# Department Information

## Overview - Directions

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<th>Program/Discipline</th>
<th>Date Submitted to Dean (Deadline by 4/27/18)*</th>
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<td>Astronomy</td>
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## List of Contributors

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<th>Name</th>
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<tr>
<td>Pimol Moth</td>
<td>Physics/Astronomy Instructor</td>
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## Signature of Area Dean/Director

Please type the name of the area Dean/Director and the date they reviewed the rest of the document. They may also use this space to provide optional comments.

Shannon Bliss
5/7/18
Questions Regarding Degree and Certificate Programs

A.1 Core Outcome I - Completion

Observing the number of students who got Awards in your program(s) using the Program Award Tool, compared to the College historical trends what insights can you share?

Notes: Is your program an awards producer or a “feeder” program? If you have multiple degrees and/or certificates, please analyze and compare the trends among them.

The Astronomy program is an awards producer. There was one AS degree awarded in Spring 2015. The low number of students who are recipients of Astronomy degrees (as compared to other degrees in the College) is to be expected because, statewide, there are few students who choose to pursue an AS degree in Astronomy. Also, the Astronomy degree program is relatively new (developed in 2014), thus there hasn’t been enough time for many students to complete the program. But within the next few years, we foresee that there will be more students completing an AS degree in Astronomy. The Astronomy Instructor has identified and has been mentoring several students who are interested in majoring in Astronomy.

How do you inform potential students about your program? How do students know which courses they should take for your program and in what sequence?

At Hartnell, we have an Astronomy Club that include students who are interested in majoring in Astronomy or just interested in the topic. Once they are in the club, the advisor always encourage students to come to visit her in office hours to ask them more information about their interest in Astronomy. She usually prints out the degree requirements that are posted on the Hartnell College Astronomy website and goes over the courses that they should take. She also recommends that they meet with a counselor to go over their Educational Plan. Also during outreach events, the degree requirements are made available for interested students.

In addition, during the beginning of each semester, the Astronomy Instructor asks students to write down their intended major. If someone indicates they are interested in majoring in Astronomy or Astrophysics, the Instructor always contacts the student so that she can meet with them to discuss their interest and give them advice about the program and the courses they should take. She also encourages the students to join the Astronomy Club.

A.2 Core Outcome II - Time and Units to Completion
Observing the Time & Units data, what insights do you get from the data in general?

In the Time and Units data, there is information about the one student who was awarded a degree in Astronomy in 2015. That student took 14 years with 161 units to complete the degree. Both these numbers are high compared to the other degrees awarded in other fields in general at the College and state-wide. However, since there is only one student, the median number of years and units cannot reliably be used to predict a trend due to low number statistics. When there are more students completing the degree in the future, we can have a better idea of the median number of years and units to complete the degree.

Looking at the 5 year trends College wide, we see that American Indians and Whites typically take the longest to complete their degrees (5.8 and 5.3 years respectively). We see that across all races, in general Males tend to complete the degree more quickly (4.3 years) than Females (4.8 years); however the number of units completed on average are the same (92 units). Thus, we can say that Females are completing the degrees with the same units, however they take a longer period of time.

Comparing the time of completion for Hartnell with other Colleges, we see that we are in the middle. Our students take typically 4.3 years to complete their degrees, while the quickest completion rates are around 3 years and the slowest completion rates are 5 years.

Observing the Subject Analysis tool, and focusing on the percentage of capacity of your program, is the college offering enough sections or too many sections of the courses in your program?

Observing the Subject Analysis Tool over the past several years, it is obvious that the College is not offering enough sections in Astronomy, especially during the Spring semesters when students need to fulfill their GE requirements to graduate. The program typically has over 100% capacity during the past several years, with the percentage over capacity typically being higher in the Spring than the Fall (up 111%). This is especially apparent in the lab sections. Every semester, the Astronomy instructors are unable to accept all students from the waitlist to the labs because of lack of staff, equipment, and Instructor's ability to assist all students. Instructors and the Dean are working together to resolve this issue.

Does the way the courses in your degree and certificate program are scheduled enable students to take courses when they need them, plan their lives around their classes from one term to the next, and complete their program on time? If it does not, are there any obvious fixes?

In general, yes, the courses in the Astronomy degree program are scheduled so that students can take courses and complete the program on time. The STEM department has worked hard to schedule the courses to minimize conflicts. The Astronomy program offers courses in different modalities (face-to-face and online), different days, times (night and day sections), and over Spring and Fall to meet the diverse needs of students. However, there is still a lot of demand for Astronomy. In the past, it was challenging to offer additional sections due to lack of staffing to teach the new sections. However, we have remedied this by revising the curriculum to include online modality for the lab section and hiring a new adjunct instructor who will be able to teach online sections during the regular semester and summer.
How do you work with underprepared students? How do you share the educational resources that are available on campus with all your students? Please give examples of when these resources have worked well and when they have not.

Astronomy instructors have, over the years, developed several different strategies to help underprepared students succeed and complete the courses. In the classrooms, we have developed activities that allow students to work together in groups and to be actively engaged in order to better understand concepts. We have also revised the laboratory modules to stress learning and improve writing skills. In addition, we have worked with the Early Support Program to provide tutoring and study sessions to assist students. This extra assistance has been very successful as it was observed that the students who attended the study sessions improved in their grades and were able to complete the class successfully.

**A.3 Core Outcome III - Transfer**

Observing the number of transfer students from the transfer volume data, what insights do you get from the data in general?

From the transfer volume data, we observe that the majority of our students transfer to CSUs and relatively few to private colleges and even fewer to UCs. There was also an increase over the last four years of students transferring to CSUs (and in the number of transfers overall) as compared to 2011-2013. In particular, there was a large increase of students transferring to UCs and CSUs in 2016-17. When we compare the number of transfers to CSUs and UCs, from Hartnell College with other Colleges in 2016 versus 2007, we see that Hartnell has the highest increase of student transfers to CSUs and is only second to Foothill College in student transfers to UCs.

What interactions do you have with students about transfer options? Please give examples.

The Astronomy Instructor has met individually with students who are interested in majoring in Astronomy to discuss transfer options. Two students majoring in Astronomy were interested in transferring to UC Santa Cruz because of the many opportunities that this University offers to our students. The Instructor gave them information about the different scholarships that are available to them offered by the University before they transfer. She also discusses other Universities that they can transfer too and the courses they should take that would be most helpful in completing the degree. The Instructor uses ASSIST as a tool to find the relevant articulated courses between Hartnell College and the University.

How are program learning outcomes aligned with the skills and knowledge students will need to succeed in transferring to baccalaureate degree programs?

The Program learning outcomes for the Astronomy program is as follows:

Upon successful completion of the Astronomy program, a student should be able to:

- explain and discuss basic astronomical phenomena.
- apply the laws of physics to explain the properties of planets, stars, galaxies, and the Universe.
- explain and discuss the impact and history of scientific theories and their importance in the
advancement of astronomy.
  • demonstrate proficiency in applying scientific procedures for making observations and measurements typical of modern astronomical research.
These program learning outcomes were selected with the goal that students will be adequately prepared when they transfer to their baccalaureate degree. When the degree program was first developed, the Instructor sought feedback from Astronomy Professors at UC Santa Cruz to determine how to structure the program. They mentioned that the program should be rigorous to ensure that when students transfer, they would be able to be prepared for the rigor of courses at the transfer institution and complete the baccalaureate degree successfully. This feedback helped to frame the courses that students should take and also the program learning outcomes. Astronomy degree recipients should be able to think like a scientist when they achieve their degrees. This means being able to think critically and independently, communicating results effectively, and being proficient in the use of mathematics and physics to attain results in research topics. These program outcomes will allow students to develop the mindset, knowledge, and skills to succeed in their transfer level classes.

A.4 Core Outcome IV - Employment

Observing the Employment data, what insights do you get from the data in general?
The Employment data over the last several years suggest that students are highly successful in finding employment after leaving Hartnell College. The average percentage of students who found employment over the last several years was 83% and only less than 10% who are seeking employment are actually unemployed. The Nursing field is especially impressive, after four quarters, 100% were able to find employment. We also observe that, in general, across all professions, our students are able to obtain an increase in earnings after being employed two additional quarters. This is especially obvious in the fields of Alcohol and Controlled Substances and Automotive Technology, where their earnings increased 185-186%.

However, when we observe the attained a living wage column, we see that, for most professions, less than 50% were able to attain a living wage. The students who were most successful in attaining a living wage were in the fields of Fire Academy and Police Academy. Thus, although students are able to attain employment after graduation, unfortunately, most are not able to earn enough in their professions to attain a living wage.

How and when do you inform students about prospective employment opportunities?
This Astronomy program is unique in that it gives students exposure to experiences and people with advanced degrees and allows them to receive early experiences in research. This program gives students this exposure in the hopes that many of them will pursue advanced degree and enter the field of research as their profession. It offers the more advanced and interested student the opportunity to take their astronomy knowledge to higher levels by participating in summer internships at one of three sites: the Fremont Peak Observatory, the Monterey Institute for Research in Astronomy, and the Astrophysics Department at UC Santa Cruz. These summer internship experiences give students a taste of what it would be like to pursue a career in Astronomy by giving them experiences with using and operating research grade telescopes and work on exciting, cutting edge projects.
These internship opportunities and early research experiences are always announced in the Astronomy Club meetings and during private consultations with students who are majoring in Astronomy. The Astronomy Instructor also actively recruits eligible students for these internship experiences.

How are program learning outcomes aligned with the skills and knowledge students will need to succeed in their future employment?

As mentioned in the Section A.3, the outcomes were selected to ensure that upon completing the program, students will learn how to think like a scientist. This means being able to think critically and independently, communicating results effectively, and being proficient in the use of mathematics and physics to attain results in research topics. These program outcomes will allow students to develop the mindset, knowledge, and skills to succeed in their future employment as a scientist. These skills will also benefit students even if they do not choose a research career and pursue other possible avenues in the field such as working in industry, observatory, planetarium, or teaching.

A.5 - Recommendations

Reflecting on your observations and analysis from A.1 through A.4, what recommendations do you have for your program?

What are most apparent in our analysis of A.1 through A.4 is that students from Hartnell College are not transferring to UCs after graduation (though there has been an increase during the last academic year) and are not able to earn living wages. The recommendation for our program is to continue to mentor and seek out talented students and encourage them to transfer to UCs, pursue internships, graduate programs, and pursue a career in research. By doing this, we can hopefully increase the number of students who are able to earn living wages in STEM.

Also, given that there has only been one student who has competed a degree in Astronomy, another recommendation would be to seek out students who are either interested in pursuing a career in astronomy or are very interested in astronomy and encourage them to pursue astronomy as a major. The challenge that we have seen is that while several students initially express interest in pursuing astronomy as a major, few actually follow through with it. Typically, when they take physics and math courses, they find them to be too challenging and cannot complete them successfully. In this case, instructors need to encourage students to participate in programs such as MESA and the Early Support program that will help them succeed in their classes. Students should be encouraged to get tutoring or attend SI sessions.

Reflecting on your observations and analysis from A.1 through A.4, what commendations do you have for your program?

The main strengths of the astronomy program are:

1) the faculty’s dedication to mentoring students: The faculty in the program are actively mentoring students to help them complete the program successfully by providing guidance in the courses they should take, advice about which Universities to apply to, and informing them to apply for internships and scholarships to help them gain experience and financial assistance to attain their goals.
2) **high enrollment rates:** The astronomy program is growing in their course offerings and enrollment. It provides different options for students to take courses by offering day/evening sections, face-to-face and online sections, and courses over different semesters. There is now more demand for more sections. We are working to keep up with the demand by hiring additional instructors and offering additional sections, and will be offering them over the summer in the future.

3) **activities and opportunities for students to gain a higher appreciation for and immersion in scientific research:** The astronomy program has formed strong partnerships with universities and research institutions that can offer our students practical real world experience in research and astronomy. This will allow students the skills to succeed at the transfer institution and be competitive in finding employment.

The Astronomy program supports the Hartnell College mission by providing a quality education with excellent and highly qualified faculty who provide the mentorship increase the student’s awareness and interest in astronomical and help them to achieve their educational and professional goals.

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**Questions About Previous Activities**

**B - Questions About Previous Activities**

Evaluate the success of each completed activity in Section D.1 (Previously Scheduled Activities) from your Spring 2017 PPA. What measurable outcomes were achieved? Did the activities and subsequent dialog lead to significant change in student learning or program success?

The completed scheduled activities were:

**Incorporate more Planetarium demonstrations/shows in the classroom:**

We have incorporated a short clip on the distance scales of the Universe to use in the astronomy lectures and a clip demonstrating the analemma to use in the labs. We have been able to purchase 6 new Planetarium shows. These planetarium clips and the new planetarium shows help students to be more interested in astronomy and understand concepts better because it gives them visualization of the concepts, which is important because many of our students are visual learners. We have show the new exoplanets show, which really helps students to understand what the properties of these exoplanets and the methods to detect them.
Establish an Astronomy Club: We have established the Astronomy club on campus during Spring 2017. Although the membership is low since it is a new club, during the short time it has existed, it has been very active in promoting activities to the community including a weekly screening of the Cosmos series and a screening of A Brief History of Time Film. These activities have benefited Astronomy lecture classes as students from the lecture classes are invited to participate in these activities as part of the Astronomy project requirement for the class. Students have also participated in exciting trips such as a trip to Oregon to view the Great American Solar Eclipse and a trip to NASA Ames. Both trips help to increase the student's interest in pursuing a career in astronomy. The solar eclipse trip helped to solidify student's understanding of solar eclipses. The faculty has used photos and videos taken during the trip in lectures about solar eclipses. These personal stories enhance the lecture and make students more interested in the topic. The trip to NASA Ames allowed students to be exposed to real life scientists who are participating in cutting edge research, which help to sustain their interest in the field.