Foothill has amazing faculty, staff, administrators, and programs. Program Review is about documenting the discussions and plans you have for sustaining and improving student success in your program. It is also about linking your plans to decisions about resource allocations. Thank you for taking the time to review your program and sharing your findings with the college community!

Program Review Committee Members for 2017-18:

Administrators	Andrew LaManque	
	Paul Starer	
	Teresa Ong	
Faculty	Carolyn Holcroft	
	Bruce Mc Leod	
	K Allison Meezan;	
Classified Staff	Craig Gawlick	
	Vacant	
	Vacant	
	Elaine Kuo (Ex Officio)	

Let us know how we can help you!
https://foothill.edu/staff/irs/programplans/index.php

BASIC PROGRAM INFORMATION

Department Name: Physics

Division Name: PSME

Please list all team members who participated in this Program Review:

Name	Department	Position
Frank Cascarano	Physics	Instructor
Annie Chase	Physics	Instructor
David Marasco	Physics	Instructor
Sue Wang	Physics/Engineering	Instructor

Number of Full Time Faculty: 3 + 2 split with Engr.

Number of Part Time Faculty: 6

Please list all existing Classified positions: *Example: Administrative Assistant I*

Lab Manager - Jenny Liang

List all programs covered by this review* and indicate the program type:

Physics ☐ Certificate ☒ AA / AS ☒ AD-T ☐ Pathway

*Not sure? Check: https://foothill.edu/programs/ and click to sort using the "Areas of study/Divisions" button Current pathways at Foothill College include: ESLL, NCEL, ENGL pathways (ENGL 209-110-1A; ENGL 209-1A; ENGL 1S/1T); MATH pathways (NCBS 401A/B; MATH 235-230-220-105; MATH 217-57).

SECTION 1: PROGRAM ENROLLMENT, PRODUCTIVITY, AND COMPLETION

Data will be posted on Institutional Research's website for all measures except non-transcriptable completion.

1A. Analysis of Transcriptable Program Completion Data: Please use your data to complete the following table.

Transcriptable Program	Five-year trend in degrees/certificates awarded	Comments
Associate Degrees	Given the sample size, this has been steady, the number of physics degrees granted has been four or fewer per year over this time span.	Physics is a service department, the bulk of the students in our classes are gaining background for CS, Engineering, Allied Health or other fields. We do not expect to see physics degrees in significant numbers.

*according to CCCApply data

1B. Non-Transcriptable Program Data: If your program offers any non-transcriptable programs, please complete the following table. Institutional Research does not track this data; each program is responsible for tracking its own data.

Non-Transcriptable Program	Comments	Five-year trend	Rationale for program
None			

The 2017-18 College Strategic Objectives (E^2SG) operationalize the college's 3 EMP goals and include:

> **Equity**– Develop an integrated plan; identify goals for alignment with equity, student success, and basic skills; and focus on efforts to integrate with enrollment strategies (access, retention, and persistence) to close equity gaps while increasing enrollments at the same.
> **Enrollment Growth** – Achieve more than 1.5% FTES growth at 500 productivity (+/- 25) with attention to integrating equity efforts related to enrollment, CTE, and Sunnyvale Center. Consider how the pathway/course sequence through your program is disseminated to students, and *education pathway.

*Education pathway is a having developed and published clear, structured academic program maps (suggested courses for each term) for all academic programs.

1C. Course Enrollment: Enrollment is a count of every student who received a final grade (A, B, C, D, F, P, NP, W) in your program's courses. It also serves as an indicator for program viability. Please use your program review data to examine your course enrollment trends and check the appropriate box below.

5-year Enrollment Trend: ☒ Increase ☐ Steady/No Change ☐ Decrease

Our college goal is to increase enrollment by 1.5% FTES this year. What steps might you take to increase the numbers of students enrolling in your courses? Steps might include cross department collaborations, actions to increase retention, service learning projects, support for student clubs, participation at recruitment events, examination of pre-requisites, review of assessment results, etc.

Over the five-year span in question, Physics has seen strong growth in enrollment, going from 1309 to 1547, an 18.2% increase. Our WSCH has seen a similar trend, going from 9,428 to 11,061 for 17.3%. The numbers have increased every year.

Taking a closer look, the bulk of our enrollment comes from the Physics 2 and Physics 4 series. Physics 2 does not use calculus, and supports biology and health-related fields, whereas Physics 4 requires calculus and is intended for scientists and engineers. Physics 2A has seen a 25% drop in enrollment over the past five years. This is not surprising, as we used to use Physics 2A as a pre-req for students who did not have high school physics. We were informed that the use of high school classes as pre-reqs for colleges is not allowable, and relaxed the 2A to 4A pre-req as well. It is reasonable to believe that this caused the drop in enrollment. However, we've seen a 41% increase in enrollment in Physics 4A, so it is also reasonable to conclude that many of the students who were lost from 2A simply moved to 4A. Moving forward, we will offer fewer 2 series classes, and closely monitor our offerings with an eye to productivity (see the following section).

The department has taken several steps to encourage enrollment. We have adopted the OpenStax OER textbooks for our 2 series and 4 series classes. In the recent past, the text for the 4 series was over $300 at the bookstore, and was in fact the second-most expensive offering they had. From now on, the textbook cost for students in our classes will be $0. With removal of this barrier to entry, we anticipate that we should get more students, especially now that our OER status is displayed in the course schedule.

Our night classes have associated labs, offered after the lectures. This is a difficulty as the end time for labs goes past when public transportation options are available at our campus. For night classes that have two lab sections, we now offer one section after lecture, and the second section during the night in the day between the lectures, in a time slot where students with limited transportation options can attend.

We are in the very early stages of planning a Physics of Sports class. We hope that this will appeal to the KA population, currently we have very few students from that Division. The class would also appeal to participants in our Physics 2 series who plan to be trainers or physical therapists.

A final option would be to offer fewer double-lab lecture sections of Physics 4A, as will be discussed below. We believe that we lose too many students in Physics 4A, and if we could teach in lectures sized at 32 rather than 56 we could positively affect student success rates.

1E. Productivity: Productivity is a measure of students served per full-time equivalent faculty and is a factor in program viability. Please use your program review data sheet to examine your productivity trends and check the appropriate box below.

5-year Program Productivity Trend: ☒ Increase ☐ Steady/No Change ☐ Decrease

The college productivity goal is **500 (+-25)**. There are many factors that affect productivity (i.e. seat count/ facilities/accreditation restrictions, curriculum, etc.). Please discuss factors that may be affecting your program's productivity trends and any plans you have for addressing the trends, especially if they are declining.

As the department has grown, it has also seen an increase in productivity. Starting at 423, we peaked at 460 in 2016-17 for an increase of 8.8%. This is more than one error bar below the target productivity. We currently have a seat count of 28 people per lab section. This sets a productivity for a single-lab lecture to 420. We offer many of our lectures as double-lab lectures, in this case the math dials in at a maximum productivity of 611 for that lecture. We have been able to increase our productivity in part by offerng more double-lab lectures and by being judicious in not running sections below a certain seat count, as described by the following math:

As noted above, Physics 4 series classes are 5 hours lecture plus a 3 hour lab, and the lab sections are capped at 28. A full single-section class has a productivity of 420. This is well below our college's targets, so we offer lectures that service two labs. If both labs fill, then the productivity is 611 (in essence we get "bonus" students in a lecture we've already paid for).

These numbers reflect cases where our classes are full. The important question is how do seats filled line up to productivity when we aren't maxed out. Using the benchmark of "need to get to a class-size of 20," a productivity of 300 is the target. In this case a two-lab lecture hits 300 at 27.5 students. In other words, if we have 14 students in one lab and 14 students in another, due to having 28 students in a lecture, this is the same as having one class of 20 students. Of course, if the spread is 27-1, cancel that second lab and hope that the stray student makes their way into the nearly-full section.

In a world where we are maximizing productivity, the question becomes "how many students need to be in a second section to improve over the productivity of one full section?" In other words, the target productivity now is 420. Doing the math, the solution is 38.5 students, so if we have one section at 28 and another at 11, our productivity is better than just one class of 28.

Similar calculations can be performed for the Physics 2 sequence, where we have 4 hours lecture, 3 hours lab. In that case the single-lab will still be 420 (since it has the same seat count), and the double is 588. Hitting the 300 productivity benchmark is 28.6 students, and increasing productivity from a single to a double occurs at 40 (if we have one full lab and the second has 12, we've increased from the productivity of a single section).

Note that the faculty have proposed fewer double-lab lectures in Physics 4A as a means of increasing student success, especially in our targeted populations. As we recognize that 28 represents a productivity of 420, we would be willing to run those smaller classes at 32, which would raise the potential productivity to a more-acceptable 480.

For the 2 series we are currently offering a single-section day class and a single-section night class during some quarters. This means that we have committed to a pair of classes that max out at a 420 productivity. This can be better managed if we have a twilight lecture that would service both a day lab and a night lab, replacing two 420 max classes with a double-lab lecture with a max productivity of 611.

Please also note that labs are resource intensive in two different aspects. They limit our flexibility around course offerings, and they also require periodic funding to maintain equipment. This year we will be asking for the replacement/upgrade of our lab interface equipment. The vendor no longer supports the older equipment, and we are running out of spares. We wish to purchase one lab's worth of interfaces to alleviate this issue.

If we offered Physics of Sports, the seat count on this class would not be capped by a lab.

SECTION 2: COURSE COMPLETION & STUDENT ACHIEVEMENT

2A. Institutional Standard: This percentage represents the lowest course completion (success) rate deemed acceptable by the College's accrediting body (ACCJC). The institutional standard during the year for which this program review is being written (2016-17) is **57%**.
Please check the appropriate box:

Program Level Course Completion: ☒ Above Standard ☐ At Standard ☐ Below Standard

If your program's course completion (success) rates are below the institutional standard (see above), please discuss your program objectives aimed at addressing this.

2B. Institutional Effectiveness (IEPI) Goal: This percentage represents an aspirational goal for course completion (success) rates; all programs should strive to reach/surpass this goal. The IEPI goal for which this program review is being written (2016-17) is **77%**.
Please check the appropriate box:

Program Level Course Completion: ☐ Above Goal ☐ At Goal ☒ Below Goal

If your program's course completion (success) rate is **ABOVE** the IEPI goal, please share your thoughts about why/how this is so (we hope to learn from your effective practices!).

2C. Course Success Demographics: Please examine the **"**Disproportionate Impact data by year**"** shared with your department and discuss actions you are taking, or plan to take, to address any achievement disparities identified in your program. If you are uncertain about actions faculty can take, please take a look at Appendix A.

A quick eyeballing of disparities between targeted and non-targeted groups shows that while Physics has problems to solve, the gaps are smaller than they are for PSME at large. We decided to look at the past five years' worth of data to check for patterns. Success rates were calculated for each sub-population each year. Assuming binomial distributions behind the success rates, the usual assumptions were made to estimate variances and standard deviations. The standard deviations were used to set the error bars on the success rates. We then subtracted the sub-populations' success rates from the average success rate, and divided by the added-in-quadrature error bars to find the gap as measured in error bars of the difference. The data are given below. Any time N>15 and the gap was larger than one error bar, the data are highlighted in yellow, any time the gap is greater than two error bars, it is highlighted in red. Several conclusions are apparent. The first is that our program is struggling in supporting our Latinx population. In the five years of data, these students never had a success rate that was within one error bar of the average success rate. There are two yellow years and three red years. We also are not doing a good job of supporting our Filipino students, with four years in the yellow.

Only one year are African American students not within one error bar, but this statistic may be misleading, as anecdotally we have enough students from Africa in that sample to confuse things. The African/African American ambiguity raises another issue; although the "Asian check box" is doing well, that is a population where the data need further disaggregation. Filipinos, who traditionally are grouped with Asians, have already been shown to be underserved when we look specifically at their data. Can the same be said for our Vietnamese, Cambodian, Laotian, and Hmong-American students, when compared Japanese-American and

Chinese-American students, who as a group have a longer history in this country and hence more access to a family history of higher education and the related privilege? What about the difference between international and domestic Asian students? There are many questions lurking behind a label that covers a very diverse set of people.

We are happy to observe that women are succeeding at the same rate as men, which is encouraging, given the problems around gender that Physics has as a field.

Year	Group	Total	Success	t'
2016-17	AA	25	0.44	2.47
	Asian	713	0.685834502	0.03
	Filipino	69	0.666666667	0.34
	Latinx	178	0.623595506	1.65
	NA	16	0.5625	0.99
	PI	9	0.555555556	0.79
	W	367	0.708446866	-0.83
	DTS	170	0.770588235	-2.44
	Women	478	0.677824268	0.35

Year	Group	Total	Success	t'
2015-2016	AA	25	0.72	0.01
	Asian	644	0.714285714	0.29
	Filipino	53	0.58490566	1.97
	Latinx	148	0.594594595	3.00
	NA	2	0	62.5
	PI	11	0.363636364	2.45
	W	374	0.772727273	-2.12
	DTS	260	0.780769231	-2.14
	Women	483	0.699792961	0.86

Year	Group	Total	Success	t'
2014-15	AA	28	0.857142857	-2.18
	Asian	642	0.697819315	0.61
	Filipino	58	0.620689655	1.39
	Latinx	118	0.542372881	3.56
	NA	5	0.2	2.85
	PI	6	0.666666667	0.23
	W	397	0.773299748	-2.59
	DTS	241	0.742738589	-1.03

	Women	471	0.736730361	-1.10

Year	Group	Total	Success	t'
2013-14	AA	23	0.652173913	0.57
	Asian	703	0.715504979	-0.31
	Filipino	20	0.55	1.42
	Latinx	138	0.579710145	2.95
	NA	9	0.666666667	0.26
	PI	14	0.785714286	-0.69
	W	377	0.732095491	-0.89
	DTS	139	0.769784173	-1.61
	Women	468	0.707264957	0.07

Year	Group	Total	Success	t'
2012-13	AA	27	0.62962963	0.81
	Asian	670	0.717910448	-0.57
	Filipino	33	0.606060606	1.15
	Latinx	135	0.637037037	1.58
	NA	9	0.666666667	0.24
	PI	7	0.857142857	-1.14
	W	342	0.730994152	-0.94
	DTS	85	0.670588235	0.67
	Women	398	0.701005025	0.18

We are very concerned about the statistics describing our success rates for Latinx and Filipino populations. We are proposing three solutions, and while these are done with these populations in mind, we believe that these measures will help all of our students. We want to run as many 4A lectures as possible as single-lab sections rather than doubles. While we believe that this will help all students, best practices for our target populations include establishing good instructor-student relationships, and a 32-person lecture rather than a 56-person lecture greatly facilitates this. We would like to pilot a "boot camp" for incoming 2A and 4A students to shore up math knowledge, re-inforce college skills, establish a cohort, and to familiarize students with their Physics instructors. This boot camp would take place the weekend before Fall quarter, and there would be follow-up sessions on selected Friday afternoons that quarter. Finally, we would also like to send faculty to the SACNAS Diversity in STEM conference. Many Diversity conferences concentrate on the Student Services element (rightfully so), and the elements focused on instruction are sparse on STEM. Most STEM instruction conferences have light offerings for diversity. This is to the point where one of our own faculty helps set the diversity agenda for the national conferences for the biggest organization in our field. SACNAS serves to bridge the two worlds. A complication, above funding, for this request, is that next year's conference is in San Antonio, so we would need the President's approval to travel to Texas on district funds.

Women make up roughly 30% of our enrollment. Statistics from the American Physical Society show that the percentage of Bachelor's degrees going to women is in the low 20's. This does not stand as a good comparison point, as most of the people in physics classes are not majors, but are in other STEM programs. In the larger scheme, women complete roughly 35% of all STEM Bachelor's, but the numbers for Engineering and Computer Science (big feeders to Physics) also hover around 20%. It is also worth noting that "higher level math" classes (1C, 1D, 2A, 2B) have had a mean enrollment of 26.2% for women over the past four years. As these classes act as context for our 4 series classes (and for many, pre-reqs), this represents another part of the struggle. While the enrollments around gender reflect larger societal issues, the success gap for gender is not statistically significant, the women in our classes as a population perform as well as their male counterparts. All FT faculty took a course on Gender Communication from the Comm department in the Summer of 2015, and while this could only help our efforts, there are much larger societal forces in play that are hindering our participation rate by women.

Be sure to include the resources you need to implement or sustain your action plans in Section 3.

2E. Faculty Discussion: Course-Level Outcomes: Please share examples of how assessment and reflection of course-level Student Learning Outcomes (CL-SLOs) has led to changes in curriculum or teaching.

In discussions surrounding CL-SLOs we have done several things. The data support the continued use of the Peer Instruction model adopted by many of the faculty. While this is also supported in mainstream Physics Education Research, it is good to see local confirmation.

As we use the SLO process as a way of looking at the experiments in our labs, we have over the years seen a gradual but constant improvement in the quality of our lab experiments.

We've also come to the conclusion that we need more FT participation in our Physics 2 series, and have discussed having one FT faculty member teach the entire series in sequence through the academic year.

2E. Faculty Discussion: Program-Level Outcomes: Please provide examples of what is being done at the program-level to assist students in achieving your Program-Level Learning Outcomes, degree/certificate completion, and/or transferring to a four-year institution (e.g. review of progress through the program, "career days"/open houses, mentoring, education pathways (clear, structured academic program maps (suggested courses for each term) for all academic programs), etc.). If your program has other program-level outcomes assessments (beyond SLOs and labor market data), discuss how that information has been used to make program changes and/or improvements.

One of our Program-Level Outcomes revolves around student lab skills. In the recent past, we have collaborated with a Physics Education Research group at Stanford led by Carl Wieman (Nobel Prize, 2001). With the guidance of one his post-docs we recast our Physics 4A labs in a model that moved away from cook-book labs towards an iterative student-led cycle of experiments. This has greatly improved students' experiences with how experimental science works. The post-doc has since moved to an Assistant Professor position at Cornell, and a paper on this set of reforms is in preparation for publication. We are refining these labs, but consider the model a success and are exploring how to implement the same in our 4B labs.

The course requirements that face our students are rather restrictive in offerings, they should complete the physics, math and chemistry sequences (although some majors offer different exit points on some of the sequences). As a result, "guided pathways" are less useful for our field. However, we have made an effort to make our course offerings both regular and predictable. Physics 2A, 4A, 4B and 4C are

offered both day and night, almost every quarter. Physics 2B and 2C are offered fewer quarters, but there are both day and night sections. Physics 4D, which is needed by a much smaller subset of our students, is offered once a year, during the day. It is open to question if it would make if it were offered more, so great effort is made that it does not conflict with other classes such as organic chemistry and high-level engineering offering.

Please attach Course and Program-Level Outcomes (Four Column Report from TracDat). Contact the Office of Instruction if you need help.

If your department has a Workforce/CTE program, please complete Section 2F.
If your department does not have a Workforce/CTE program, please skip to Section 3.

2F. Workforce/CTE Programs: Refer to the program review website for labor market data.

What is the regional five-year projected occupational growth for your program?

What is being done at the program-level to meet/adjust to the projected labor market changes?

What is being done at the program-level to assist students with job placement and workforce preparedness?

Be sure to include the resources you need to implement or sustain your action plans in Section 3.

SECTION 3: SUMMARY OF PROGRAM OBJECTIVES & RESOURCE REQUESTS

3A. Past Program Objectives: Please list program objectives (not resource requests) from past program reviews and provide an update by checking the appropriate status box.

Hire and support a new FT faculty member.	Year: 2015-	☐ Completed	☒ Ongoing	☐ No Longer a Goal
Continual improvement of instructional labs.	Year: 2016-	☐ Completed	☒ Ongoing	☐ No Longer a Goal
	Year:	☐ Completed	☐ Ongoing	☐ No Longer a Goal
	Year:	☐ Completed	☐ Ongoing	☐ No Longer a Goal
	Year:	☐ Completed	☐ Ongoing	☐ No Longer a Goal

Please comment on any challenges or obstacles with ongoing past objectives.

For many years the department felt that it could not take on new responsibilities as between our classes, outreach (Physics Show), and professional contributions (shared governance at Foothill, additional responsibilities outside of Foothill), the full-time faculty were stretched too thin. The addition of a new faculty member will allow us to expand our capacity for new objectives once they have made required progress towards tenure. Note that one of our previous concerns, the lack of depth in the part-time pool, has been addressed by the hire of a new full-time faculty member. The support and improvement of our labs is hampered by the long cycle-times of the program review process. It is our

belief that programs with lab components should have an annual budget for maintenance and upgrade. These funds would be disbursed at the discretion of the Dean.

Please provide rationale behind any objectives that are no longer a priority for the program.

None

3B. Current Program Objectives and Resource Requests: Please list all new and ongoing program objectives based on discussion in Sections 1 and 2, including your objectives to eliminate any achievement disparities in course success for student subgroups (Section 2A). If additional resources are needed, indicate them in the table below. Refer to the Operations Planning Committee (OPC) website for rubrics and resource allocation information.

Resource Request	Program Objective	Implementation Timeline	Progress Measures	Resource Type Requested*	Estimated cost
Funding for "boot camp"	Increase success rates of students going into 2A and 4A.	Pilot will take place next Fall, if funded.	Student complete Bootcamp, examination of success rates for the following quarter.	One-time B-budget	$4000 ($1000 for a faculty member to plan/organize for 20 hours, $2000 for 40 hours of faculty participation, $1000 for two days of lunch for 50 students)
Flexibility around productivity goals	Manage seat counts in intro classes.	This will vary with projected enrollment.	Increased success in Physics 4A.	Reduced productivity.	The college will need to accept productivity losses in the courses where we have an effective drop in seat count.
Purchase of 16 PASCO Capstone interfaces	Ongoing support of labs. This purchase of replacement equipment supports all of our lab classes.	ASAP	Physics department continues to offer a strong lab program.	Facilities/Equipment	$17,524.56.
Additional conference/travel funding	Improve success rates of targeted populations	For Oct 2018 SACNAS Conference	Faculty return with new approaches.	One-time B-Budget	$2000 per faculty sent

Set Budget for immediate lab purchases.	Ongoing support of labs.	Rolling	Physics department continues to offer a strong lab program	Ongoing Facilities/Equipment	$20k
None	Physics of Sports class	Unclear, depends upon other demands upon faculty.	COR submitted and approved, course being taught.		None.
None.	Continue to roll-out OpenStax	By the end of the current year, all our courses will have an open-resource text that will be free to students. The faculty will provide support for these texts via solution manuals. Our two largest courses are 4A&4B. 4A should be completed in late 2017 or early 2018, and 4B by Fall 2018. Other manuals to follow as time allows.	All courses using OpenStax books. Instructor-sourced resources completed.	None	None

*Resource type should indicate one of the following: One-time B-budget; Ongoing B-budget augmentation; Facilities/Equipment; New faculty/staff.

3C. Faculty/Staff Position Requests: Please describe the rationale for any new faculty or staff positions your program is requesting:

Assuming stability in the existing FT, no new positions will be needed in the near future.

3D. Unbudgeted Reassigned Time: Please list and provide rationale for requested reassign time.

None

3E. Please review any resource requests granted over the last five years and whether it facilitated student success.

The biggest request was for a new FT faculty position. This was granted, and we are integrating the new instructor into the department. This has allowed us to shift our PT/FT ratio, and has given us extra hands for departmental efforts.

For the most part our resource requests have not been prioritized for funding. Lab equipment has been bought via budgetary discretion of the Dean, and has operated outside the confines of the Program Review structure. We were granted money a year or so ago to replace aging e/m equipment, but the cycle-time in terms of when we asked and when the money was granted was long enough that we replaced the experiment in our curriculum, and the money was not spent by the program.

SECTION 4: PROGRAM SUMMARY

4A. Prior Feedback: Address the concerns or recommendations made in prior program review cycles, including any feedback from the Dean/VP, Program Review Committee (PRC), etc.

Concern/Recommendation	Comments
Depth of PT faculty pool	A FT faculty member was hired, which allowed us to address this problem by lowering the PT/FT ratio.
Budget for lab equipment	This continues to be a concern. While the program review process is appropriate for the funding of large purchases of equipment, it does not make sense to spend large portions of a year or possibly longer to make purchases of lab equipment at low price points. Equipment budgets should be funded for departments like Chemistry, Biology and Physics.

4B. Summary: What else would you like to highlight about your program (e.g. innovative initiatives, collaborations, community service/outreach projects, etc.)?

Our program has a success rate that is strong in the context of PSME. Our SLO assessments for our core classes consist of industry-standard instruments, and our students have consistently out-performed the national averages.

The Physics Show has rolled past 100,000 attendees, including roughly 15,000 we have bused in from Title 1 schools for a show, a tour of our campus and a free Foothill College Physics Show shirt. These students are from Foothill's targeted populations, and an overwhelming majority would be first-in-family. We have even seen our first set of students who witnessed our original show. We have generated good press with multiple articles the San Jose Mercury News. We believe we are the largest event of our type west of the Mississippi, and have had a representative of the largest in the county (University of Minnesota's Physics Force) fly out specifically to see our show. A $10,000 donation by a member of the public shows both the high-profile nature of our program, and the belief that we are doing good work.

As mentioned previously, we are doing work with the Wieman group at Stanford to use Physics Education Research to investigate how students best learn. In addition to our efforts in our teaching labs, we are looking at how students use mechanistic models in Electricity and Magnetism, and whether pre-recorded video explanations are more likely to be used by students in place of assigned readings.

At the department level, we have a thriving Science and Engineering Club which supports both the Physics Show and the Physics Olympics in the Spring. We offer the F=ma contest for local Physics high school students. We offer a departmental scholarship program that will award $3000 this year.

At the college level, department faculty serve on a number of shared governance committees, including involvement in the Academic Senate, the Behavioral Intervention Team, the Human Resources Advisory Committee, and as the faculty chair of the Scholarships committee. This is in addition to involvement in multiple hiring and tenure committees.

Outside of Foothill, our faculty take leadership in the local (statewide) professional association for our field (which includes organizing and running two conferences a year). The local section is the most successful one outside of Texas, where the section works in combination with the APS section. Participation in this organization extends to the national level, where a member serves on the American Association of Physics Teacher's Committee on Diversity in Physics. This instructor will serve as vice-chair of said committee in 2018, and will chair it in 2019.

Since our last comprehensive review, two members of our department have been recognized at the national level. Frank Cascarano was appointed as a Fellow of the American Association of Physics Teachers, and David Marasco was selected to take part in a NASA program where he flew on SOFIA, a 747 modified to carry an infrared telescope.

SECTION 6: FEEDBACK AND FOLLOW-UP

This section is for the Dean/Supervising Administrator to provide feedback.

6A. Strengths and successes of the program as evidenced by the data and analysis:

The strengths of the program are as follows:

1. Enrollment in the program is increasing.
2. The authors of this document have done an excellent job of analyzing the productivity in their course offerings and also of analyzing the student success data.
3. The successful outreach model established by the program is a benchmark for such activities.
4. Changes to the Phys-4A laboratory curriculum based on collaborations with Stanford researchers and going to a inquiry based lab curriculum is a great idea.
5. The cost savings the department is providing to students by using OpenStax textbook is commendable.

6B. Areas of concern, if any:

The following items are of concern:

1. The success gap between targeted and non-targeted student populations is large. But the department has recognized this and proposed steps to address this issue.
2. Equipment budget: As identified in this and the program review document from the chemistry department, the two lab science classes in our division have unique challenges in maintaining and servicing existing equipment and also replacing old/broken equipment is just as essential. State of the art equipment/instrumentation is a requirement to provide our students the necessary learning tools and exposure; without which our students will be at a disadvantage at the transfer institution.
3. The department has indicated an interest in traveling to the next SACNAS meeting. While this is important, especially in light of the lower success rates among latinx students, the location of the meeting in Texas presents some logistical challenges pertaining to funding for the travel.

6C. Recommendations for improvement:

The following are some suggestions for improvement:

1. I agree with the department's idea of moving into the single-section classes in Phys-4 series with a seat count of 32. This might require a conversation at the district level.
2. Perhaps the department can look into grant proposals (from NSF) that could help in the acquisition of modern equipment. With the modification of the lab curriculum to one that is more project based (perhaps this could be expanded to the entire series), the chances of success is higher.

6D. Recommended Next Steps:

- ☐ Proceed as Planned on Program Review Schedule
- ☐ Further Review / Out-of-Cycle In-Depth Review

This section is for the Vice President/President to provide feedback.

6E. Strengths and successes of the program as evidenced by the data and analysis:

6F. Areas of concern, if any:

6G. Recommendations for improvement:

6H. Recommended Next Steps:

- ☐ Proceed as Planned on Program Review Schedule
- ☐ Further Review / Out-of-Cycle In-Depth Review

Upon completion of Section 6, the Program Review document should be returned to department faculty/staff for review, then submitted to the Office of Instruction and Institutional Research for public posting. Please refer to the Program Review timeline.