PROGRAM OVERVIEW

Program Title: Astronomy

Program Code: 1911 - ASTRONOMY/PLANETARIUM

Review Type: Instructional

Does this review contain any career technical education (occupational) programs?
No

External Regulations:
No

Chaffey College Mission Statement

Chaffey College improves lives within the diverse communities it serves through equal access to quality occupational, transfer, general education, and foundation programs in a learning-centered environment where student success is highly valued, supported, and assessed.

Please describe how your program supports the college's mission and discuss how your program evaluates its effectiveness in meeting the college mission:

Astronomy offers general education courses with lab and lecture components conferring physical science credit for degree or transfer. Because of its emphasis on digital data and images, astronomy is able to offer labs that are more portable than many sciences. Astronomy offers hybrid courses for students whose life situation makes classroom attendance challenging. Moreover, astronomy offers labs that can be taken into the CIW prison, so we are able to serve inmate students, some of the most vulnerable in our district. Astronomy evaluates the effectiveness of instruction through the SLO process.

Review Team Response

Given that astronomy is a non-degree program, its reach within the various educational programs of the College is remarkable.

PROGRAM DATA

Enrollment
Given the data, what changes can be identified in enrollment patterns? Identify any important trends and explain them.

Though Astronomy is still a small program, total enrollment has increased greatly, by over 49% in the last year. This is due to new offerings of fast track courses, and to extending lab and lecture offerings at Fontana, Chino and online, while largely maintaining offerings at Rancho. While astronomy's economical and flexible lab requirements make it an advantageous science for the college to grow, such rapid growth may be affecting success and retention. Responding to growth will be key to Astronomy's Improvement Plan. Astronomy numbers are still small enough that deviations from college trends are not meaningful for smaller ethnicity/gender categories, but under representation of hispanic and female students may be significant. While this is in keeping with national trends in physical science, it is troubling. (Analysis of the actual number of underrepresented students follows as an attached file.)

Retention
Given the data, what changes can be identified in retention patterns? Identify any important trends and explain them.

Total retention rates in Astronomy are still good, but they have generally declined, except in online courses where retention has increased since 2008/2009. Declines are concentrated in daytime courses. Causes of these declines are probably related to staffing issues brought on by astronomy's recent rapid growth. (For example: three new adjunct instructors with physics qualifications but no prior experience teaching astronomy, time required for full-time faculty extensively to mentor these new adjuncts, instructors teaching fast track for the first time on very little notice.) A reasonable implication for Astronomy is that we should attempt to hold program size constant in the near future while addressing retention and success. It would not be wise intentionally to shrink astronomy as that would squander effort recently put into developing new adjuncts.

Success
### Measure

<table>
<thead>
<tr>
<th></th>
<th>2008-09 to 2009-10</th>
<th>2009-10 to 2010-11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Census Success</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Day</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Evening</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Online</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Arranged</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Given the data, what changes can be identified in student success patterns? Identify any important trends and explain them.
Like retention rates, success rates have declined, especially in the last year, with particular deficits among African-American and female students. This also probably has its origin in our rapid growth. A similar conclusion can probably be drawn: it would be wise to hold program size constant in the near future while our new staff builds experience and while the program addresses student success as will be described in the Visionary Improvement Plan.

Review Team Response
Data and trends are interpreted properly. Implications for the program are included. Suggestions that program size be held steady over the next several years seem reasonable given the thorough assessment of the apparent trends in enrollment, retention, and success.

DEGREE/CERTIFICATE DATA

Review Team Response

STUDENT LEARNING OUTCOMES
Distinguish between scientific arguments and those generated from other ways of knowing.
Discuss how the number, type, depth, and breadth of the courses support program SLO's.
Astronomy currently offers two courses, ASTRON 26 (Stars & Galaxies--3 units, no lab) and ASTRON 35 (Planets & the Solar System--4 units, with lab). Each supports all of Astronomy's program-level SLOs, which is appropriate because each is a free-standing transfer- or degree-level general education course. (Note that the list of SLOs is not properly populated in this PSR. See complete list in Attaced Files. Astronomy's Program SLO Curriculum Mapping Matrix and Program SLO to Core Competencies Mapping Matrix are also attached.)

Discuss how courses in the program articulate with or complement each other.
Students usually take only one Astronomy course, because either one is sufficient to meet physical science general education requirements. While subject matters differ, level is comparable, and course choice probably depends mostly on whether students need lab credit or not. In either course, students are introduced to and practice all Astronomy SLOs (except that the lab SLO pertains only to the lab course). Because these are introductory courses, only one SLO is pursued to mastery: that students will be able to follow astronomy discussions in lay or popular media. Astronomy does not and should not have majors, because an intending astronomer should be single-mindedly focussed on attaining calculus-level physics.

Discuss how courses in the program interact with other programs on campus (for example: cross-listing, overlapping content, or shared resources).
Both Astronomy courses are applicable to IGETC, Cal State transfer, and the general education physical science requirement for the associate degree. They are also applicable to associate degrees in Physical Science and Earth Science. Astronomy 35 is the only science course available via the Chaffey CIW program. Both astronomy courses advise completion of MATH 410. Some content in both courses overlaps with Physics, and some content in Astronomy 35 overlaps with Geology. Astronomy shares dedicated lab space with Geography on the Rancho campus and can share lab space with other sciences as needed at Chino and Fontana, though the latter arrangements are ad hoc. Astronomy shares adjunct instructors with Physics because the minimum qualifications are the same, and Astronomy is coordinated with Geography and Geology/Earth Science. Astronomy tutoring is available in the Rancho Success Center, and astronomy has participated in the SI program since 2008.

How and when has your department assessed Program SLO's' and how have you responded to the results?
In a program with only one full-timer, SLO assessment has gone slowly, but Astronomy has assessed at least one SLO across all sections taught by the full-timer every term since 2008. Astronomy has not been successful in getting more than occasional adjunct SLO participation. During the four semesters of 2009-2010, Astronomy assessed two related SLOs that required students to communicate key ideas in astronomy: the idea that the universe contains structure on a wide range of scales, and the idea that structures in the universe are the result of physical processes. As a communication SLO, it was to be assessed via a rubric developed by the full-time faculty member, and this rubric was applied to student oral presentations. While this SLO was, on average, met across all sections, differences between sections inspired improvements to pedagogy that will be discussed in the next box. Also in spring of 2010 and fall of 2011, Astronomy completed various required documents: the Program SLO Curriculum Mapping Matrix, the Program SLO to Core Competencies Mapping Matrix, the 2010 SLO Annual Report
and the Chronological Assessment Plan. The Core Competencies Matrix was very gratifying, as there proved to be substantial overlap in the areas of global awareness, information competency, communication skills, critical thinking and academic development. That suggests that Astronomy SLOs express Chaffey values. By the Spring of 2011, however, it was becoming clear that our assessment strategies, though motivated by the attempt to be rich and deep, were simply not realistic for our novice adjuncts. Occasional adjunct involvement mostly suggested that even using the same rubric, different instructors were applying different standards. In Spring and Fall of 2011, the full-timer experimented with a simplified rubric to evaluate the same SLOs via a short essay test question. Even this seems unrealistic. Astronomy is coming to the conclusion that our growing ratio of adjunct instruction makes adjunct involvement our key SLO challenge. Astronomy will next try evaluating SLOs via a common set of multiple choice test questions. Multiple choice may go less deep, but right now, Astronomy needs to evaluate more broadly.

**What program or course changes have been made based on the result of the assessed outcome?**
1. assessed SLO outcomes have highlighted the need to provide increased Astronomy resources (in the form of a small library of recent periodicals) to CIW to support inmate students communication and information competency activities. The library was brought to CIW for Cohort 2, and the improvement in quality of presentation (as well as student engagement in the presentations) was striking! 2. SLO assessment has also suggested that students in some (not all) hybrid sections get too little opportunity for student-to-student discussion. The problem is that the change to pedagogy--adding more online, written communication--does not reliably prepare students for the oral presentations by which the SLO is evaluated. If improved oral communication is the real goal, a better solution will probably be to find more classroom time for student discussion (by moving even some of the labs online). However, if we move to multiple-choice assessment, we may not be have a chance to test.

**Review Team Response**
Overall Program Level Implementation of SLOs is Proficiency: SLOs and authentic assessment are in place for the programs SLOs. Results of assessment are being used for improvement. There is widespread dialogue in the program about the results. Decision-making includes dialogue on the results of assessment and is purposefully directed toward improving student learning. Comprehensive SLO reports exist and are completed on a regular basis. The Outcomes and Assessment Committee would like to commend your program for your work on Student Learning Outcomes.

**Discuss how your services help maintain a high level of student satisfaction.**

**Discuss how you evaluate your effectiveness in meeting students' needs.**

**How and when has your service reviewed or revised SLOs and/or AUOs?**

**How has your program utilized SLO/AUO assessment results for program improvement?**

**Review Team Response**

**CURRICULUM UPDATE**
Courses should be updated every six years; if course updates are due, please describe your plan and timeline for updating courses:
I thought that I updated Astron 26 completely last summer. Evidently I didn't. I will do so this spring.

What steps has your program taken to proactively respond to changing and emerging student and community needs?

Briefly explain:
Astronomy has not developed new courses or programs, but it has expanded existing lecture and lab offerings at the Chino and Fontana campuses, and now offers lecture and lab instruction at all Chaffey sites (though equipment and supply sets remain to be completed). We are also experimenting with a new teaching format: Audio Power Points have been piloted as a more effective and interactive alternative to lecture capture for distance astronomy students online and at CIW. At CIW, where these have already been in extensive use this term, student and tutor response has been very positive. Since we have not had INET instruction this term, we are still looking forward to the chance to test the Audio Power Points for INET students. (PSR review team asked whether a needs assessment had been carried out. Astronomy did not do an assessment of the need to expand to Chino and Fontana. Astronomy was told by our dean and coordinator that expansion to other sites was a College priority.)

Review Team Response
Astronomy curriculum seems to be responding well to emerging campus needs.

Review Team Response

NON-INSTRUCTIONAL PROGRAM INFORMATION

How does your program improve, expand, or support student learning? How do you know?

Describe staff functions and services (these can include diversity, specialties, staff preparation and training, professional activities and committee participation, accomplishments, grants, new programs etc.)

How does your program evaluate its effectiveness?

Review Team Response

STUDENT SUPPORT - ACCESS

How do the services you provide to students facilitate access to learning? (e.g. - admissions applications,
payment processing, pre-requisite clearances, assessment testing, adaptive technology, program applications, healthcare, student activities, and other specialized services.)

<table>
<thead>
<tr>
<th>Type of Service</th>
<th>Description of Service</th>
<th>How many students received this service?</th>
<th>Measured with?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>08-09</td>
<td>09-10</td>
</tr>
</tbody>
</table>

**Additional information:**

Review Team Response

**STUDENT SUPPORT - SUPPORT**

How do the services you provide to students support student learning? (e.g. 'counseling, orientations, workshops, financial assistance (scholarships, grants, etc'), career assessments, health education, service learning, advisory committees, and other specialized services.)

<table>
<thead>
<tr>
<th>Type of Service</th>
<th>What knowledge, skills, and/or abilities are learned?</th>
<th>How many students received this service?</th>
<th>Measured with?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>08-09</td>
<td>09-10</td>
</tr>
</tbody>
</table>

**Additional information:**

Review Team Response

**STUDENT SUPPORT - OTHER**

How do the services you provide to students promote transfer, completion, specialized services, and/or future success? (e.g. graduation ceremony, CSU/IGETC certifications, university transfer, securing employment, transcript requests, enrollment verification, conferring of degrees/certificates, scanning/imaging documents, phone calls received, face-to-face contacts, refunds granted, and other specialized services.)

<table>
<thead>
<tr>
<th>Type of Service</th>
<th>How does this contribute to student success?</th>
<th>How many students received this service?</th>
<th>Measured with?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>08-09</td>
<td>09-10</td>
</tr>
</tbody>
</table>

**Additional information:**

Review Team Response

**VISIONARY IMPROVEMENT PLAN(VIP)**
Please identify 1-3 program improvement goals for the next three years. Goals should state 'what' you plan to achieve and the rationale 'why' for doing so. 'How' you achieve your goals will be entered under Steps to Success. Keep in mind that your VIP should be SMART:

- Specific
- Measurable
- Action-oriented
- Realistic
- Time-bound

All plans should improve or expand student learning.

**Year Three Goal:**
Increase program success rate across ethnic and gender categories to approach or exceed success rate of Chaffey General Education Sciences as a whole.

**To which planning direction does this goal apply?**
Excellence in teaching and learning

**Year 1 Steps to Success (activities) and VIP Assessment:**
Increase adjunct and full-time faculty awareness of national Astronomy Education Research supporting efficacy of active learning strategies in general education astronomy student success across ethnic and gender categories. By the end of Spring semester, all adjunct faculty will have participated in an individual or group mentoring session with full-time faculty to plan implementation of at least one new or improved active learning strategy.

**Year 2 Steps to Success (activities) and VIP Assessment:**
Full time faculty and a majority of adjunct faculty will have implemented a new or improved active learning strategy. By the end of Spring semester, data should indicate in increase in student success across ethnic and gender categories.

**Year Three Goal:**
Support astronomy laboratory instruction at Chino and Fontana by developing and adhering to a process that makes laboratory equipment and supply sets more standard from campus to campus, less idiosyncratic to the preferences of particular instructors, and appropriate to instruction as specified in the Astronomy 35 COR.

**To which planning direction does this goal apply?**
Excellence in teaching and learning

**Year 1 Steps to Success (activities) and VIP Assessment:**
Survey representative group of lab instructors to develop realistic equipment and supply list for Astronomy 35. Compare to equipment and supplies actually at Chino and Fontana. By end of Spring a prioritized list of needed items will be completed. Lab technician will have received prioritized list to purchase as
Year 2 Steps to Success (activities) and VIP Assessment:
Progress towards acquisition of needed items will be monitored. Strategies will be developed to seek other funding (perhaps via grant) if needs are not yet met.
By end of Spring, supply and equipment set should be sufficient that an instructor at any campus will be able to teach lab without having to carry any but the most compact, expensive equipment from another location.

Year Three Goal:
Contribute to instruction and community outreach by restarting Chaffey's Planetarium program

To which planning direction does this goal apply?
Excellence in teaching and learning
Connectedness

Year 1 Steps to Success (activities) and VIP Assessment:
Develop plan for outreach program activities. Develop hiring criteria and training plan for part-time Planetarium Presenter.
Draft plan will have been developed and circulated to Dean of Math and Science grant writer, and other college entities.

Year 2 Steps to Success (activities) and VIP Assessment:
If and when part-time Planetarium Presenter is hired, trained, and allowed to gain experience on current equipment, faculty and Presenter will collaborate in finalizing outreach plan, planning renovated Planetarium facility and working with grant writer to seek funding.
Planetarium Presenter will have delivered shows to multiple campus audiences, reviewed and contributed to outreach plan, and begun to work with grant writer.

Review Team Response
The goals are clear, concise, attainable, measurable, and are clearly tied to data and SLO assessment results. They follow the handbook instructions: First, describe your goal with a verb. Next, include what you plan to achieve (what) and the rationale (why) in one sentence.
3--Goals are clear and provide for measurability and time frames seem realistic.

PROFESSIONAL DEVELOPMENT ACTIVITIES THAT SUPPORT STUDENT LEARNING OR IMPROVE YOUR PROGRAM
List Recent departmental professional development activities connected to student learning.

<table>
<thead>
<tr>
<th>Recent activities</th>
<th>Recent workshops/courses taken</th>
<th>Recent conferences/training</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLO and SLO assessment workshops, Moodle training, Dealing</td>
<td>Project Kaleidoscope STEM workshop, Chaffey Title V Grant workshop, Cultural Astronomy</td>
<td>American Astronomical Society, Division of Planetary Sciences, Science &amp; Society in</td>
<td>Gave many talks to community groups. Piloted audio PowerPoints for</td>
</tr>
</tbody>
</table>
How are student learning outcomes affected by these professional activities? What steps are recommended for improvement?
Attending national & regional meetings (especially when delivering papers) keeps faculty current in subject matter and connected to others in field. Pedagogy and Flex activities have promoted active learning in Chaffey Astronomy. Faculty have sometimes brought adjuncts to meetings, to make them aware of current content and pedagogy.

Discuss departmental engagement on campus in connection to student learning.

<table>
<thead>
<tr>
<th>Governance committees</th>
<th>Other college-related committees</th>
<th>Other campus participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enrollment Success Management</td>
<td>Curriculum, Distance Education</td>
<td>Pilot of Moodle CMS, CIW training by Department of Corrections</td>
</tr>
</tbody>
</table>

How does your program benefit from your campus engagement?
Collectively, committee involvements let program gain perspective on campus-wide issues, and they offer chance to voice program's concerns on issues affecting astronomy. Given Astronomy's small size and its emphasis on distance learning, engagement is focussed in these areas. ESM provides desirable breadth.

Teaching/Years of Service

<table>
<thead>
<tr>
<th>0-5 years</th>
<th>6-10 years</th>
<th>11-15 years</th>
<th>16-20 years</th>
<th>21+ years</th>
</tr>
</thead>
</table>

Given the data how has your program been impacted?
Astronomy has one full-time faculty member. This seems too small a number to sustain department activities, especially in view of the department's rapid growth. Hiring, mentoring new adjuncts with limited astronomy experience, and establishing labs on new campuses all compete for time with routine department activities.

Does your program anticipate retirements within the next 3 years?
No.

Review Team Response
Although SLO's are not directly addressed in this section, the rest of the material is clear and focused.

PROJECTED NEEDS

Is any part of the program funded by sources other than the instructional budget (such as grants, partnerships, or other means)? If yes, please identify the source, amount, and length of funding.
After reviewing and analyzing the data and assessment results in this report, please describe and provide rationale for any projected resource needs required to accomplish your Visionary Improvement Plan using the boxes below. Your requests should be based on student need.

FT Faculty:

Year 1:
Full Time Astronomy Instructor. Recent rapid growth of Astronomy has skewed Adjunct to FT ratio. Moreover, the pool of adjunct faculty with astronomy experience is very small. As a result, the last three adjunct we have hired have been physicists with no prior astronomy teaching experience and little if any coursework of their own in astronomy. While their preparation meets minimum qualifications, intensive mentoring is required to teach physicists how to teach astronomy, and it takes years before they are teaching a real astronomy course rather than a physics course in disguise. Physicist adjuncts are also likely to move on if they can find other jobs in which they can do more physics. Hiring a Full-timer with astronomy experience will be the most effective way of improving student success and assuring the integrity of astronomy instruction.

Hiring Criteria:

Department Concerns
Adjunct to FT ratio is extremely skewed (note: The 75/25 ratio state mandate is campus wide not per department)
Adjunct faculty are difficult to find (quality and qualified, high turnover, specific skill sets, external agency licensure requirements)

Year 2:

Hiring Criteria:

Year 3:

Hiring Criteria:

STAFF

Year 1
Astronomy, Geography and Geology/Earth Sciences jointly request the hiring of a permanent, full-time laboratory technician/planetarium presenter. Job title from CSEA contract would be Instructional Assistant IV, with a pay range of 14 for 2012-2013 academic year. This staff member would divide time between two roles: 1. Support lab instruction at the three campuses. The current lack of support impacts instruction and student success, as well as placing an undue burden on full-time and adjunct faculty in these small departments. Prior temporary staffing was a great relief to faculty, but that position ceased and needs to be reinstated in a permanent form. 2. Plan and implement Chaffey's Planetarium outreach program, as described the Visionary Improvement Plan. An appropriately skilled individual filling this position would make it possible for Astronomy to establish an outreach program, reinstate public outreach shows using existing equipment, plan for the eventual renovation of the planetarium facility, and work with the grant writer to secure funding.

Year 2
Year 3
EQUIPMENT
Year 1
Year 2
Year 3
TECHNOLOGY
Year 1
Year 2
Year 3
SOFTWARE
Year 1
Year 2
Year 3
OTHER
Year 1
Year 2
Year 3

Review Team Response
Staffing requests seem reasonable. Equipment needs are missing (portable lab materials, planetarium re-start) but this is understandable since these exact needs have yet to be determined. We suggest an update within the three-year cycle as soon as these needs are more concrete.

Review Team Response
The program contains excellent information and analysis to be useful for planning, supporting and improving student achievement and SLO’s. The review contains clear, measurable goals and resource requests. With the exception of some missing equipment and technology needs, this Program Review is clear, useful, and forward-looking.