineering faculty to know whether those expectations are reasonable. Neither party expects to dictate curriculum to the other. Instead, the aim is to open communication for each to see the effect on student success. We will continue to work with our excellent colleagues in the math department to serve students better in our courses. As discussed previously, faculty are also reporting issues with students' ability to read and write. This problem appears widespread among the courses, but undefined. As with the difficulties with MATH, it is unclear where these problems are coming from and what their nature is. We plan to investigate this more fully in the coming year. Again, in relation to AB 1705, integration of basic skills into all coursework is more important than it was before. We intend to offer more opportunities for students to practice reading and writing skills.

Related Documents for Charts and Graphs

Practice Reflection Complete

Yes

Mid-Cycle Updates

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

No changes

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

No changes

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

No changes

Summary and Reflection

Goal 1: Increase enrollment in ENGE courses with an emphasis on ENGE 101 and ENGE 116.

Unit Goal: Goal 1: Increase enrollment in ENGE courses with an emphasis on ENGE 101 and ENGE 116.
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 2: X
- Scholarship - Objective 3: X
- Scholarship - Objective 4: X

Action Plans	Action Plan Update
Action Plan Status: Active **Action Plan:** Participate in outreach events such as JumpStart and STEM Student Success and prepare written materials for advising events **Action Plan Cycle:** 2022 - 2023, 2023 - 2024, 2024 - 2025, 2025 - 2026	**Submission Date**: 01/24/2024 **Action Plan Update**: We participated in outreach events such as JumpStart and STEM Student Success. Also enrollments in ENGE 116 has increased significantly and we added a new section. **Update Year**: 2023 - 2024 **Action Plan Progress**: On Track
Action Plan Status: Active **Action Plan:** Explore different course offerings in terms of time and days to attract different students **Action Plan Cycle:** 2022 - 2023, 2023 - 2024, 2024 - 2025, 2025 - 2026	**Submission Date**: 01/24/2024 **Action Plan Update**: Due to increase in enrollments, we need to offer courses with different modalities so students with different life style will be accommodated. **Update Year**: 2023 - 2024 **Action Plan Progress**: On Track
Action Plan Status: Active **Action Plan:** Complete Lab Curriculum for ENGE 211 **Action Plan Cycle:** 2022 - 2023, 2023 - 2024, 2024 - 2025, 2025 - 2026	**Submission Date**: 01/24/2024 **Action Plan Update**: In order to complete the Lab Curriculum, the Engineering Materials lab equipment must be purchased and we need to find a lab space to house these lab equipment. **Update Year**: 2023 - 2024 **Action Plan Progress**: Barriers Encountered

Goal 2: Increase Student Success in ENGE 200.

Unit Goal: Goal 2: Increase Student Success in ENGE 200.
Goal Status: Active

Summary and Reflection

Beginning Year: 2022 - 2023
Projected Completion Year: 2025 - 2026
Mapping
Mesa College Strategic Plan: Roadmap to Mesa2030: (X - Highlight the X to Align)

- Scholarship - Objective 2: X
- Scholarship - Objective 3: X
- Scholarship - Objective 4: X
- Stewardship - Objective 3: X

Action Plans	Action Plan Update
Action Plan Status: Active **Action Plan:** Expand Peer Mentoring Program **Action Plan Cycle:** 2022 - 2023, 2023 - 2024, 2024 - 2025, 2025 - 2026	
Action Plan Status: Active **Action Plan:** Continue work with the STEM Curriculum workgroup to explore Math prerequisites and connections to other disciplines and clear pathways for students. **Action Plan Cycle:** 2022 - 2023, 2023 - 2024, 2024 - 2025, 2025 - 2026	
Action Plan Status: Active **Action Plan:** Identify more clearly reading and writing problems for students in ENGE courses. **Action Plan Cycle:** 2022 - 2023, 2023 - 2024, 2024 - 2025, 2025 - 2026	

Goal 3: Decrease Enrollment gaps for Female and Black/African American students in ENGE

Unit Goal: Goal 3: Decrease Enrollment gaps for Female and Black/African American students in ENGE
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
- Scholarship - Objective 2: X
- Scholarship - Objective 3: X
- Scholarship - Objective 4: X

Summary and Reflection

Action Plans	Action Plan Update
Action Plan Status: Active **Action Plan:** Participate in outreach events such as JumpStart and STEM Student Success and prepare written materials for advising events. **Action Plan Cycle:** 2022 - 2023, 2023 - 2024, 2024 - 2025, 2025 - 2026	
Action Plan Status: Active **Action Plan:** Explore different course offerings and modalities. **Action Plan Cycle:** 2022 - 2023, 2023 - 2024, 2024 - 2025, 2025 - 2026	
Action Plan Status: Active **Action Plan:** Explore connections with Transfer Partners to connect students to engineering clubs such as Society of Women Engineers. **Action Plan Cycle:** 2022 - 2023, 2023 - 2024, 2024 - 2025, 2025 - 2026	
Action Plan Status: Active **Action Plan:** Purposefully recruit and retain students from underrepresented groups in introductory courses such as ENGE 101. **Action Plan Cycle:** 2022 - 2023, 2023 - 2024, 2024 - 2025, 2025 - 2026	