

El Camino Community College

PROGRAM REVIEW 2022-23

Division of Natural Sciences

Astronomy



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SECTION 1

Program Overview

A) Provide a brief narrative description of the current program, (e.g., the program's mission statement, a description of the students it serves) and any highlights of the program's previous success, future vision, and related needs.

The Astronomy Department offers seven courses in freshman-level astronomy that fulfill general education requirements for the A.A. and A.S. degrees in natural science:

Astronomy 12: Astronomy Lab
Astronomy 13: Astronomical Optics
Astronomy 15: Astrobiology: Life in the Universe
Astronomy 20: The Solar System
Astronomy 20H: The Solar System for Honors students
Astronomy 25: Stars and Galaxies
Astronomy 25H: Stars and Galaxies for Honors students

These courses meet transfer requirements for CSU for physical science, both lecture and lab courses, and are also transferable to UC. Two lecture courses, Astro 20/20H and 25/25H, are taught in the 30-foot Planetarium, which houses a GOTO star projector. The star projector was installed in early 2000 and has about half its life left. It had replaced an older star projector. Astro 12 is taught in the evening on a dedicated observing deck with an observatory. Astro 12 currently has twelve 11-inch telescopes dedicated to student use. There are also twelve digital cameras for the telescopes, which students use during the course to take images of objects such as planets, the Moon, galaxies, and nebulae. Astro 13 is a course in telescope making, highly unusual at community colleges, and is taught in a classroom specially designed for the purpose—perhaps the only such classroom on Planet Earth. Over twenty years ago, students approached Dr. Perry Hacking, a previous Astronomy professor, and wanted him to start a telescope making class. They signed a petition, and the course began. In the course, students begin with 6-inch mirror blanks which they grind, polish, and shape into a paraboloid. They then get the mirrors aluminized and construct their own telescopes. Amazingly, some students founded a telescope company Planewave using the knowledge they acquired in Astro 13. Astro 15 is our newest course, which began in Fall 2022. It is taught in any available science classroom. Since the pandemic, we also offer Astro 20 and 25 online.

Looking at other community colleges' astronomy courses, El Camino is comparable to some. Cerritos college has 4 lecture courses and 1 lab course. Their lecture courses are parallel to ours. Santa Monica college has an astronomy degree path that offers a few more courses, including some astrophysics courses. On the other end of the spectrum, there are some community colleges that only offer 1 lecture and 1 lab course in astronomy, such as Long Beach City College. Our department is considering having an astronomy degree program and creating two new courses that would be a great addition to our current offerings. One would be an astrophysics course, and another would be an astrophotography course.

The Department currently consists of two full-time instructors. One of the full-time instructors regularly teaches physics as well and one sometimes teaches a physics course. This past year there were three part-time instructors. We also have a physics instructor who teaches an astronomy course every semester.

There are about 33 sections offered every year serving approximately 1100 students. Astronomy is a popular choice for students seeking to fulfill their graduation and transfer requirements in natural science; many will take a second or third course because of their interest in the mysteries of the cosmos.

B) Describe the degrees and/or certificates offered by the program.

The Astronomy Program currently offers no degrees or certificates. We would like to pursue this option.

C) Explain how the program fulfills the college's mission.

The mission of El Camino College is to make a positive difference in people's lives by providing a comprehensive educational programs and services that promote student learning and success in collaboration with our diverse communities.

The Astronomy Program supports the College's Mission Statement by providing popular, exciting, and inspiring classes. Our courses emphasize critical thinking about issues in science and build a deep understanding of how the natural world affects world civilization.

The program's mission statement is:

The Astronomy Department prepares students to become scientifically knowledgeable and contributing citizens. Important to this mission are an improved student perspective on how their lives and new scientific developments fit within the greater context of mankind's knowledge, and an understanding of how new knowledge is achieved.

STRATEGIC INITIATIVES

- Student Learning:

The Astronomy Department is dedicated to providing stimulating, exciting courses that encourage critical thinking and problem solving in student-centered learning activities and employing dramatic imagery, realistic sky simulations and immersion video.

- Student Success and Support:

The Astronomy Department works with our Supplemental Instruction leaders and student tutors to increase student success. We use a variety of educational methods and techniques in order to engage students and promote learning, including the realistic display of stars and sky motions in the Planetarium, full-dome video presentations, and lecture-tutorial exercises that promote active learning. We also offer many online classes for those who cannot come to campus.

- Collaboration:

The Astronomy Department collaborates with other natural science departments on the annual Onizuka Space Day, providing an introduction to space science for young people.

- Community Responsiveness:

When it comes to outreach to the community, the Astronomy Department is very active. Once a month, we host the meetings of the local astronomy club, the South Bay Astronomical Society, who bring excellent speakers to our campus. Supported by a grant, planetarium shows and telescope observing are offered to the community about once a month during the school year. These events are free, open to the public, and exhibit the wonders of the night sky to all. We also participate annually in Onizuka Space Science Day, aimed principally at middle-school and high-school students, when an astronaut comes to campus to speak to the students and a wide variety of activities are offered to inspire them to take an interest in the sciences. We also provide free planetarium shows to school groups and organizations, as requested.

- Institutional Effectiveness:

The Astronomy Department participates regularly in student assessment, program planning, and program review.

- Modernization:

The Astronomy Program strives to utilize modern technology, including a full-dome video projector with surround sound, four digital posters, and our star projector. The Observing Deck has been modernized and equipped with the latest computerized telescopes and digital cameras.

D) Discuss the status of recommendations from your previous program review.

If more than ten recommendations were presented in the previous program review, expand the enumerated list below as needed.

1. **Recommendation:** 7 laptops
Status: completed
Notes/Comments: The laptops are used for our lab class, Astronomy 12. We have had them for over 5 years. We currently have a total of twelve functional laptops, but the other five are much older. We foresee needing new laptops in the future.
2. **Recommendation:** 12 CCD cameras
Status: Completed
Notes/Comments: we obtained CMOS cameras instead of CCD. They are working well as of now. As technology improves, we may need to replace them.
3. **Recommendation:** Blocking filter diagonal
Status: Completed
Notes/Comments: We needed the filter to use our solar scope.

4. **Recommendation:** Infrared camera
Status: Completed
Notes/Comments: We haven't used it as much as intended. We should think of more ways to use it.
5. **Recommendation:** 2 11-inch telescopes
Status: completed
Notes/Comments: Obtaining the telescopes has given us a total of 12 telescopes for our lab class. Telescopes need constant maintenance and with the amount of use they get in each semester there is a high probability we will need more in the future.
6. **Recommendation:** Hire a planetarium manager
Status: Active
Notes/Comments: We have been requesting a planetarium manager for years. We need someone who can maintain the planetarium equipment, the telescope equipment, and provide planetarium shows to the public. We used to have a planetarium manager in the past. Without a manager, the responsibilities fall on the faculty members.
7. **Recommendation:** Hire another faculty member
Status: Completed
Notes/Comments: Need for another faculty member has arisen. Our department used to have 3 full-time faculty, now we only have 2.
8. **Recommendation:** Add astrobiology course
Status: completed
Notes/Comments: first time taught in fall 2022.
9. **Recommendation:** TV monitor
Status: Active
Notes/Comments: In the planetarium, we currently have four monitors we can use to display images around the room. We would like one more for the foyer.
10. **Recommendation:** New star projector
Status: Active
Notes/Comments: As stated above our current star projector is at about half its life. We will need a new one in the future to replace the current one.
11. **Recommendation:** Add a thermostat in the planetarium
Status: Completed
Notes/Comments: Previously the planetarium's temperature varied a great amount. It would go from 65 degrees to 80 degrees in a given day! With the thermostat, the temperature has been regulated.
12. **Recommendation:** Schedule 8-week versions of Astro 20 and 25.
Status: Abandoned

Notes/Comments: We tried providing 8-week courses. They were not as popular, but we do occasionally offer them.

SECTION 2

Program Assessment

Program Contribution to Student Success and Equity

For the program under review, examine the following data for the last four years by:

- **Disaggregating by race/ethnicity, gender, and age where possible.**
- **Discussing internal and external factors contributing to constant, increasing or decreasing trends.**
- **Highlighting equity gaps found among different groups of students.**

❖ *If the program under review is a Career Education Program, please examine a) through k) from the list below.*

❖ *If students taking courses from the program under review end with a degree or certificate issued by the program, please examine a) through h) from the list below.*

❖ *If students taking courses from the program under review do not end with a degree or certificate issued by the program, please examine d) through g) from the list below.*

a) Degree Completion: Number/percent of students earning a program degree

N/A

b) Certificate Completion: Number/percent of students earning a program certificate

N/A

c) Transfer to a four-year institution: Number/percent of students transferring to a four-year institution

N/A

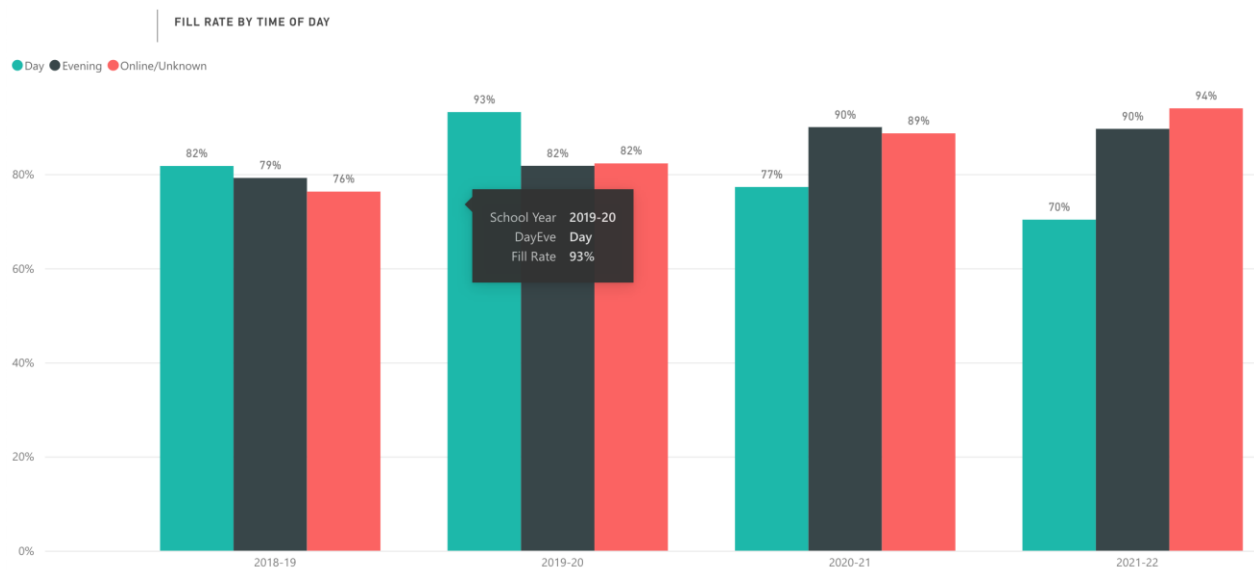
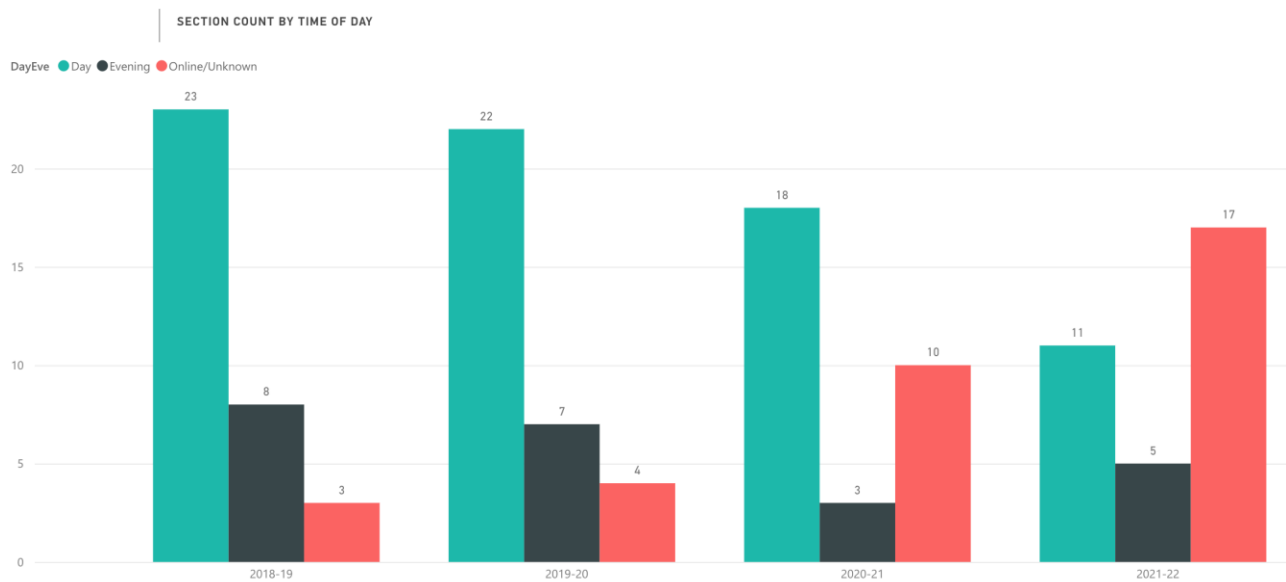
d) Scheduling of courses: Percentage of students enrolled in day/evening courses, on campus/online/hybrid courses, days of the week

Year	Day sections/fill rate	Evening sections/ fill rate	Online section/ fill rate
2018-2019	23/ 82%	8/ 79%	3/ 76%
2019-2020	22/ 93%	7/ 82%	4/ 82%
2020-2021	18/ 77%	3/ 90%	10/ 89%

2021-2022	11/ 70%	5/ 90%	17/ 94%
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In 2018, 2019 there were primarily day, on campus classes offered. The enrollment for those classes was highest compared to evening or online.

In 2020, 2021 the online sections increased due to the pandemic. The day and evening classes represent synchronous online (via zoom). In both years, the asynchronous online had high enrollment. The synchronous classes dropped in overall enrollment. It became clear that students preferred asynchronous online astronomy classes.



e) **Fill rate:** Percentage of actual students enrolled in a term in relation to total seats offered

Year	Sections offered	Enrollment	Fill rate
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2018-2019	34	1098	81%
2019-2020	33	1204	90%
2020-2021	31	1026	82%
2021-2022	33	1106	85%

Our fill rate tends to be around the low 80% in the past 4 years. There was a slight dip in 2020-2021, most likely because of the pandemic.

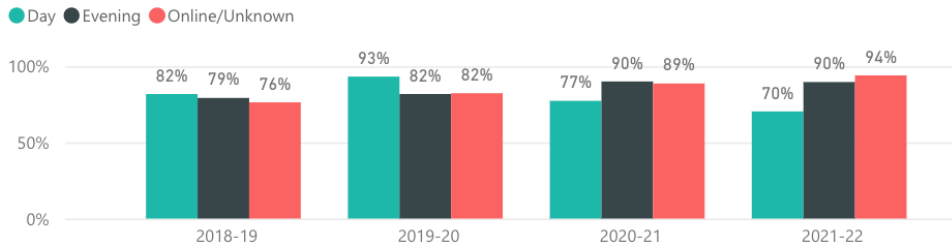
When looking at the fill rate by semester, Spring semester displays the lowest out of all four terms. There is a sudden decrease in the 2021-2022 year spring semester. The drop could be a result of having some classes back on campus rather than online. On campus enrollment was very low initially. Winter term has the highest and most consistent fill rate. Summer has taken a dramatic increase in the since 2020.

Looking at the fill rate for in-person vs. Online classes, pre-pandemic there was not much difference. Post-pandemic, online classes tend to have a higher fill rate.

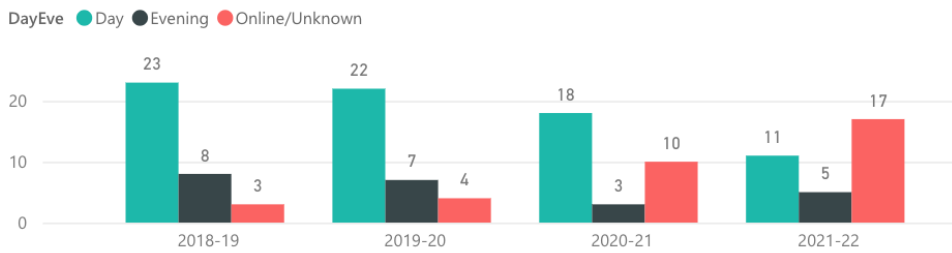


Trend of online courses getting fuller

Fill Rate by Time of Day



Section Count by Time of Day



f) Grade Distribution: Percentage of students in a course receiving each of the possible grades that can be awarded

Course	A	B	C	D	F	Pass	No pass	W	Total
A12	38.5%	19.8%	13.5%	5%	7.9%	0.2%	0	15%	585
A13	61%	33.3%	5.6%	0%	0%	0	0	0	18
A20	28.3%	23.6%	17.6%	4.6%	9.2%	0	0	16.7%	2484
A20H	55%	26.9%	7.7%	0%	2.6%	0	0	7.7%	78
A25	25.9%	18.3%	17.1%	5.9%	11.2%	0.2%	0.1%	21.3%	1012
A25H	45.2%	14%	9.7%	4.3%	8.6%	0	0	18.2%	93

The grade distribution is not a bell-curve. There are far more A's and B's awarded for each course. However, the grade distribution has changed since the pandemic. Looking at the grades pre-pandemic, there were more B's and C's awarded than A's. The distribution did represent more of a bell-curve. During the pandemic, as classes became online, more A's were awarded and there have been far fewer D's and F's. As we transition some classes back to on campus, it will be interesting to compare the grade distribution of online classes vs. on campus. One such case was A12. A12 was taught online and on campus in Spring 2022, and for online 85% of the students received an A. The on campus A12 in Spring 2022 only had 41% of the students earn an A. That is an astounding difference and may warrant for our program to investigate the level of rigor in online classes. We no longer teach Astro 12 online, mainly because it does not align with the course objectives.

The table clearly shows our honors course students tend to earn A's and B's more than the non-honors equivalent course, which conveys the level of student readiness and motivation in an honors course.

g) Course Success: Percentage of students enrolled at census who complete the course with a grade of A, B, C, or P

Overall:

Year	Success percentage
2018-19	63.3
2019-20	65.2
2020-21	69.9
2021-22	75.5

Overall, students' success rate has increased in the past year, most likely due to the pandemic and having more online classes. Based on the grade distribution section, it seems that online classes tend to have more passing grades than on campus. Since more lecture courses are being taught online, it is expected to see the success rate increase.

Demographically, the success rate follows as:

Gender/Ethnicity*	Success percentage averaged over 4 years
Females	68.3 (over 70% last 2 years)
Males	68.45
African American	54.6
Asian	80
Hispanic	66
Two or more	74.2
White	78.7
Unknown/decline	70.6

*Certain groups not included due to low number representation

There is an obvious disparity in the African American success rate compared to all others listed in the table. The difference in success rate is an equity issue. The answer to how we can make the gap smaller is still being discussed. In the next section, we offer possibilities.

Based on the chart below, females make up 50% of the demographics in 2021-22 and Hispanics make up almost 50% in 2021-22. Looking at the different statistics, females have better success rates than males for most cases. The highest success rates come from Asian females. Hispanic success rate seems to follow the overall success rate by year.

Looking into the age factor, there is not much of a difference in the success rate by age group except for the 50+ group. They have a dramatic decrease from an average of 72% in the years 2018-2021 followed

by a sudden drop to 60% in 2021-22 year, most likely a result of the pandemic and having to be technologically savvy.

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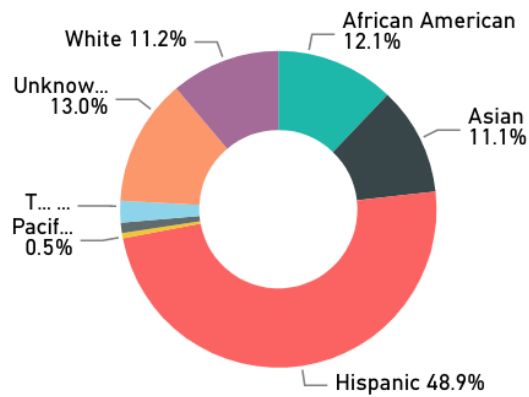
Students

Program Demographics displayed for the selected program/term combination in the most recent completed academic year (2021-22).

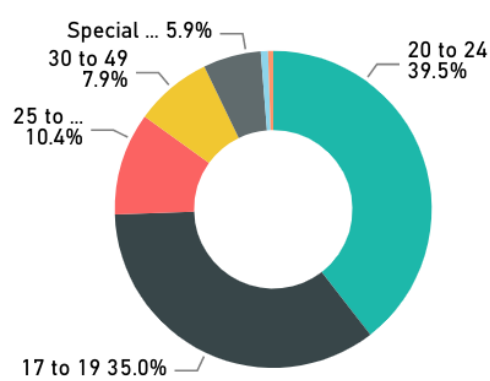


C

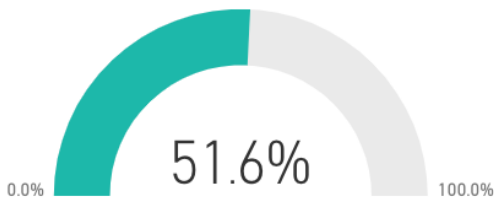
Students by Ethnicity



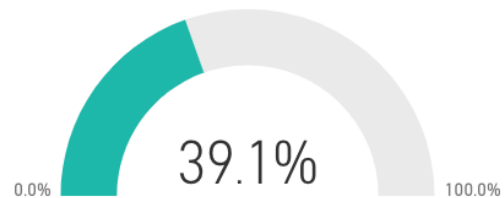
Students by Age Group



Percent Female



Percent Enrolled Full-Time



h) Unit Accumulation: Number of units accumulated by students working towards a program degree/certificate. Discuss whether students who take units beyond the requirements for their educational goals serve educational purposes or not. Focus on general trends, not on particular courses within the program.

N/A

i) Annual earnings: Median annual income of alumni who attended the program under review (or the closest related sector)

N/A

j) *Living Wage Attainment:* Percent of alumni who attended the program under review (or the closest related sector) and earn living wage

N/A

k) *Job in Field of Study:* Percent of alumni who pursued a career education path with a job related to their field of study.

N/A

Curriculum and Outcomes Assessment

a) Examine the program curriculum using an equity lens by responding to the following questions: To what extent does the curriculum:

○ **Prepare students to actively engage in a diverse society?**

In Astro 15 where students learn about aliens and life in the universe, we definitely engage in the most diverse society we can imagine. In all seriousness, our astronomy lecture courses do discuss how other cultures and societies have looked at astronomy throughout time. The El Camino library has many resources on ethno-astronomy and cultural astronomy that we can use in class or have students seek out as a separate project.

○ **Include multicultural content?**

Various topics in our astronomy lecture classes include varying degrees of multicultural content. For example, when we discuss the history of Astronomy we must talk about astronomy from other parts of the world. We frequently talk about how the Greeks advanced astronomy, but we also try to include other countries/cultures in the discussion. We also talk about the lunar calendar system, which is still prevalent in other cultures. When we discuss stars and constellations, we talk about the origin of stellar names and constellations. There is also discussion about the use of sacred land in Hawaii for astronomical purposes, e.g., building of telescopes.

○ **Respond to diverse students' learning needs?**

All our astronomy faculty have had students who need SRC help, in-class note taking help, and other disabilities for which we have always been accommodating. We have also had international students that struggle due to language issues. Astronomy itself is a whole new language, so not only are they struggling with English, but they are also struggling with astronomical words. One faculty has had a deaf student, and a blind student. We have had students who are parents or need to support their families, which requires them to work full-time or more. We have had students in wheelchairs for our lab class, in which usage of telescopes and the observatory becomes difficult or nearly impossible. In all instances, we have had to be more flexible and recognize that there is not one set way of learning. Whether having to explain a topic multiple ways, creating exams/quizzes that test students fairly, using different technology to allow access to equipment, or allowing make-ups and extensions, we have essentially forced ourselves to respond to diverse students' learning needs because otherwise we would be doing an injustice to many students every year.

- **Encourage instructors and students to investigate their own views, biases and values and discuss multiple perspectives different from their own?**

In a science class, instructors and students are encouraged to critically think about various topics. In astronomy, students have multiple beliefs ranging from how the Universe was formed, how old the Earth is, if a solar eclipse means bad luck, and whether their astrological sign really reflects who they are. How do we foster an environment where everyone questions their own biases and perspectives? Via the scientific method. In all our astronomy lecture courses, one SLO is about the scientific method. It is so important to have a systematic way of testing ideas and understanding why the current theories are widely supported. Once students understand the importance of the scientific method, and how pseudoscience and other hypotheses can be disproven, students are able to question their beliefs appropriately. As instructors, we do not belittle others' beliefs, rather we allow them to think about their beliefs and figure out where it fits into science. There have been multiple occasions where religion clashes with scientific theories in astronomy, and as instructors we try to keep the class focused on the science aspects.

- **Use critical/equity-oriented pedagogy?**

In the classroom we tend to not just talk to the students, but rather talk with them. We try to have some discussions occurring. We try to engage them with questions they must answer by collaborating with each other. Some of us use "lecture tutorials", or worksheets to have the students understand the material. We use various technologies we have available, like the planetarium projector, to teach the material allowing students who are more visual learners to understand the content.

When it comes to assessing the students, we also have various ways of doing so. Grades typically do not depend on just homework and exams. We give projects. We give quizzes. Also, our exams are not just multiple-choice type questions. We try to incorporate various question-types, such as drawing, interpreting graphs, short answers, matching, ordering/ranking. Having different types of exam and quiz questions, and different assessment methods allow students to show their strengths. It makes for a fairer learning environment. Overall, our department is aware that students do not learn the same way and we try to allow for opportunities for students to show their strengths.

- **Ensure creating an empowering classroom environment?**

When students enter an Astronomy class on the first day, they think it will entail looking at the stars and learning constellation names only. They soon learn, it is a science course with a whole new language. It quickly makes them feel like they know nothing about astronomy. What is amazing about our program is that as students go through the semester they start learning, actually learning. In our program we have projects, activities, and discussions that allow students to feel empowered about the knowledge they've gained. An extra credit assignment we offer is going to Griffith observatory. We constantly receive feedback on how the students understood the museum as opposed to when they went before taking astronomy. We also give a moon phase project, and it is exhilarating to hear how students can recognize the moon and they tell their friends and family about it. We try to get students to know their sky, the names of constellations, stars, and visible planets. They are always so happy they get to impress their friends and family with their knowledge of the sky. There are astronomy novels that students

read and convey how they knew the places, words, context that was talked about in the book because of the class. We also show APOD (astronomy picture of the day) in class regularly. Each picture comes with a scientific description. By mid-semester students start understanding the pictures and the words. All in all, the course offers many instances where students feel empowered by the knowledge they've gained.

Besides knowledge, students feel empowered learning about astronomical accomplishments by different races and genders. Students are encouraged to go to see the shuttle Endeavor. At the museum, they read about different space shuttle missions and the importance of each one. Numerous times, students point out the missions that include the first female, or first African American, etc. The recognition makes students feel important. In class, we try to bring up women in astronomy when we can as well.

- **Use multiple evaluation techniques sensitive to the diverse ways students can demonstrate understanding?**

In our astronomy program, we tend to have multiple testing techniques. We have quizzes and exams. They are not all multiple choice. They tend to have free response sections, drawing sections, matching, fill-in-the blanks, and true or false. We also have homework assignments and projects. All evaluation methods allow students to do well in at least one area. If a student struggles with exams, we also offer extra credit assignments. One such assignment a faculty member offers is reading a science nonfiction work and writing a review of the book highlighting its main themes, its purpose for existing, and things the student found insightful.

In our astronomy 12 class, the evaluation is based not only on their labs but whether they know how to use the telescope, and how well they know their sky.

In our astronomy 13 class, the evaluation method is mainly based on the progress of their mirror making.

Overall, we do not have one set way of evaluating a student's progress. Specifically, in the lecture courses students have multiple ways to demonstrate their understanding and if one method is not their strongest, they have others to fall back on.

b) Summarize SLO and PLO assessment results over the past four years for key/gateway courses. Gateway courses are determined by your department & division – contact your Dean.

Out of our astronomy courses, Astro 20 and Astro 25 can be considered gateway courses. These two lectures are offered the most throughout a year and thus make up most of our astronomy students.

The SLO results over the past 4 years for Astro 20 can be summarized as follows:

SLO #1 Scientific method: standard not met

SLO #2 Seasons: Standard not met

SLO #3 Planet origins: Standard not met

For all three SLOs, students have not met the standard. This is not to say that students do not understand individual questions asked in an SLO assessment, but rather as a whole. Looking at the data, there have been assessments where students have scored above the standard for parts of the assessment. In Fall 2019, for SLO #2 students scored over 70% for 3 out of 4 of the questions. They were very close to meeting the standard. In Fall 2022, for SLO #3, students did

fine for half the questions asked. Overall, students seem to have a harder time with SLO #1 in Astronomy 20.

The SLO results over the past 4 years for Astro 25 can be summarized as follows:

SLO #1 Scientific method: Standard not met

SLO #2 EM radiation: No data due to covid

SLO #3 Universe origins: Standard not met

Note: SLO #2 was supposed to be assessed during the pandemic, which was postponed.

For the other two SLOs, the standard was not met. As in the case for Astro 20, SLO #1 has poor scores overall, except for specific questions. In Spring 2022, one question out of five had 93% correct rate. SLO#3 has poor scores as well. In Spring 2019, more than half the students had less than 50% on the assessment.

PLOs in astronomy have not provided any substantial data. Since astronomy is not a degree or certificate program, most students only take 1 astronomy course in total. Some take a lecture and lab class; however, the lab class is more hands-on, and students do not always take the classes concurrently or back-to-back. Therefore, the data we have for PLOs do not give us much insight. Students who do take multiple astronomy courses do tend to do well, but it is a very low-number statistics, less than 5% of the total.

c) Discuss programmatic factors contributing to constant, increasing or decreasing trends in the results for SLO and PLO assessment within the previously examined courses.

Looking over the SLO results, the trend seems pretty constant. However, in the most recent years since we have had more online courses, there has been a new trend. Astro 20 SLO #3 was assessed in Fall 2022. Out of the 123 students assessed, 76 students took the course online. The results of the online students were well below the results of the 47 students who had taken the course in person. The SLO results seemed to show a trend of how online learning may not be the best type of learning for most students. More data/assessments need to be conducted to make any solid conclusions.

In general, our department does try to make the SLO results better by incorporating the subject material in the course multiple times a semester, or trying to make worksheets that address the material. For Astro 25, SLO #3, the material that needs addressing does not typically occur until the very end of the semester, and it gets rushed. Students tend to be overwhelmed with finals making the material harder to digest. We need to come up with a solution. Retention is sometimes an issue as well. The timing of when to administer the assessment can be altered, which can change the trends. The SLO assessments have been adjusted over the years to make it more accessible on canvas and easier to understand, which may change the trends in the coming years as well.

d) Highlight equity gaps found in SLO and PLO assessment results among different groups of students.

We do not have much data for this as of now. As we incorporate the SLO and PLO assessments on canvas and outcomes, we will be able to better answer this.

SECTION 3

Program Vision and Future Planning

Program Vision

A) Describe the vision of the program for the next four years considering the assessment reported in the previous section, student groups that are underrepresented in the program's field, and any relevant changes within the program field/industry. A vision statement describes the desired future state of the program.

The Astronomy program would like to increase enrollment, increase outreach, and stick to college-level expectations in student learning and pedagogy.

In order to meet our vision statement, we need to hire a planetarium manager, hire one full-time faculty, upgrade the planetarium, make astronomy into a degree program, add an astrophysics course and possibly an astrophotography course, increase public planetarium and telescope nights, and make the observatory ADA accessible.

Future Planning *

A) Based on the assessment reported in the previous section, develop program goals to be completed during the next four years in relation to:

- **Adjusting the curriculum for coherence and alignment with students' workforce needs**
- **Advancing towards a more equitable program to close equity gaps among groups of students**
- **Clarifying students' paths to completion, further education and employment**
- **Helping students explore options and build foundation skills**
- **Helping students stay on the path**
- **Integrating applied learning experiences**

To meet some goals, we can increase our outreach. If we had more planetarium shows or telescope nights, we could have more opportunities for the public to become aware of our astronomy department and El Camino. We can also reach out to more high school students and younger children. They can be introduced to hands-on science at an earlier age or in a different manner than in a classroom. Having more outreach and reaching out to more youth can help students with exploring options and building foundation skills. It can also help with keeping students on a path.

Another goal we can strive for is adjusting the curriculum by expanding our courses and having a program or certificate degree for our department.

Keeping some online courses available, but perhaps upping the level of rigor, can allow for a more equitable program.

B) What projects will the program complete to achieve the desired goals? Please specify at least two for each goal.

For the outreach aspect, and thus helping students with exploring options and building foundation skills, and keeping students on a path, we would like to offer more public planetarium shows and telescope nights. We also have an Astronomy Club on campus, and they can also reach out to students more. Hiring a planetarium projector can tremendously help with the goal.

For adjusting the curriculum goal, we would like to introduce two new courses. One of them would be a specialized astrophotography course. Another course we would like to introduce is an astrophysics course. With an astrophysics course, we can better argue for having a degree or certificate program.

For having a more equitable program, we would like to continue offering online courses. Other projects that can help with this goal still need to be discussed.

C) When the next program review is due, how will the program determine if the goals have been met? Please specify at least one quantitative target or qualitative accomplishment for each goal.

In general, comparing the data and looking specifically at student retention and success rates can help us identify how our program is doing during the next program review. We can measure if our equity gap has improved or worsened.

For outreach purposes, keeping track of attendance helps determine how successfully we are reaching out. Perhaps we can also start having a survey that targets high schoolers and younger attendees.

Program Resources

In the following areas, what are the resources needed by the program to meet the goals for the next four years?

- **List resources in order of priority. You might want to prioritize them within each category and/or develop an overall prioritized list of resources.**
- **Explain how these resources contribute to the [College's equity goals](#).**

a) Staffing

Planetarium/observatory manager:

Our primary goal is to hire a Planetarium/observatory Manager. Filling this position will restore our public programs and will help short- and long-term recruitment. The manager would also be able to maintain all equipment and do the general upkeep of facilities. This is essential with all the improvements and expensive equipment in the planetarium and observatory. Currently, faculty members try to upkeep the telescopes, which is not part of our contract. We have been responsible for minor repairs, collimating telescopes, handling repair orders, and ordering and organizing parts for Astro 13 all of which is unpaid extra work. The manager would also help students in all lab sections. This has been a high priority for this department for 25 years. A planetarium manager would be responsible for offering Planetarium shows to elementary and middle school students during the day and would also

be responsible for evening shows for the community as a whole. All other sciences have lab technicians. A planetarium manager would be astronomy's dedicated lab technician.

Full-time faculty member:

In the past four years, two full-time faculty members have retired. We have only replaced one. Our program needs 3 full-time faculty members. We once had 4. We have over 6 sections every semester being taught by part-time faculty. Having a third faculty member can ease responsibilities for the current 2 full timers (currently all the extra division duties are split among the two of us), it can bring more consistency in teaching and grading for students, and it is generally hard to find good part-time faculty in astronomy.

b) Facilities and Equipment

Update Planetarium computer projector/sound system:

The planetarium recently acquired a brand-new podium computer. We also received a newer projector for our lectures. However, the wiring makes the two new systems not communicate well. There is also a constant buzzing sound coming from the sound system. Overall, the wiring, equipment, and infrastructure need to be updated. The buzzing sound and projector issues can be very distracting to students and faculty.

Make Observatory ADA accessible and upgrade:

Currently, the observatory is not ADA accessible. There are only stairs available. Also, to get to the rooftop there is an elevator which needs a faculty/staff keycard. These two aspects make the observatory, and thus our Astro 12 lab class, not equitable. While updating the observatory, we can also upgrade the 16" telescope that currently the observatory houses. The telescope could be replaced with a bigger scope. In the meantime, the telescope needs to be serviced and cleaned.

New Planetarium Building:

The current Planetarium is over 50 years old. As other buildings on campus are being updated, it only makes sense to give the planetarium a facelift as well. We could expand the planetarium to add wings to serve as classrooms. We can modernize the interior and exterior of the planetarium. Adding classrooms and modernizing the building can allow for more class time flexibility, more enrollment, more outreach opportunities for K-12 school groups, and a chance to display recent astronomical findings. Our current posters and display cabinets can be updated. We can also update the plumbing, as the current water fountain does not always taste great.

c) Technology/Software

New Planetarium Projector:

Our current Chronos Goto projector has lived about half its life, however the computers that communicate with the projector do not have as much time left. We are currently trying to

purchase some back-up computers that need to run Windows 2000 to extend the use of the projector. Inevitably, the day will come when we will not have a working projector. It is essential we continuously search for a new system. The current projector helps students understand the visual aspects of astronomy, and it provides wonderful outreach, however there are limitations. Modern projectors can do a lot more than what our current projector does, such as zooming into sky objects, being able to see more stars and all the constellations, and incorporating digital videos during a show more readily. Having a modern projector would enhance our curriculum and student learning.

d) Contracts/Services

Offer more planetarium outreach shows:

The astronomy program has various resources that can provide wonderful outreach such as the planetarium, telescopes, and demonstrations. However, faculty alone cannot provide as much as we would like. Currently, faculty get paid through a school grant, which is not a permanent funding source. We need to come up with sustainable funding or we hire a planetarium manager. The public shows we currently provide consistently receive great feedback and influence many youths. It is a shame that we are not able to use our resources to their fullest capabilities.

APPENDIX A

CAREER EDUCATION (CE) SUPPLEMENTAL QUESTIONS

CE programs must conduct a full program review every 4 years. The comprehensive program review includes responses to the CE supplemental questions below. Every two years (once between full program reviews) these supplemental questions must be answered and submitted to Academic Affairs for posting on the College website.

Use labor market data, advisory committee input/feedback, and institutional and program-level data to respond to the following questions:

- 1. How strong is the occupational demand for the program?** In your response, describe any changes in demand over the past 5 years and discuss the occupational outlook for next five (5) years. Provide applicable labor market data (e.g., US Bureau of Labor Statistics, Employment Development Department) that address state and local needs.
- 2. How does the program address needs that are not met by similar programs in the region?** In your response, identify any distinctive components of the program (e.g., curriculum, facilities, resources) and/or describe any unique contributions the program or its students/graduates make to the community served.
- 3. What are the completion, success, and employment rates for students in the program?** In your response, identify the standards set by the program and discuss any factors that may impact completion, success, and employment rates among students in the program. Describe the status of any action plans for maintaining/improving rates relative to such benchmarks.
- 4. List any licensure/certification exam(s) required for entry into the workforce in the field of study and report the most recent pass rate(s) among program graduates.** In your response, identify any applicable performance benchmarks set by regulatory agencies and describe the status of any action plans for maintaining/improving pass rates relative to such benchmarks.
- 5. Are the students satisfied with their preparation for employment? Are the employers in the field satisfied with the level of preparation of program graduates?** Use data from student surveys, employer surveys, and other sources of employment feedback to justify your response.
- 6. Is the advisory committee satisfied with the level of preparation of program graduates? How has advisory committee input and feedback been used in the past two years to ensure employer needs are met by the program?** Describe the status and impact of any advisory committee recommendations.

California Education Code 78016 requires that the review process for CE programs includes the review and comments of a program's advisory committee. **Provide the following information:**

- a. Advisory committee membership list and credentials.
- b. Meeting minutes or other documentation to demonstrate that the CE program review process has met the above Education Code requirement.