SAN DIEGO MESA COLLEGE

Program Review

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

Instructional Program - Physical Sciences (PHYN)

Executive Summary

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

The Physical Sciences program has encountered a few challenges and had some victories in the past year. The Physical Sciences program primarily includes courses in Astronomy (ASTR) and Physical Science (PHYN). All these courses are for students looking to fulfill a General Education requirement for physical science. PHYN 105 also serves as a pathway course for students in Liberal Studies (Teacher Education). The program includes an AS degree and a Certificate of Achievement that was recently discontinued. The program has had success in the online environment and is beginning to recover their on-campus enrollment.

The Physical Sciences program is closely tied to the Geology/Oceanography program and faculty in the departments worked together during the 2021/2022 year to make a comprehensive plan for General Education courses. Unfortunately, the program lost its only full-time faculty member in Fall 2022. We are grateful to our adjunct faculty who were able to prevent further enrollment slippage and maintain high rates of student success. However, we feel the loss for the program in terms of curriculum and laboratory improvement, and outreach. Currently, we are in the middle of the hiring process for a new faculty member and until then the program is idling with the potential to take off soon.

Astronomy faculty asked for and received a portable planetarium as part of the HSI-STEM grant. We finally took delivery of the Planetarium late in Fall 2022. A demonstration of the projector was given for Mesa faculty and was visited by colleagues from SDSU and Grossmont College. Extensive plans for using the planetarium are on hold, but we hope to use it within courses and for outreach to get more students interested in Astronomy. Also, in terms of outreach, we are very excited to say that on April 27, Mesa hosted the first Astronomy Night since March 2020! The Astronomy Night was a great success with people participating from 2 to 85 years old from Mesa and other campuses and colleges. Organizers included faculty and staff from the department who had to force people out from the roof at 9:30 pm. The event was very engaging, with physics students asking questions about orbital mechanics, the sun's magnetic activity and many just being in awe after the first-time peeking through the telescope.

Astronomy (ASTR) courses were offered in online modalities before the pandemic. However, the proportion of online to on campus offerings has shifted towards online in the post-pandemic landscape. Enrollments in courses in both modalities are recovering, but section offerings have been lower since our return to campus. We hope to use outreach events to increase our on-campus offerings. This is especially true for labs which can’t be taught online due to transfer restrictions. Our ASTR 109 (Astrophotography) course has been especially popular with students to get outside and see the stars (See photo right).

Physical Science (PHYN) 100 and 101 courses have been on hiatus since Spring 2022. Enrollment in General Education classes had been lackluster in 2021-2022 and the loss of faculty influenced the decision to focus on courses that had enrollment and faculty to teach them. In Spring 2022, we found out that we were awarded a grant from the National Science Foundation to revamp our PHYN 100 course to include applications from partnerships with regional industries and laboratories. Although this project was begun by previous faculty, current faculty have picked up the challenge and intend to offer the course in Fall 2023. There are also funds for students to do individual research projects inspired by work in the course.

Physical Science and Astronomy courses are being offered in our new “Studio” Classroom space. Desktop computers and desks were removed from the department computer lab and replaced with laptops and moveable tables (See Photo Left). ASTR uses this space for lab courses where their equipment is available and set up by department ILT’s. PHYN faculty use this as an activity space where courses are offered in a mixed modality in which students engage in evidence-based thinking using simple lab equipment or laptop computers. The lab equipment is stored in the classroom so that ILT’s are not burdened with set-up and tear-down.

Summary and Reflection

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.
N/A

If applicable, describe the impact of any new resources (human, fiscal, etc) on the unit and/or action plan implementation.
Hiring failed in the Spring 2023 because of the applicant pool. We are repeating the process and approaching the first round of interviews 12/7 and 12/8. The applicant pool is worse than in the Spring 2023. We had to extend the advertisement period for a month and paid extra to advertise with AAS, but still we received only 11 applicants out of whom 7 didn't have any experience. All four applicants that will be interviewed are current or former adjuncts. At the same time UCSD was hiring Astronomy faculty job and received over 200 applicants. They used the same advertising platform. One needs to wonder why we can't attract more applicants? Is it the nature of the job, do Astronomy PhDs want more research and not teaching jobs? Or is it the financial compensation, which is well below the market value at Mesa College compared to UCSD.

Mesa hosted the first Astronomy Night on April 27th, 2023. However this semester because we are understaffed and overworked, we couldn't organize such an event. However we did organize the partial eclipse event viewing and it was visited really well. This was on Saturday 10/14 from 8am until 11 pm. Our ILTs and adjunct faculty were there to support the event.

In this Fall semester we had the enrollment of n=383 students and Astronomy and Physical Sciences classes with productivity of 93%. This is up from the n=312 and productivity of 83% that we had in the Spring 2023. We struggle to staff Astronomy classes, and if we could staff we would offer additional on campus section in the Spring 2024.

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.

As discussed previously, enrollment in ASTR and PHYN 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). PHYN enrollment has been in decline for several years as interest in the PHYN 100 and PHYN 101 courses has waned. We believe that enrollment in PHYN had been driven by the popularity of a dynamic instructor who is longer with us at the college. Enrollment in the PHYN 105 course is also in decline. This course is fairly new to the college having been offered at the beginning of Fall 2018 and its enrollment is strongly tied to the Teacher Education program. This program has recently hired a new director who is in the process of compiling data to understand these trends more completely. See Chart 1

The ASTR courses had enrollment increases in the middle of the pandemic, but enrollment began to slide in Fall 2021. Astronomy and Physical Science courses had not returned to campus in Fall 2021. Thus, the enrollment dip was not due to changes in modality. In fact, both Astronomy and Physical Science maintained their enrollment from Fall 2021 which was online only to Spring 2022 when courses were mixed between online and in person formats. However, enrollment slipped again going into Fall 2022 with some regain in Spring 2023. A different look at these courses can be seen in the Enrollment change graph below. This graph compares the enrollment changes since Fall 2019 for Astronomy (in Orange) and all Math, Science, and Engineering courses (in Blue). Each data point is a ratio of the semester's enrollment over enrollment in Fall 2019 (numbers higher than 1 on the graph indicate an increase in enrollment and lower than 1 indicate a decrease). Enrollment in the school as a whole has been in decline since Fall 2019. Astronomy courses appear to be following the same trend with better than average

enrollments until Fall 2022. See Chart 2

Success in PHYN and ASTR courses have been acceptable for the data shown on the dashboards as seen in the graphs below. Campus and school success rates are around 72% for the time periods shown. PHYN 105 is a course that is taken by students late in their pathways which means that success should be higher since these are more experienced students. ASTR 111 is a lab course in which success is always a bit higher. Astronomy 101 is a little bit lower than we would like. See Chart 3

Describe any equity gaps in the data. Are there differences and/or patterns observed by demographics (e.g.race/ethnicity, gender, age, etc.)
Since Astronomy 101 has the lowest success gaps, we will focus our attention on equity data in that course. We did not see any equity gaps in terms of gender, but there were gaps for ethnicity for Black/African American and Latinx students. These are areas of concern for us as we go forward in our thinking about this course. See Chart 4

Astronomy has always offered courses in a variety of modalities. We noticed that there were no significant gaps due to modality for ASTR 101, but there were gaps for ASTR 111, which is the laboratory course. Due to transfer issues, we can't offer the course in an online format, but it is interesting for future discussions to note the achievement gaps.
One last look at achievement gaps that was interesting was about Session Length. According to the dashboards, there is an equity gap for students taking 16-week courses. This is interesting because we did not see any equity gaps for Modality, but we do see them here (keep in mind that these do not include Summer or Intersession courses). All of our 10-week courses are taught in an online format. This may open discussions about possible modalities for shortened courses. See Chart 5,6,7

Related Documents for Charts and Graphs
Chart 1.png;
Chart 2.png;
Chart 3.png;
Chart 4.png;
Chart 5.png;
Chart 6.png;
Chart 7.png

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

Course Learning Outcomes have not been directly measured in the last two years and need measurement. Using grades as a proxy, most instructors have reported seeing slight declines in student learning outcomes. The discussion has mostly centered around student preparation and overall interest in learning. Some instructors have mentioned difficulties with getting students to do higher level tasks involving critical thinking.

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.

We are concerned with the fall in enrollment for the courses in this program and will continue to try to determine the source. We know that the college as a whole has been feeling enrollment drops and we are thinking of our practices in terms of this overall issue. However, we see some problems that may be specific to our courses and we are looking for solutions. In Astronomy courses, we are noticing a high demand for online courses and the shortened 10wk sessions appear to have more student success. For this reason, we are considering offering shorter-term courses for our on-campus offerings. A 10-week Astronomy lab might be a big draw for students who enroll in Astronomy lectures and find that they need the labs. Additionally, a 10 week on campus Astronomy course might also be popular for students who can't make a 16-week commitment. Astronomy is a very flexible course

and we will continue to look for ways to offer students what they need and want. In Physical Science, we need more information about the Liberal Studies program and its impact on PHYN 105. We have tried to offer evening sections in the hope of capturing working students, but that did not seem to be much of a draw. We are considering limiting this course offering to once a year. In terms of curriculum, PHYN 100 has the potential for the greatest growth. We are working on a redesign of the course that we hope to roll out in Fall 2023. We would like to link this course more closely to the problems and potential employment opportunities that exist in the San Diego area. Outreach is going to be one of the biggest goals for this year. With the acquisition of the portable planetarium and the ability to hold Astronomy Nights on campus, we have a great potential to reach out to prospective students. We are hurting in this regard currently without a Full-time Faculty member to spear-head the use of the Planetarium. We have reached out to people at the R.H. Fleet Science Center and they are interested in partnering with us. The goal of the partnership is for us to learn how to use the planetarium for general public audiences.

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

Practice Reflection Complete
Yes

Mid-Cycle Updates

YEAR 2 Updates (2023 - 2024)

Provide any edits or updates to the prompts originally documented in the Executive Summary section for Year 2.
Yes, we incorporated impact of lack of human resources on Astronomy program.

Provide any edits or updates to the prompts originally documented in the Data Reflection section for Year 2.
None.

Review Outcomes Report. Review the unit's outcomes assessment process for 2022 - 2023. Discuss connections to unit goals/action plans/resource requests.
Faculty are reviewing CLO's to see if they are appropriate for Physical Science and Astronomy courses. The original department CLO's were written for Physics courses that tend to be more math-based. They may not be appropriate for the GE courses housed in the Physical Sciences program.

Provide any edits or updates to the prompts originally documented in the Practice Reflection section for Year 2.
No edits

YEAR 3 Updates (2024 - 2025)

Provide any edits or updates to the prompts originally documented in the Executive Summary section for Year 3.
A new Astronomy faculty was hired during the Spring 2024 semester to start in Fall 2024. We are hoping that the new faculty member can bring leadership to the program and help to further the program goals. We have offered Astronomy Night in the Fall 2024 and engaged the broader Mesa and district student and staff population. In the Spring 2024 we also engaged Mesa populations into partial solar eclipse viewing.

Astronomy Departments from both UCSD and SDSU have reached to us to recruit students for their bridge and summer internship programs. Our faculty (Stojimirovic) is the part of the Executive Committee for the Summer Transfer Academy for Research in Astronomy (STARTastro) program. This program aims to support the preparation, training and retention of transfer students from regional Community Colleges into the UCSD and SDSU Astronomy programs. The program website is https://www.startastro.org. We are also being asked to create ASTR 201 course to better prepare Astronomy majors for transfer.

Our faculty (Thompson) has also been a part of AB 1111 to create the new template for state wide curriculum for astronomy lecture and lab classes.

Summary and Reflection

The NSF grant provided funds to make changes to the Physical Sciences course. The grant evaluator has indicated significant increases in student Science Identity based on these improvements. Please see "Practice Reflection" for more information.

One of the ILT's in our department left us last Spring. Consequently, it has been a struggle to support Astronomy courses in particular. We are looking into more innovative ways to set up the Astronomy labs to reduce the amount of ILT support necessarily. We are also actively hiring a new ILT during the Fall 2024 semester. We know that it will take some time for new staff to learn how to support Astronomy effectively. Until then, we will be asking for some technology improvements that will make things a bit easier.

The tutoring and embedded tutoring support is not provided for the Astronomy and Physical Sciences courses. The courses in this discipline are such that an embedded tutor would be the best solution to provide support. Students often work in class on activities and often need assistance in the moment rather than later in tutoring. Additionally, Astronomy and Physical Science courses tend to vary in teaching approach more than other courses. Having an embedded tutor who would work with the faculty and know how they approach the course would be more helpful than a general tutor. Embedded tutors have been requested, but haven't worked out.

Provide any edits or updates to the prompts originally documented in the Data Reflection section for Year 3.
The PHYN 100 and PHYN 101 courses were redesigned as part of a grant from NSF. There were two important changes to the course. The first was that the course was advertised as being more centered on problems that affect communities (please see "PHYN 100 Advertising" file). The second was the addition of assignments aimed at increasing Science Identity for GE students which meant increasing their interest in science and their understanding of the role of science in society. These interventions were successful in many ways. The course did attract a higher percentage of Latinx students at 52%. In comparison, we see 38% for Mesa College as a whole. Secondly, we saw higher gains on Pre-/Post-Surveys aimed at measuring science identity. Our evaluator found that these differences were significant and mentioned that this was a big finding because the number of students in the sample was statistically small.

Enrollment in Astronomy and Physical Science has become stronger in recent years. Offerings have remained steady and no new growth is expected until FTEF can be increased. We decided to focus on Astronomy courses over Physical Science until we are able to get extra FTEF to grow (See "Practice Reflection" for more information. PHYN 100 and PHYN 101 are viable courses, but are less productive courses than ASTR courses. Also, we would like to invest more heavily in our Astronomy courses to support our new faculty hire.

Review Outcomes Report. Review the unit’s outcomes assessment process for 2023 - 2024. Discuss connections to unit goals/action plans/resource requests.
During the Fall 2024 department meeting, faculty worked together to write new CLO's for Astronomy and Physical Science courses. Faculty are satisfied with the new CLO's as being able to describe student outcomes better than the old ones. Since we wrote all new outcomes, as a department, our goal is to assess all of them by the end of Spring 2025. The only In this cycle of assessment, we are looking to see if our CLO's and our process for assessing are appropriate. We hope to adjust as data is reported.
Physical Science CLO's have already been assessed. Students met the benchmarks. Faculty report that benchmarks themselves might be a little too low and are discussing whether to increase the standard.

Provide any edits or updates to the prompts originally documented in the Practice Reflection section for Year 3.
We were pleased with the results from the data for our interventions from the grant activity. As mentioned previously, we need to use our FTEF wisely in scheduling decisions. The PHYN 100/101 courses are small and don't have a designated faculty member. To grow the courses it would have to be at the detriment to our other GE disciplines. At this time, we want to focus on Geology, Oceanography, and Astronomy to support our new faculty and give them room to grow. However, there are lessons learned from the NSF data. The first is the draw of courses that are problem-centered. The content of the PHYN 100 course didn't change during the intervention. Instead, the course content was designed around contemporary problems. It is believed that this Problem-based approach was one of the reasons for the success. Secondly, asking students to explore their interest and the role of science explicitly through the Science Identity assignments was one of the reasons for the significant impact. Our PHYN 100 students started the semester with an average negative Science Identity and ended up more positive than other GE courses. The point is that the positive outcomes from the reinvention of the PHYN course is not specific to PHYN. Other courses could also become more Problem-based with specific assignments designed to improve science identity.

Summary and Reflection

YEAR 4 Updates (2025 - 2026)

Provide any edits or updates to the prompts originally documented in the Executive Summary section for Year 4.

Provide any edits or updates to the prompts originally documented in the Data Reflection section for Year 4.

Review Outcomes Report. Review the unit's outcomes assessment process for 2024 - 2025. Discuss connections to unit goals/action plans/resource requests.

Provide any edits or updates to the prompts originally documented in the Practice Reflection section for Year 4.

Unit Goals, Action Plans, and Updates

Goal 1: Increase Enrollment

Unit Goal: Goal 1: Increase enrollment in Astronomy and Physical Science 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:** Develop pathways that provide students with clarity about degree, certificate, and transfer requirements. (**X**)
- **Completion - Objective 3:** Design and promote programs and services that intentionally target a reduction in equity gaps in completion outcomes (**X**)

Action Plans	Action Plan Update
Action Plan Status: Active **Action Plan:** 1. Apply for Leaf Designation for 1 of the ASTR courses. 2. Develop a plan for use of Mobile Planetarium 3. Create promotions for ASTR and PHYN courses 4. Offer Astronomy Night program once per semester. **Action Plan Cycle:** 2022 - 2023, 2023 - 2024, 2024 - 2025, 2025 - 2026	**Submission Date**: 11/26/2024 **Action Plan Update**: Plans 1-2 are in progress. Goals 3 and 4 are complete. **Update Year**: 2024 - 2025 **Action Plan Progress**: On Track **Submission Date**: 01/12/2024 **Action Plan Update**: These goals are in progress. We have done promotions for PHYN and ASTR courses for Fall 2023 and Spring 2024. Enrollment has improved. We are in the process of hiring a new Contract instructor in order to help us progress with Plan 1, 2, and 4. We have reached out to Fleet Science Center for help with use of our Planetarium. **Update Year**: 2023 - 2024 **Action Plan Progress**: Barriers Encountered

Goal 2: Decrease Equity gaps and Increase Science Identity

Unit Goal: Goal 2: Decrease equity gaps and increase science identity in Astronomy and Physical Science 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:** Design and promote programs and services that intentionally target a reduction in equity gaps in completion outcomes (**X**)
- **Pathways and Partnerships - Objective 3:** Increase community engagement, experiential learning, integrated career planning, and workforce training

to prepare students for future careers (**X**)

- **Scholarship - Objective 4:** Expand the use of innovative and high-quality teaching, learning, and support practices that achieve equitable outcomes and increase student success (**X**)

Action Plans	Action Plan Update
Action Plan Status: Active **Action Plan:** 1. Provide online modules to increase science identity in ASTR and PHYN courses 2. Complete revision of PHYN 100 course to include awareness of local science applications. 3. Investigate new possible modalities for ASTR courses. **Action Plan Cycle:** 2022 - 2023, 2023 - 2024, 2024 - 2025, 2025 - 2026	**Submission Date**: 11/26/2024 **Action Plan Update**: Plan 1 is in progress. Online modules have been used successfully in PHYN 100. Plan 2: Revision of PHYN 100 is complete. Plan 3 is in progress. ASTR 101 was offered as a late start hybrid course in Fall 2024 with mixed results. **Update Year**: 2024 - 2025 **Action Plan Progress**: On Track
	Submission Date: 01/12/2024 **Action Plan Update**: This goal is in progress.Online modules have been identified for PHYN courses. PHYN 100 has been revised and offered. Modalities for ASTR courses are being discussed and explored. **Update Year**: 2023 - 2024 **Action Plan Progress**: On Track