Program Information & Executive Summary

1. 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 2022l. 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.

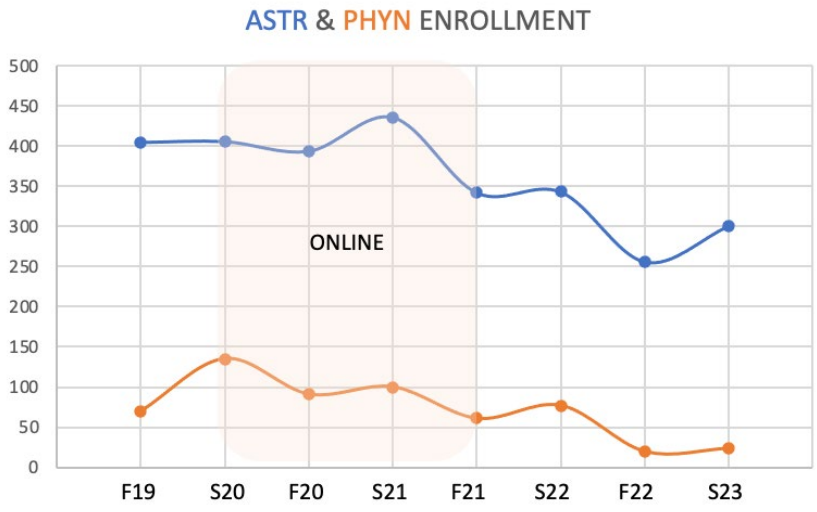
Physical Science and Astronomy courses are being offered in our new "Studio" Classroom space. Desktop computers and desks were removed from the department computer lab and replaced with laptops and moveable tables (See Photo Left). ASTR uses this space for lab courses where their equipment is available 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.

2. **Please confirm that the department has reviewed the Course Learning Outcomes listed in CurricuNet for each course and verify accuracy.**
   - ☒ **Reviewed and accurate**
   - ☐ **Reviewed not accurate, update in progress**
   - ☐ **Reviewed not accurate, need support**

Data Reflection

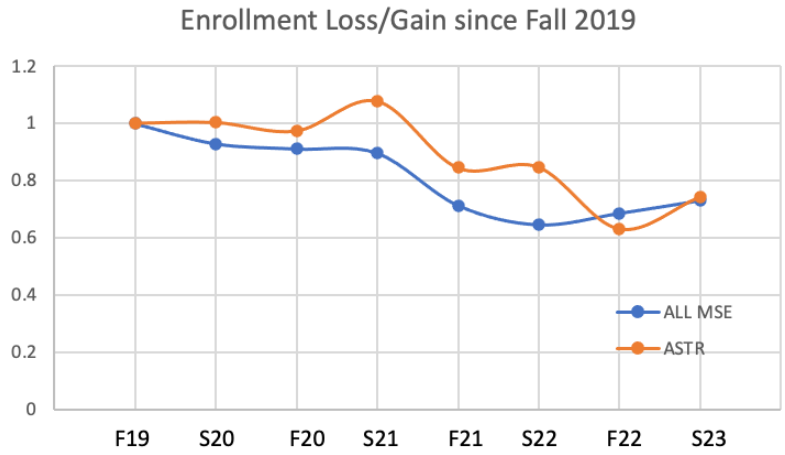
1. **Describe the trends you see in your program/service area's data (Instructional Data you may consider: enrollment trends, course & program learning outcomes, Institutional Learning Outcomes, course success and retention rates, degree completion, transfer, employment, labor market analysis, other data relevant to your unit's work).**

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.

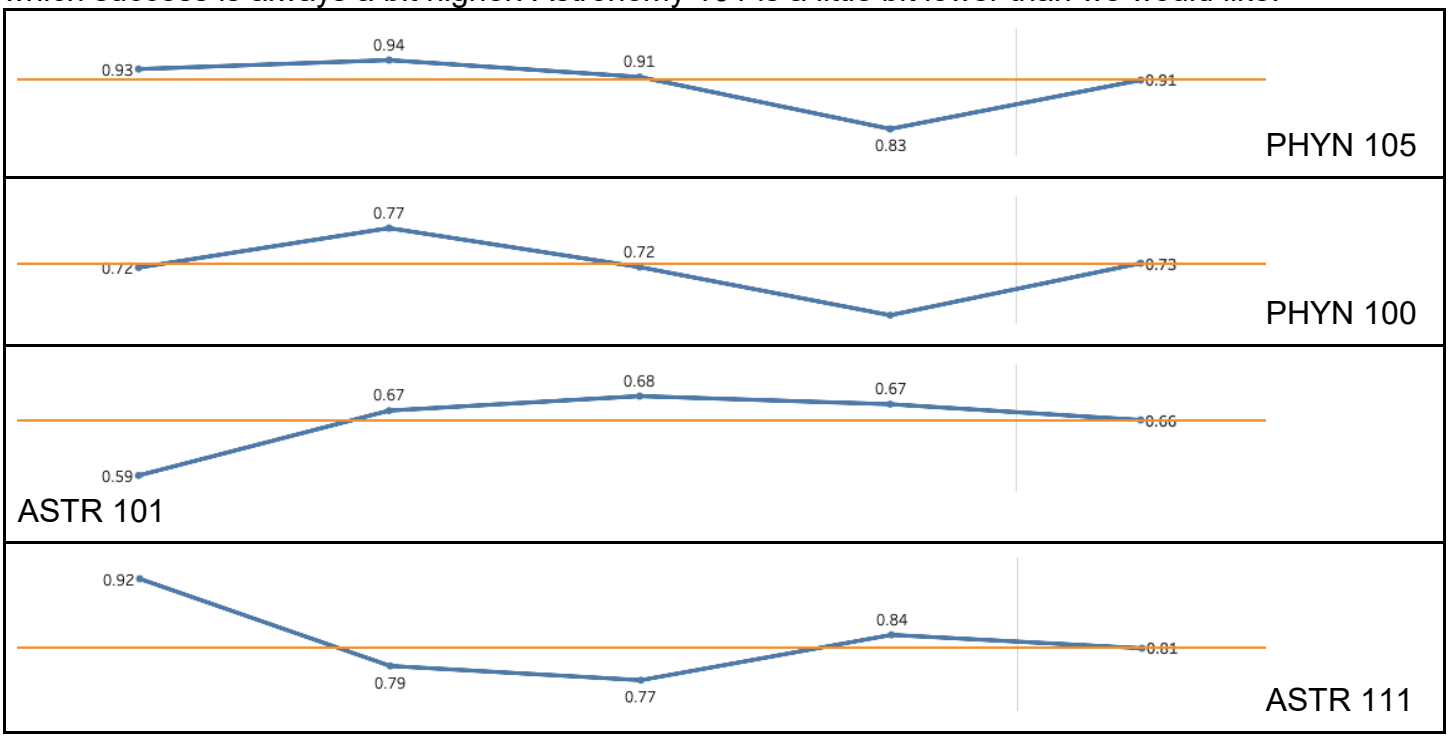


The ASTR courses had enrollment increases in the middle of the pandemic, but enrollment began to slide in Fall 2021. Astronomy and Physical Science courses had not returned to campus in Fall 2021. Thus, the enrollment dip was not due to changes in modality. In fact, both Astronomy and Physical Science 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.

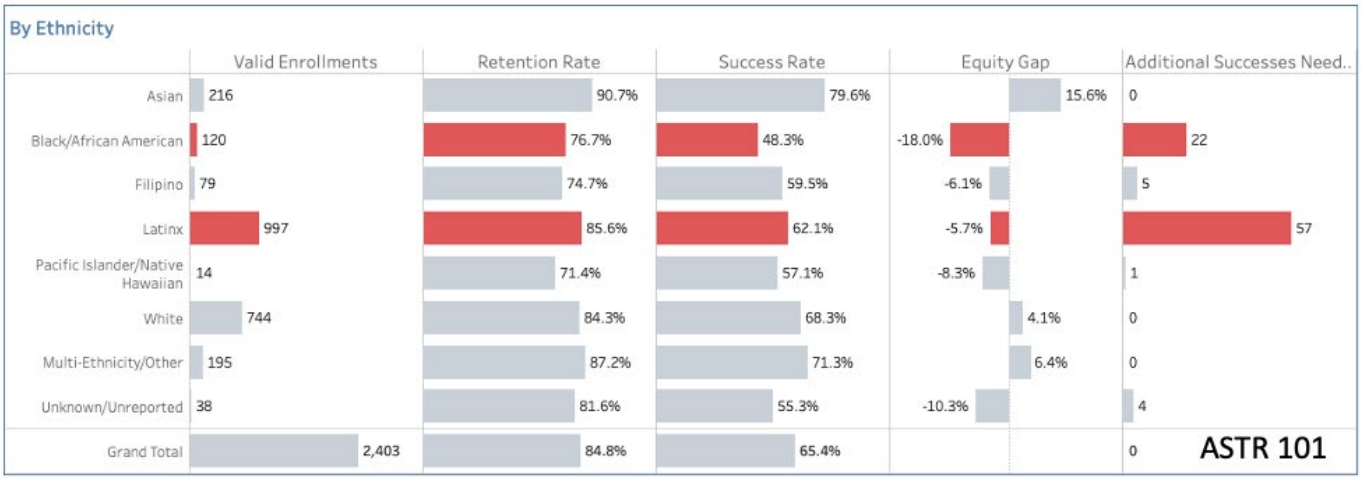


Success in PHYN and ASTR courses have been acceptable for the data shown on the dashboards as seen in the graphs below. Campus and school success rates are around 72% for the time periods shown. PHYN 105 is a course that is taken by students late in their pathways which means that success should be higher 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.



2. Describe any equity gaps you see in these 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.



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.

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

4.

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.

Practice Reflection

1. **Describe current practices your unit has engaged in that you believe impact the above data trends and equity gaps. (Items to consider: new actions specifically focused on issues of equity, major curricular changes, professional learning, policy or process changes, data-informed unit dialogue, community outreach.)**

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.

2. What other factors (internal or external) might also impact the above data trends and equity gaps? (Items to consider: legislative changes, fiscal changes, staffing changes, recruitment, hiring, and retention practices.)

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.

Unit Goals and Action Plans

1. **Unit Goals (Goals should connect to Data and Practice Reflections. Goals should be Specific, Measurable, Attainable, Relevant, and Time-bound.)**

   Goal 1: Increase enrollment in Astronomy and Physical Science courses through outreach and curricular changes.

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

2. **Mesa2030 Roadmap Strategic Objective (SO) Alignment**

   Goal 1:Increase enrollment in Astronomy and Physical Science courses through outreach and curricular changes.

   - Completion 3: Design and promote programs and services that intentionally target a reduction in equity gaps in completion outcomes.
   - Completion 1: Develop pathways that provide students with clarity about degree, certificate, and transfer requirements.

   Goal 2:Decrease equity gaps and increase science identity in Astronomy and Physical Science courses through increased awareness of local science applications and curricular changes.

   - Pathways and Partners 3: Increase community engagement, experiential learning, integrated career planning, and workforce training to prepare students for future careers.
   - Completion 3: Design and promote programs and services that intentionally target a reduction in equity gaps in completion outcomes.
   - Scholarship 4: Expand the use of innovative and high-quality teaching, learning, and support practices that achieve equitable outcomes and increase student success

3. **Identify specific actions your program/service area will engage in to accomplish this goal (Examples may include: policy or practice changes; unit initiatives, curricular changes, etc.).**
   Goal 1: Increase enrollment in Astronomy and Physical Science courses through outreach and curricular changes.
   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.

   Goal 2: Decrease equity gaps and increase science identity in Astronomy and Physical Science courses through increased awareness of local industry and curricular changes.
   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.