College of San Mateo — Program Review Submission

Instructional Program Review

Program Name: **Astronomy**
Program Contact: **Stanford, Darryl**
Academic Year: **2013-2014**
Status: **Submitted**

1. Description of Program

Provide a brief description of the program and how it supports the college's **College Mission and Diversity Statements**, **Institutional Priorities, 2008-2013**, **5 in 5 College Strategies, Spring 2011**, and other **Institutional Program Planning** as appropriate.

The Astronomy Department offers labs and courses in introductory astronomy. These courses and labs enable students to discover and critically analyze the universe around them. The student will get a basic understanding of the universe and all that is contained within it. More advanced students can use the observatory to pursue independent research on spectroscopy and photometry. All of the courses and labs are UC and CSU transferrable.

We have also started the first step in our Astroimaging and Observatory Operation certificate program. The Introduction to Astrophysics course (ASTR 200) with a small group of 6 students is running. The next step occurs in Fall 2014, when these students take ASTR 203, Astroimaging Techniques.

2. Student Learning and Program Data

A. Discuss Student Learning Outcomes Assessment

Reflect on recent SLO assessment results for courses and degrees and certificates offered by the program. Identify trends and discuss areas in need of improvement.

Assessments are ongoing. Here are some results from ASTR 115 Solar System Astronomy:

SLO 1: Explain the reason for the seasons.

90% of the students got that answer correct.

SLO 2: Analyze the role of tectonics in shaping the surfaces of the terrestrial planets.

78% of the students got that answer correct.

SLO 4: Contrast the similarities and differences of the major solar system moons.

76% of the students got that answer correct.

In each case, the assessment method was a passing grade of 70% on a 50 question multiple choice exam. Apparently SLO 1, was easiest for the students, because it is not difficult for them to relate to the seasons. However, SLO 2 was somewhat more difficult, because students must first understand what the word 'tectonics' means with respect to the Earth and apply it to the other terrestrial planets. SLO 4 was also somewhat difficult, since students had to remember a number of moons as well as their characteristics. I think spending a bit more time on these topics, and discussing them in more detail, may lead to deeper understanding.

B. Student Success Indicators

1. Review **Student Success and Core Program Indicators** and discuss any differences in student success indicators across demographic variables. Also refer to the **College Index** and other relevant sections of the **Educational Master Plan: Update, 2012**, e.g., Student Outcomes and Student Outcomes: Transfer. Basic Skills programs should also refer to **ARCC** data.

Student Success Indicators

Astronomy		**Success (%)**	**Retention (%)**	**Withdraw(%)**
	2010-11	71.3	86.4	13.6
	2011-12	72.6	89.1	10.9
	2012-13	74.6	89.2	10.8

College		**Success (%)**	**Retention (%)**	**Withdraw (%)**
	2010-11	69.4	83.5	16.5
	2011-12	71	84.7	15.3
	2012-13	70.1	83.9	16.1

Math/Science		**Success (%)**	**Retention (%)**	**Withdraw (%))**
	2010-11	65.9	80.8	19.2
	2011-12	67.4	82.7	17.3
	2012-13	66.6	81.1	18.9

As can be seen from the data above, Astronomy has exceeded both the retention and success figures for the Math/Science division and college for the years 2010-13. In addition, the withdrawal rate is far lower than both college and the Math/Science division.

The following are the Successful Course Completion Rates for the 2012-2013 year.

The success rate for Hispanic students taking Astronomy courses was 70.5%, while it was 57.4% for the Math/Science Division and and 64.1% for the College. The rate for white students was 74.3%, 70.6% and 74% respectively. The corresponding rates for Native American students were 83.3%, 56% and 62.4% respectively. Black students accounted for only 2.9% of Astronomy's total enrollment, but had a success rate of 71%, compared to 51.1% for Math/Science Division and 59.3% for the college. The number of Black students is unfortunately very low, as is the case all across the board for Math/Science Division and the college. However, Black students are sorely underrepresented in Astronomy. This is partly due to lack of role models as well as insufficient exposure to the science. I do, however, see many Black families coming to our planetarium shows, Project Star Gaze, and Jazz Under the Stars events. Hopefully, this exposure will help to increase the numbers. Overall, students are succeeding at a higher rate taking the courses the Astronomy Department offers, compared to the corresponding rates for the Math/Science Department and the College.

Why is this so? Perhaps, students really enjoy taking these courses and as a result respond favorably. Many of them participate in our

community outreach activities and also like to let their instructors know of the latest news in astronomy. This means that these students are really interested and as a result have a good success rate.

2. Discuss any differences in student success indicators across modes of delivery (on-campus versus distance education). Refer to **Delivery Mode Course Comparison**.

The online courses have been successful. The enrollment was 232 students in the Fall 2011 and 2012 semesters. The retention rate is 90.9%, compared to 85.3%, summing over all traditional astronomy courses. The success rates are comparable: 66.4% for the online course compared to 64.3% for the traditional course.

C. Program Efficiency Indicators. Do we deliver programs efficiently given our resources?

Summarize trends in program efficiency as indicated in the **Student Success and Core Program Indicators** (LOAD, Full-time and Part-time FTEF, etc.)

Program Efficiency Indicators

For Astronomy:

LOAD in Fall 2012 was 1039.8, in Spring 2013, it was 1036.3 and in Summer 2013, it was 1372.7. The success rate for the same time period was 73.3%. 76% and 83.6% The withdrawal rate was 11.2%, 10.4%, and 5.6%.

For the College:

The comparable LOAD figures for the college as a whole were 545.1, 519.7, and 535. The success rate for the College for the same time period was 70%,70.3%, and 79.3%. Lastly, the withdrawal rate was 15.4%, 16.9%, and 10.4%.

For the Math/Science Division:

LOAD for the comparable period was 543.6, 516.5, and 613.4. The success rate for Math/Science Division was 65.9%, 67.3%, and 78.8% Lastly, the withdrawal rate was 18.5%, 19.3%, and 10.5%.

The Astronomy Department's LOAD figures are higher than both the College's and Math/Science departments, The success figures are higher than both the College's and Math/Science departments and the withdrawal figures are lower than both the College's and Math/Science departments. Overall, the Astronomy Department is doing very well in retaining and enabling students to succeed.

3. Career Technical Education

D. Additional Career Technical Education Data - CTE programs only. (This information is required by California Ed. Code 78016.)

1. Review the program's **Gainful Employment Disclosure Data**, **External Community**, and other institutional research or labor market data as applicable. Explain how the program meets a documented labor market demand without unnecessary duplication of other training programs in the area. Summarize student outcomes in terms of degrees, certificates, and employment. Identify areas of accomplishment and areas of concern.

2. Review and update the program's Advisory Committee information. Provide the date of most recent advisory committee meeting.

4. Additional Factors

Discuss additional factors as applicable that impact the program, including changes in student populations, state-wide initiatives, transfer requirements, advisory committee recommendations, legal mandates, workforce development and employment opportunities, community needs. See **Institutional Research** as needed.

The main factor impacting the program is the money needed to maintain the service contracts on our planetarium equipment. As this report is written, Astronomy has just received word that our GOTO CHRONOS maintenance contract has been extended for five more years. Our Evans & Sutherland digital system contract expires April 1, 2014, and we are seeking to extend this contract, as well.

5. Planning

A. Results of Program Plans and Actions

Describe results, including measurable outcomes, from plans and actions in recent program reviews.

We have purchased an FLIR camera. This was used in a number of demonstrations and experiments in the classroom and the lab. For instance, the camera allowed students to see themselves in the infrared portion of the electromagnetic spectrum. They were able to see the different temperatures of their hair, skin, clothes, etc. This showed them how different parts of their bodies can be at different temperatures.

Clickers are now being used in all of our lectures, as a result of a rental agreement between the bookstore and the clicker company. Clickers are allowing us to increase student to student and faculty to student interaction. Students love using them, since it allows them to compete with their friends, as to who knows the correct answer. Faculty love using clickers because they allow them to really see if the students understand the material. It also allows faculty to hear from students, who are normally reticent to express their opinion.

B. Program Vision

What is the program's *vision* for sustaining and improving student learning and success over the next three years? Make connections to the **College Mission and Diversity Statements**, **Institutional Priorities, 2008-2013**, and other **Institutional Program Planning** as appropriate. Address discussion in the Student Learning and Program Data section: SLO assessment results and trends in student success indicators. [**Note**: Specific plans to be implemented in the next year should be entered in C of the Planning section.
CTE programs must address changes in the context of completion and employment rates, anticipated labor demand, and any overlap with similar programs in the area as noted in D1 and D2 of the Career Technical Education section.]

The Astronomy Department now has an Astroimaging and Observatory Operation (AOOC) Certificate, recently approved by the California state review board. The AOOC program is designed such that, upon completion, students are qualified to operate any observatory, and apply various imaging techniques to gather and analyze astrophysical data. With minimal modification, students can apply their course load for this program toward a BS degree in astronomy or astrophysics upon transfer to any four-year institution that offers such a degree. Bay Area colleges and universities, as well as professional observatories, are in need of qualified technicians that can operate telescopes and various imaging devices to collect astrophysical data and advance the field of astronomy. For instance, a graduate of this program is well equipped to operate the telescopes at Stanford University or San Francisco State University. There is a high demand for such technicians and there are very few institutions that can train the students in this field. The College of San Mateo Astronomy Department, with its roll off roof observatory and trained staff and faculty, is in a unique position to fulfill that need.

1. To guide future faculty and staff development initiatives, describe the professional activities that would be most effective in carrying out the program's vision to improve student learning and success.

The Astronomy Department is interested in pursuing Reading Apprenticeship. We believe it would be important in ascertaining how well Astronomy students comprehend their textbook. There are a number of students, for whom English is their second language. Reading

Apprenticeship would be a way to see how well these students are really comprehending their book.

2. To guide future collaboration across student services, learning support centers, and instructional programs, describe the interactions that would help the program to improve student success.

We like the Supplemental Instruction (SI) Program and hope that it can be instituted for the Astronomy program. We can see how a student, who has gone through a particular class, can indeed improve the success of other students, who are having difficulty, in that class.

3. To guide the **Institutional Planning Budget Committee** (IPBC) in long-range planning, identify any major changes in resource needs anticipated during the next three years. Examples: faculty retirements, equipment obsolescence, space allocation.

See the Resource Requests section below to enter itemized resource requests for next year.
Leave sections blank if no major changes are anticipated.

Faculty

We would like to hire a full time faculty member during the next few years. We have just instituted a new certificate program, the Astroimaging and Observatory Operation (AOOC) Certificate program. The AOOC program is designed such that, students are qualified to operate any observatory, and apply various imaging techniques to gather and analyze astrophysical data. To fully implement this program and to address our increasing enrollment, a full time faculty member is needed. At present, there is just one full time faculty member (on overload) and two adjuncts teaching 1065 students in 26 sections for the 2012-2013 academic year.

Equipment and Technology

Our Evans & Sutherland D3 digital video system and video projectors in our planetarium are old and outdated. Within the next two to three years, the manufacturer will no longer support any maintenance agreement for our D3 projectors. Our present digital system service contract for D3 expires April 1, 2014. We hope to update our digital system to a more modern system and are presently evaluating what would work best for us. We are looking for a state-of-the-art system, with the ability to incorporate the latest astrophysical data sets. This would allow us to present the most realistic content to students and the community. Our present video projectors project an image with a fulldome resolution of 2K x 2K pixels, which is a relatively low resolution. We anticipate going to video projectors, which can project 4K x 4K worth of data onto our dome. This increased resolution will give sharper, more realistic images and is more in keeping with our state-of-the-art facility. In addition, we hope to purchase 2 new planetarium shows, to update our present selection. It is extremely important for us to purchase full dome content, reflecting the latest advances and discoveries in astronomy. These shows vary in price, from $5000 to $10,000 each.

Instructional Materials

Observational Astronomy 103 Lab and astronomy 101 lab students can now continue to be able to observe and analyze emission line spectra of typical gas tubes. Several of our tubes have deteriorated and new ones are needed.	Cost **$1088.95**
Edmund Scientific gas tubes:	
5 Hydrogen gas tubes @ $37/tube	$ 185.00
5 Helium gas tubes @ $37/tube	$ 185.00
5 Mercury gas tubes @ $37/tube	$ 185.00

2 Neon gas tubes @ $37/tube	$ 74.00
SOFIA Active Astronomy Infrared Kit	$ 85.00
SA 200 Diffraction Grating	$200.00
20 Clipboards	$100.00
Celestron Micro Guide Eyepiece	$74.95
Total	**$1088.95**

Classified Staff

Not applicable

Facilities

Not applicable

C. Program Plans and Actions to Improve Student Success

Prioritize the plans to be carried out next year to sustain and improve student success. Briefly describe each plan and how it supports the **Institutional Priorities, 2008-2013**. For each plan, list actions and measurable outcomes. (Plans may extend beyond a single year.)

Plan 1

Title
Solar and Stellar Spectroscopic Observations

Description
Observational Astronomy 103 Lab and astronomy 101 lab students plan to be able view and analyze spectra of the sun and other stars. In addition, this equipment will support our new Astroimaging and Observatory Operation (AOOC) Certificate.

Action 1	Completion Date	Measurable Outcome(s)
Observe the sun's Fraunhofer lines and the Zeeman Effect on sunspots.	Ongoing	Students will complete several solar observing labs

Action 2	Completion Date	Measurable Outcome(s)

Observe stellar spectral absorption lines and determine the elements they represent.	Ongoing	Students will complete several stellar spectral labs

Plan 2

Title
Emission Line Spectra observations

Description
Observational Astronomy 103 Lab and astronomy 101 lab students can now continue to be able to observe and analyze emission line spectra of typical gas tubes. Several of our tubes have deteriorated and new ones are needed. In addition, another power supply will allow students to view the spectra of an additional 'unknown' gas.

Action 1	Completion Date	Measurable Outcome(s)
Observe emission line spectra of various gases.	Ongoing	Students will complete several spectroscopy labs

Plan 3

Title
Special Projects Student Research and Support of our New Astroimaging and Observatory Operation (AOOC) Certificate Program

Description
Special projects students conduct original research in imaging of nebulae and galaxies, stellar spectroscopy, and photometry of exoplanets, pulsating variable stars and eclipsing binaries. In addition, our new astroimaging certificate program will benefit from getting a new, small refractor for visual observing, and other equipment for updating our observatory's facilities.

Action 1	Completion Date	Measurable Outcome(s)
Special projects students complete their projects.	Ongoing	Students are able perform research, using our state-of-the-art equipment. They submit a report at the end of the

		semester o their research.

Action 2	Completion Date	Measurable Outcome(s)
Students complete the requirements for their astroimaging certificate	Ongoing	Our certificate program has begun in Spring 2014.

6. Resource Requests

Itemized Resource Requests

List the resources needed for ongoing program operation.

Faculty

NOTE: To make a faculty position request, complete **Full-time Faculty Position Request Form, AY 2013-2014** and email to your Dean. This request is separate from the program review.

Full-time faculty requests	Number of positions
Full-time Astronomy faculty position	one

Equipment and Technology

Description	Cost
Orion ShoreView 8 x 42 Waterproof binoculars @ $50 each - 10 required	$400.00
Explore Scientific 102mm Air-Spaced Triplet ED Refractor Telescope	$1249.99
Losmandy GM8 G Equatorial mount w/Gemini GOTO Electronics @ $2495 - 2	$4990.00

required	
Losmandy to Vixen Dovetail Adaptor	$130.00
Losmandy to Universal Dovetail Adaptor	$130.00
Shelyak Alpy 600 Spectrograph	$759.00
Lhires Lite visual spectroscope	$1935.00
Lhires III spectrograph	$4900.00
Maxim DL Software Program for image analysis and reduction	$500.00
Total	**$14993.99**

Instructional Material

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Description	**Cost**
Edmund Scientific gas tubes:	
5 Hydrogen gas tubes @ $37/tube	$ 185.00
5 Helium gas tubes @ $37/tube	$ 185.00
5 Mercury gas tubes @ $37/tube	$ 185.00
2 Neon gas tubes @ $37/tube	$ 74.00
SOFIA Active Astronomy Infrared Kit	$ 85.00
SA 200 Diffraction Grating	$200.00
20 Clipboards	$100.00
Celestron Micro Guide Eyepiece	$74.95
Total	**$1088.95**

Classified Staff

Description	Cost
Not applicable	

Facilities

For immediate or routine facilities requests, submit a CSM Facility Project Request Form.

Description	Cost
Not applicable	

7. Program Maintenance

A. Course Outline Updates

Review the **course outline update record**. List the courses that will be updated in the next academic year. For each course that will be updated, provide a faculty contact and the planned submission month. See the **Committee on Instruction website** for **course submission instructions**. Contact your division's **COI representatives** if you have questions about submission deadlines.

Career and Technical Education courses must be updated every two years.

Courses to be updated	Faculty contact	Submission month
ASTR 125	Darryl Stanford	May 2014

B. Website Review

Review the program's website(s) annually and update as needed.

Faculty contact(s) (our Astronomy tech maintains our website)	Date of next review/update
Dean Drumheller	ongoing

C. SLO Assessment Contacts

Faculty contact(s)	Date of next review/update
Darryl Stanford	May 2014
