Report of Outside Reviewer, Program Review for the Department of Physics, Sonoma State

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Introduction

This review of the Sonoma State Physics and Astronomy program is based on a careful review of the provided self-study document dated April 20, 2015, and a one day visit to the CSU Sonoma Campus on April 24. During my one-day on campus visit, I followed the schedule as provided to me by Dr. Severson, which included meetings with all tenured/tenure-track faculty members, the department chair, instructional and administrative staff, undergraduate physics majors, and administrators. The dean and I spoke by phone shortly after my visit, as she was not on campus during my visit. It is clear that opportunities had been arranged for me to talk to all relevant personnel and the feedback I received from meeting with the undergraduate students (7 students, 5 female, 4 male) was also very helpful.

I greatly appreciate the abundant hospitality I received- everyone I met at Sonoma State was friendly, welcoming, and helpful.

Strengths

Collaboration: A major strength I observed during my campus visit is the quality and cohesiveness of the faculty. I came away with a firm impression of a hardworking and committed faculty, who were cohesive, collegial, and displayed excellent working relationships. From the vantage point of my one-day visit, I was struck by the camaraderie and excellent morale of the tenured faculty. In addition I feel the recent tenure track hire of Dr. Targett was a success as he demonstrates a strong record of excellence in teaching with research that strongly complements and strengthens that of the department. The curriculum of the program also reflects the cohesiveness of a strong faculty emphasizing the specific strengths and expertise of the current faculty, producing a program unique in its emphasis on astronomy and astrophysics.

Innovative curriculum: Some great ideas have been well-implemented here. I was impressed with the initial physics courses for all physics majors (P100, A100) with the particular emphasis on conveying the fascination of the cutting edge research (why physics is fun) that keeps students motivated and excited in their initial years while they get mathematically prepared for the upper-division coursework. I found the upper division labs to have excellent resources and the curriculum very strong; every student gets exposed to instrumentation including a scanning electron microscope and other well-maintained high-level equipment. A mandatory senior project (capstone) for all physics majors is a well thought culminating experience prior to graduation, and I encourage further development of structure for this requirement (more on this below).

Alumni Connection: The willingness of graduates to stay in touch and keep the department updated about their work seems to be a reflection of a department in which students feel nurtured and guided. The documentation provided in the appendices of the report titled “Graduates and Their Career Pathways” containing current information on 350 graduates is beyond anything I’ve ever seen in terms of maintain connection with alumni and data for career outcomes and is an outstanding achievement.

Graduation Rates: Sonoma Stat’s physics graduation rate of 9.6 graduates per year is excellent given the faculty to physics major ratio (here at Fresno State our average is about 6 graduates per year with 10 TT faculty).

Contribution to GE: In addition to the innovative and exciting opportunities for majors, this department offers a very strong contribution to general education at the university. In the past academic year more than 1000 students enrolled in Astronomy 100 (from Appendix A), given the student population of about 9000 for the university as a whole it seems that more than a third of all students at the university take the introductory astronomy class for GE! This is an amazing accomplishment and wholly appropriate in the eyes of this reviewer.

FYE participation: Very good effort in the area, especially noted is Dr. Qualls’ development of a first year STEM experience centered on Science 120. Increasing retention is correlated to improvement in diversity in STEM graduates and this work is important.

Research: Over the period since the last program review that department has seen good success in obtaining external grants and Dr. Cominsky’s EPO program remains strong.

Challenges

Given the level of commitment by all parties in the physics program, documented in the program review binder and observed during my visit, one paramount issue of concern is the workload taken on by the five tenured faculty, and by the technical staff. In my role as reviewer I noted a sense that the faculty were at the upper limit in terms of commitment and productivity- they are giving it there all, and by all appearances this means many hours beyond a normal work week in the line of duty. I applaud the sense of mission and dedication, and I strongly advocate for the requested increase in resources detailed in the program review. Maintaining research in the face of heavy teaching loads is indeed currently being accomplished, but further support is needed to make the important curriculum element (the requirement of all seniors to complete a research project) sustainable in the long run.

Specifically, I received feedback from seniors that I met with over dinner that spoke highly of the senior research projects, and the requisite research presentation, but also mentioned that they felt further preparation, including more structure in setting expectations early in the project, would have been beneficial. This kind of mentoring instruction is what provides real research experience and is a main source of excellence in the program- but it comes at the cost of tenured professor workload, a cost that is fully warranted and worth investment at a high priority.

Another area that can be a sink on professional time is antiquated and worn-out equipment. The physics and astronomy program involves the utilization of specialized equipment in engineering and science related service

courses as well as upper division labs for majors. Here the relevant staff and faculty told me there are serious equipment renovation and replacement needs, and that maintaining malfunctioning equipment is taking a toll on the technical staff in terms of time and productivity. It was brought to my attention that lower division labs need a renovation of the physical space- the labs as designed do not allow a line-of-sight to the whiteboard and instructor, a situation clearly out of synch with current best practices.

Academic Advising: The distributed advising model (assignment of the pool of majors to tenured faculty) seems to be working but at a very high toll on faculty workload. On my campus it is a considered a given that good academic advising leads to higher pass rates, higher graduation rates, and higher retention. The model where advising is central and supported by course release should be reinstated. The program has taken its role seriously: the advising handout describing the program curriculum is detailed and well thought and in my interview with Andrea (department administrative coordinator) she reported that by comparison physics majors seem well informed and ask fewer curriculum related questions of her on the whole. Again, the current success is due to the conviction and dedication of the faculty, but has come at the price of increased workload that sacrifices (and threatens to sacrifice) other important areas of the program.

Finally, although I saw evidence of a very strong temporary faculty pool, this resource of talent cannot make up for the lack of tenured faculty. The program had seven tenured faculty for many years but most recently the program has had to make do with the heroic efforts of just four faculty. Just this year the program added Dr. Targett, and although this recent hire is a step in the right direction, only an increase in tenured faculty can address and relieve the workload issues that threaten the productivity and moral of the program.

Recommendations

1) Given the quality of the program and its major contributions to student success and the university as a whole, it is strongly recommended that the university should authorize at least one (or more) tenure track hires in the near future. It is important to restore the tenured faculty density back to a level that will ensure the continued excellence of the program, to allow the preservation of high moral and productivity of the existing dedicated and collaborative faculty and staff, and to address the challenges outlined in the previous section.

2) The proposed changes to the degree program as discussed in detail in the program review binder (section H.2.i) are well thought and well documented and should be implemented. This reviewer supports all curriculum changes recommended by the program. The proposed BS in physics with a concentration in Astrophysics is an excellent renovation to the former BS in Applied Physics; this recommended new degree option would showcase the strong expertise and history of excellence in Astrophysics and Astronomy unique to Sonoma, but would avoid the perception of a lack of rigor sometimes associated with a BS in Astronomy alone. It is wise to still offer a BA in physics (with the rigor of calculus prerequisites), and the proposal to change the former degree of a BA (but without calculus) to a BA in Physical Science is completely in-line with many physics programs in the CSU system and beyond.

3) The department should develop a prioritized list of equipment needs and submit this list on a semester basis to the administration. The list should be detailed with cost estimates provided, and with clear statements of need, foremost detailing the impact on student learning outcomes, and secondly on impact towards faculty

and staff productivity. Given the current needs of the program (and future needs as all equipment has a half-life), such a well-documented and substantiated list may be used to argue for a multi-year investment plan that would hopefully entail an equipment budget line item in the program's overall budget allocation each year.

4) One of the many highlights of the program is the upper-division laboratories where students get to interface with cutting edge equipment (such as the Scanning Electron Microscope (SEM), in Dr. Shi's courses). Currently Mr. Steve Anderson has the expertise to maintain this (and many other) delicate pieces of equipment and this expertise is crucial to the longevity of these lab experiences. A loss of Mr. Anderson for any unforeseen reason would result in dramatic setbacks to the program in delivering these crucial aspects of the undergraduate experience. To emphasize this point; at the reviewer's institution we do not have staff with such expertise and our model is to pay for expensive maintenance contracts with external vendors, and often these funds run out with consequences that negatively impact our program (currently Fresno State does not have a functioning SEM). Given this situation I recommend that detailed logbooks be kept on all equipment with high overhead (such as the SEM) and that further staff are allocated to support Mr. Anderson to the extent that he has time and resources to produce sufficient documentation, and optimally, to train additional staff in these sensitive high-expertise areas such that the unique technical experience on these specific machines should not be lost. In addition, professional development funds should be allocated to staff on an annual basis- at least enough to attend a conference and workshop each year.

5) Academic advising should be recognized for its importance in savings to the university and to students. It is recommended that the department receive course release to support their academic advising.