



FULLERTON COLLEGE

ELEVATING. EXCELLENCE.

Instructional Programs
2014-2015 Self-Study
Three-Year Program Review Template
Physics

Natural Sciences

Statement of Collaboration

The program faculty listed below collaborated in an open and forthright dialogue to prepare this Self Study. Statements included herein accurately reflect the conclusions and opinions by consensus of the program faculty involved in the self-study.

Participants in the self-study

- Liliana Barabas
- Bruce Cordell
- Benjamin Crowell
- Brendan O'Neill
- George Sherman

Authorization

After the document is complete, it must be signed by the Principal Author, the Department Coordinator, and the Dean prior to submission to the Program Review Committee.

| | | | |
|--|-----------|-------|-------|
| _____ | _____ | _____ | _____ |
| Printed name of Principal Author | Signature | Title | Date |
| _____ | _____ | _____ | _____ |
| Printed name of Department Coordinator | Signature | Title | Date |
| _____ | _____ | _____ | _____ |
| Printed name of Dean | Signature | Title | Date |

1.0 Mission and Goals

The College's Mission, Vision, Core Values and Goals drive all college activities. The Program Review committee would like to understand the connection of your program to the College's Mission, Vision, Core Values and Goals. Summarize how your program supports each area.

Mission: The Fullerton College physics department builds our students' skills in critical thinking and quantitative reasoning.

Vision: The department promotes excellence in learning by providing a rigorous program of transfer-level courses.

Core Values: Nearly all students entering our courses are underprepared in mathematics, science, and critical thinking, and we are continuously working to improve our ability to address their needs, without sacrificing academic standards.

College Goals: The department has a number of ongoing efforts to increase student success. The most important of these is a program of supplemental instruction, which is endangered due to a lack of ongoing institutional support.

2.0 Program Data & Trends Analysis

2.1 Key Performance Indicators (KPI)

For each KPI listed below, analyze and report your findings and describe what they mean. (Attach 5-year longitudinal data from Office of Institutional Research and Planning (OIRP) to Appendix.)

| KPI | Findings |
|------------|--|
| Enrollment | Enrollment has increased by about 25% because we have been allowed to offer more sections. |
| Total FTES | Total FTES has shown the same trend as enrollment, for the same reasons. |
| Sections | The number of sections offered has increased due to the improved budget situation. |
| FTEF | FTEF has remained constant. |
| Fill Rate | The fill rate has remained constant at about 100%. |
| WSCH/FTEF | WSCH/FTEF has increased. |
| Retention | There has been no statistically significant change in retention. |
| Success | There has been no statistically significant change in success. |

2.2 Peer Institution Comparison

Complete the table below.

| College/Program: | Your Program | LA City College | Santa Ana College | Cypress College | Glendale Community College (CA) |
|------------------------------|---------------------------|-----------------|-------------------|-----------------|---------------------------------|
| Retention: | 76% | 70% | 91% | 85% | 85% |
| Success: | 68% | 57% | 80% | 79% | 71% |
| Degrees Awarded: | No correct data available | N/A | N/A | N/A | N/A |
| Certificates Awarded: | None awarded | N/A | N/A | N/A | N/A |
| Transfers: | No data available | N/A | N/A | N/A | N/A |

How does your program compare with peer institutions? Provide a narrative of your comparison. (Peer institutions are colleges or programs identified by the Office of Institutional Research and Planning (OIRP)).

Our retention and success numbers are comparable to those of our peers.

The KPI data on degrees awarded are clearly incorrect. We have asked for corrected data but have not received any. The KPI printout claims that we award 10 to 20 degrees every year, but we know that the actual number is more like 0 to 2. Physics is a service department with very few majors, and many students who are majoring in physics do not apply for an AST degree.

The KPI spreadsheet has an empty box for transfers. In any case, transfer statistics have never been meaningful for our department because they are based on the fraction of majors who graduate and transfer in a given year, but our majors typically never apply for a degree, so they are not counted in the statistic. The empty box may indicate that we awarded zero degrees during this period, which is possible, and would contradict the clearly incorrect number given for degrees awarded.

2.3 Achievement Gap

Indicate achievement gap for each of the groups listed below. (Attach to Appendix the Success and Retention by Ethnicity Data as identified by the Office of Institutional Research and Planning.)

| Group | % Retention | % Success |
|-------------------------|-------------|-----------|
| Males | 81 | 73 |
| Females | 65 | 57 |
| Asian-American | 72 | 64 |
| African-American | 70 | 70 |
| Filipino | 71 | 68 |
| Hispanic | 67 | 57 |
| Native American | 100 | 100 |
| Other Non-White | 50 | 50 |

| | | |
|-------------------------|----------------|----------------|
| Pacific Islander | | |
| White | 77 | 70 |
| Unknown | 47 | 47 |
| Range (Max-Min) | Not meaningful | Not meaningful |

The data supplied in the KPI printout do not allow much meaningful analysis of the above numbers. In previous years, we were provided with data that included the sample sizes within each group, and this allowed us to determine that most of the comparisons one could make between groups were not statistically significant. This year we had no access to information on sample sizes. The statistics for males versus females do provide a meaningful comparison. As noted in our previous program review, the male-female gap appears to be because men and women take different physics courses, not because there is a difference in success within a given course.

2.4 Program Effectiveness

Since your previous Program Review Self-Study, what significant changes have occurred that impact the effectiveness of your program?

We have offered more sections of several classes.

2.5 Describe any laws, regulations, trends, policies, procedures or other influences that have an impact on the effectiveness of your program. Please include any other data (internal or external) that may be relevant to student achievement, learning, and trends within your Basic Skills, CTE, or Transfer Education programs.

The state budget has been better, so we have been able to offer more classes. Two of our faculty also teach astronomy, which has had growing enrollment (more rapid than the growth in physics).

Because of the growth in the number of sections of physics and astronomy classes offered, our full-time faculty have been spread increasingly thin. We have had difficulty attracting and retaining qualified part-time instructors to teach our classes. Our lab technician, whom we share with astronomy, has had to deal with an increased workload, even though she is part-time.

One of our full-time faculty (Sherman) intends to retire very soon.

2.6 Provide any other data that is relevant to your self-study.

3.0 Strengths, Weaknesses, Opportunities, Challenges (SWOC)

Based on your analysis in 2.1 through 2.6, answer the following questions:

3.1 What are the strengths of your program?

We have a rigorous program taught by highly qualified faculty. We have a strong supplemental instruction program centered on room 415-P, next to one of the physics labs.

3.2. What are the weaknesses of your program?

Our rapid growth in enrollment has strained our resources. Our inability to find qualified part-timers has resulted in the cancellation of some classes. We expect Dr. Sherman to retire in the near future, which will make this problem more serious. Our growth is also starting to run up against limits in the number of available classrooms.

There is no permanent funding available for our supplemental instruction program, which has depended on money from a grant administered by Dr. Wu. If this grant money evaporates, so will the educational benefits of this program to our students.

3.3 What opportunities exist for your program?

We hope to change our lab technician's job to a full-time position, and to hire two new full-time instructors. One of these hires has already been approved, and we will be interviewing in spring 2015 for someone to start work in fall 2015. We hope to get approval to make a second hire as well.

3.4 What challenges exist for your program?

See 3.2 above.

4.0 Student Learning Outcomes (SLO) Assessment

4.1 List your program level SLOs and complete the expandable table below.

| | Program Student Learning Outcomes (PSLOs) | Date Assessment Completed | Date(s) Data Analyzed | Date(s) Data Used For Improvement | Number of Cycles Completed |
|----|--|---------------------------|-----------------------|-----------------------------------|----------------------------|
| 1. | Upon successful completion of courses leading to the Physics AS-T, the student will be able to demonstrate an understanding of how the scientific method is used to explore topics in physics. | spring 2014 | 2014 Oct 26 | n/a | 0 |
| 2. | Upon successful completion of courses leading to the Physics AS-T, the student will be able to demonstrate the ability to apply physics concepts to solve problems. | spring 2014 | 2014 Oct 26 | n/a | 0 |
| 3. | | | | | |

4.2 Assessment: Complete the expandable table below.

| Program Student Learning Outcomes Assessment for Instructional Programs at Fullerton College | | | |
|---|---|---|---------------------------|
| Intended Outcomes | Means of Assessment & Criteria for Success | Summary of Data Collected | Use of Results |
| 1. Upon successful completion of courses leading to the Physics AS-T, the student will be able to demonstrate an understanding of how the scientific method is used to explore topics in physics. | Common questions, problems, or projects assessed at the course level. | 91% of students succeeded on an SLO for Physics 223 involving qualitative reasoning. 71% of students succeeded on an SLO for Physics 222 involving the experimental investigation of electromagnetic phenomena. | Discussed by instructors. |
| 2. Upon successful completion of courses leading to the Physics AS-T, the student will be able to demonstrate the ability to apply physics concepts to solve problems. | Common questions, problems, or projects assessed at the course level. | 18% of students succeeded on an SLO for Physics 223 involving quantitative reasoning. 62% of students succeeded on an SLO for Physics 222 involving quantitative reasoning 64% of students succeeded on an SLO for Physics 221 involving quantitative reasoning | Discussed by instructors. |

4.3 What percentage of your program level SLOs have ongoing assessment? Comment on progress/lack of progress.

100%

4.4 How has assessment of program level SLOs led to improvements in student learning and achievement?

Instructors for Physics 221, 222, and 223 have discussed them.

4.5 How has assessment of program-level SLOs led to improvements in transfer or certificate/degree awards?

As discussed in more detail in section 2.2, the only data we have on transfers and degrees are clearly incorrect. We have requested corrected data but have not received any. We believe the number of physics AS-T degrees to be about 0 to 2 per year, which would not be sufficient to allow any meaningful test for a change over time. If there were a change over time, we would not have any way of determining whether there was a causal relationship between PSLOs and these measures of success.

4.6 What challenges remain to make your program level SLOAs more effective?

Get administrative support to obtain correct data on degrees.

5.0 Evaluation of Progress Toward Previous Goals/SAP's (Future program review templates for this section will identify "previous goals" as "previous *strategic action plans*"-- SAP's.)

5.1 List the goals from your last self-study/program review.

goal 1: Add another section of Physics 223 in spring semesters starting in 2013 to address unmet student demand.

goal 2: Offer a new course, Physics 120, Relativity for Poets, in fall 2013.

goal 3: Purchase a set of eight spectrophotometers for use in astronomy and physics labs

goal 4: Make our lab technician's position full-time.

5.2 Describe the level of success and/or progress achieved in the goals listed above.

Goal 1: A new section was added, along with new sections of other courses.

Goal 2: The course will be offered for the first time in spring 2015.

Goal 3: The spectrophotometers were received them in fall 2013. They have been used in Physics 130 for lab activities, and will also be used for Physics 223 starting in fall 2014.

Goal 4: We were unable to make our lab technician's position full-time.

5.3 How did you measure the level of success and/or progress achieved in the goals listed above?

Goal 1: increased FTES

Goal 2: hasn't happened yet

Goal 3: The spectrophotometers have been used for two activities. The first activity involved collecting and observing the spectra from several different sources, including an unknown source to be identified. In this activity, the students used both the new spectrophotometers along with the traditional hand-held spectrometers which provide only a visual image of the spectra. The advantages of using the newer devices was immediately apparent. The graph of intensity vs. wavelength provided by the newer devices clearly showed more spectral lines that were easily detectable in the presence of the continuous background and the mercury doublet clearly showed up as a double peak. Furthermore, the new devices record a spectrum that can be saved and compared directly with another spectrum, thereby facilitating direct comparisons.

The second activity involved collecting and observing the spectrum produced by a hydrogen discharge tube. Detailed studies of whether the newer devices actually provide a positive benefit to the students are yet to be done. However, early indications support a positive benefit. For example, the students were able to obtain better results in less time. Thus, a lab activity that used to extend over 2 class periods was completed in a single class period.

Goal 4: not achieved

5.4 Provide examples of how the goals in the last cycle contributed to the continuous quality improvement of your program.

The main goal that was achieved was an increase in the number of sections offered. This has increased the number of students we are able to educate.

5.5 In cases where resources were allocated toward goals in the last cycle, how did the resources contribute to the improvement of the program?

Funding was required in order to offer the additional sections.

5.6 If funds were not allocated in the last review cycle, how did it impact your program?

Our lab technician's ability to manage the increased number of sections was one of the factors, along with unavailability of qualified part-timers, in the cancellation of some sections of Physics 130.

6.0 Strategic Action Plans (SAP) [formerly called Goals (6) and Requests for Resources (7)]

Using the tables below, list the strategic action plans (SAPs) for your program. These plans should follow logically from the information provided in the self-study. Use a separate table for each SAP.

SAPs for this three-year cycle:

| STRATEGIC ACTION PLAN # 1 | | |
|---|---|--------------------------|
| Describe Strategic Action Plan: (formerly called short-term goal) | Hire two new full-time faculty members, i.e., one more in addition to the one to be hired for fall 2015. | |
| List College goal/objective the plan meets: | College Goal #: 1 – student success Objective #: 3 and 4 – degrees and transfers | |
| Describe the SAP: (Include persons responsible and timeframe.) | Hire two new new full-time instructors. Responsible persons are the department faculty, who will hire the new faculty. The time frame is defined by our current need to cancel sections due to lack of faculty and lab support; this problem already exists and will continue until it is resolved. | |
| What <i>Measurable Outcome</i> is anticipated for this SAP? | Increased FTES in physics. Improved educational quality. An increase in the number of students in other departments who can obtain degrees and transfer, due to the availability of a sufficient number of sections of physics to satisfy their requirements. | |
| What specific aspects of this SAP can be accomplished without additional financial resources? | None. | |
| If additional financial resources would be required to accomplish this SAP, please complete the section below. Keep in mind that requests for resources must follow logically from the information provided in this self-study. | | |
| Type of Resource | Requested Dollar Amount | Potential Funding Source |
| Personnel | ongoing, ~\$150,000/yr | College funds |
| Facilities | | |
| Equipment | | |
| Supplies | | |
| Computer Hardware | | |
| Computer Software | | |
| Training | | |
| Other | | |
| Total Requested Amount | ~\$150,000/yr | |

STRATEGIC ACTION PLAN # 2

| | |
|---|--|
| Describe Strategic Action Plan: (formerly called short-term goal) | Make our lab technician's position full-time. |
| List College goal/objective the plan meets: | College Goal #:1 – student success Objective #:3 and 4 – degrees and transfers |
| Describe the SAP: (Include persons responsible and timeframe.) | See above. Responsible persons are our lab technician (Hanh Pham) and the faculty teaching physics and astronomy. The time frame is defined by our current need to cancel sections due to lack of faculty and lab support; this problem already exists and will continue until it is resolved. |
| What <i>Measurable Outcome</i> is anticipated for this SAP? | Increased FTES in physics. An increase in the number of students in other departments who can obtain degrees and transfer, due to the availability of a sufficient number of sections of physics to satisfy their requirements. |
| What specific aspects of this SAP can be accomplished without additional financial resources? | None. |

If additional financial resources would be required to accomplish this SAP, please complete the section below. Keep in mind that requests for resources must follow logically from the information provided in this self-study.

| Type of Resource | Requested Dollar Amount | Potential Funding Source |
|-------------------------------|-------------------------|--------------------------|
| Personnel | \$27,400/yr | College funds |
| Facilities | | |
| Equipment | | |
| Supplies | | |
| Computer Hardware | | |
| Computer Software | | |
| Training | | |
| Other | | |
| Total Requested Amount | \$27,400/yr | |

STRATEGIC ACTION PLAN # 3

| | |
|---|---|
| Describe Strategic Action Plan: (formerly called short-term goal) | Buy two solar telescopes, hardware for a new photoelectric effect lab, and additional hardware for the lab in which students measure the charge-to-mass ratio of the electron. |
| List College goal/objective the plan meets: | College Goal #: 1, student success Objective #: 2, address the needs of under-prepared students |
| Describe the SAP: (Include persons responsible and timeframe.) | See above. Responsible persons are Pham, Barabas, Crowell, and O'Neill. |
| What <i>Measurable Outcome</i> is anticipated for this SAP? | <p>Solar telescopes are needed to safely observe the sun in ESC 116 Astronomy Lecture and ESC 116L Astronomy Laboratory. Approximately 350 students enroll in ESC 116 Astronomy Lecture each semester and about 100 students in ESC 116 L Astronomy Laboratory. We currently do not have appropriate tools for observing the sun and rely only on outdated projection methods, which cannot provide details of the surface of the sun. The solar telescopes we are requesting are equipped with H-alpha filters that would allow safe observations of details on the surface of the sun: sunspots, filaments, flares and granulation and provide the most natural view of the sun, in yellow, orange, and red. The telescopes would be used during lectures, labs and special events such as eclipses, planetary transits and high sunspot activity. Through the use of solar telescopes students will be able to use the scientific method in collecting data, formulating and testing a hypothesis, which is one of the student learning outcomes for ESC 116 L, and will be able to apply scientific reasoning to future astronomical discoveries, a student learning outcome for ESC 116.</p> <p>New hardware is needed for the photoelectric effect lab, because we currently do not have enough working hardware for all our lab groups. The vendor has stopped selling the version of the hardware that we have, and is now selling a very different setup that could not be used alongside the old one. Therefore we need to buy a complete set of the new hardware for 7 lab groups.</p> <p>Replacement hardware is needed for the lab in which students measure the charge-to-mass ratio of the electron. We currently do not have enough hardware for 7 lab groups. Furthermore, the lab depends on vacuum tubes that have a finite lifetime; we need one spare so that we can continue instruction when one dies.</p> |
| What specific aspects of this | None. |

| | |
|---|--|
| SAP can be accomplished without additional financial resources? | |
|---|--|

If additional financial resources would be required to accomplish this SAP, please complete the section below. Keep in mind that requests for resources must follow logically from the information provided in this self-study.

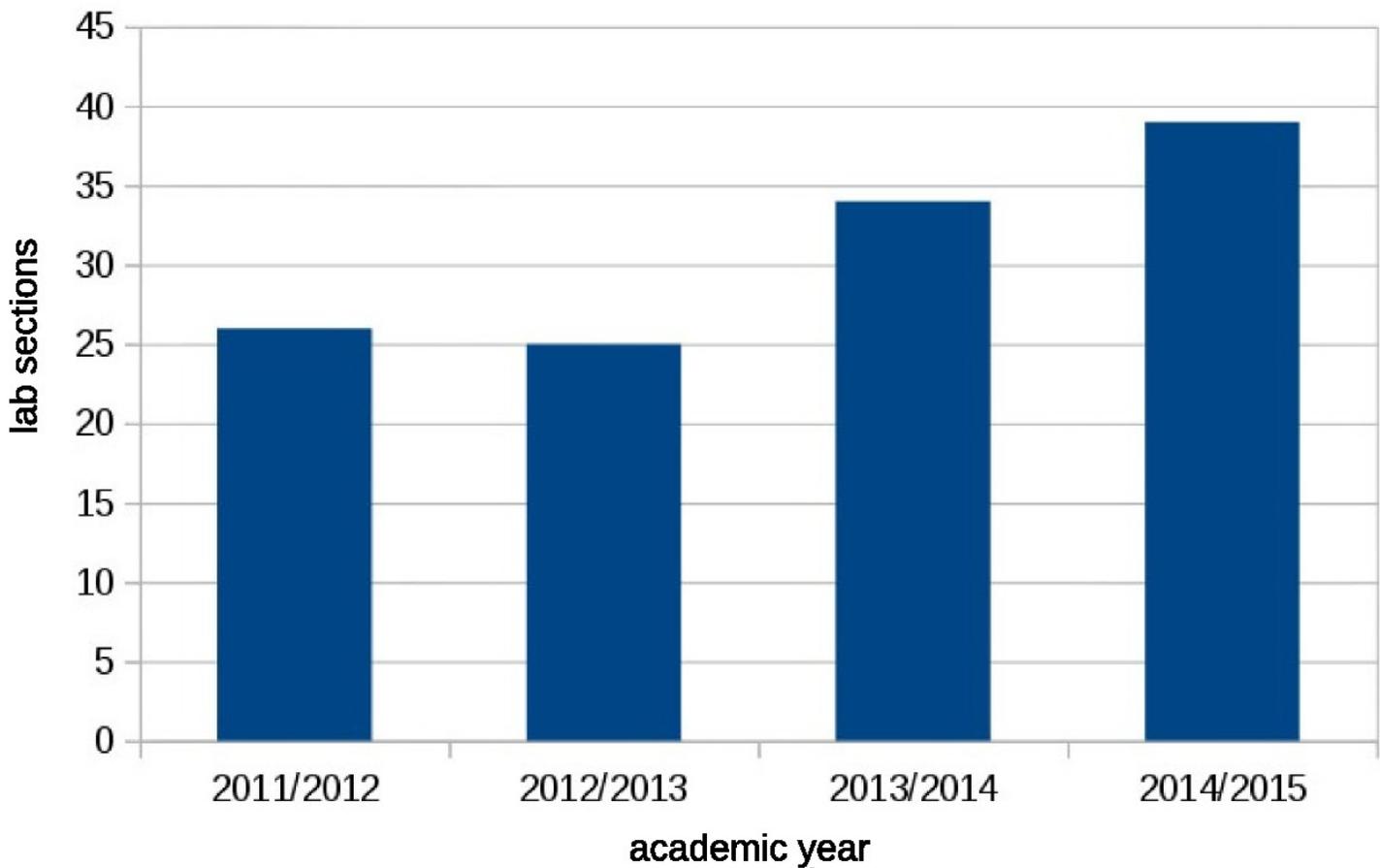
| Type of Resource | Requested Dollar Amount | Potential Funding Source |
|-------------------------------|-------------------------|--------------------------|
| Personnel | | |
| Facilities | | |
| Equipment | \$28,400 | |
| Supplies | | |
| Computer Hardware | | |
| Computer Software | | |
| Training | | |
| Other | | |
| Total Requested Amount | | |

7.0 Long Term Plans

Describe the long term plans (four-six years) for your program. Please consider future trends in your narrative. (Identifying financial resources needed for these plans is optional.)

After a long period of stable enrollment, the last few years have seen a surge in the number of students served in physics and astronomy. The following chart shows the 50% growth in the number of lab sections offered, which is representative of growth over all.

Physics and astronomy at Fullerton College have historically had a total of about 4 full-time faculty. We currently have 5, but the imminent retirement of Dr. Sherman will bring us back to 4. Because of growth in the number of students served, this is not enough. We have had trouble finding enough qualified part-timers to cover all our classes, and this has led to the cancellation of some sections. The growth in the number of lab sections has strained the ability of our part-time lab technician to provide the necessary support.



Due to these trends, we believe that the department should set 6 full-time faculty as its goal for staffing. This means hiring one more faculty member in addition to the position approved for this year. We also believe that it will be necessary to increase our lab technician's position to full time.

8.0 Self-Study Summary

This section provides the reader with an overview of the highlights, themes, and key elements of this self-study. It should not include new information that is not mentioned in other sections of this document.

The physics department faces a number of challenges in the near future that we will have difficulty overcoming without a significant increase in institutional support. These include the following.

1. Our successful supplemental instruction program depends on grant money, which may dry up. To continue this program, we will need ongoing support.
2. Strong growth in our course offerings will require the hiring of two new full-time faculty.
3. Strong growth in the number of lab sections offered will require that our lab technician's position be made full-time.
4. We are a service department that teaches labs that require expensive equipment. During the state budget crisis following the 2008 economic crash, we were unable to properly maintain our lab facilities. Significant funding will be required in the coming years in order to catch up.

**Division Deans' or appropriate Immediate Management Supervisor (IMS)
Response Page**

I concur with the findings contained in this Program Review.

I concur with the findings contained in this Program Review with the following exceptions (include a narrative explaining the basis for each exception):

Area of exception:

I do not concur with the findings contained in this Program Review (include a narrative exception):
