Graduate Program Review
Biological Sciences, Sonoma State University

Prepared by Emily Taylor, PhD
Associate Professor and Graduate Coordinator, Cal Poly, San Luis Obispo
June 2016

I. Summary

The Sonoma State University (SSU) faculty and graduate students have a mutualistic
relationship where both learn and gain from one another professionally. The graduate students
clearly contribute several elements that are essential to the teacher-scholar model of the CSU
at SSU, including data collection and other duties needed to meet research and grant-related
expectations, teaching introductory laboratories (freeing up faculty to teach specialty courses),
and acting as mentors to undergraduate researchers. The SSU Biological Sciences department
has been doing an excellent job in efficiently mentoring graduate students through meaningful
research experiences resulting in publications and career placement. Notably, they have done
so with remarkably few resources, but with evident strain on faculty and graduate students
alike, despite their impressive successes. In this review, I comment on the practices that appear
to be of most value to the graduate program and provide suggestions for improvement.
Throughout, I focus on how graduate students in the SSU Biological Sciences department
form the backbone of the professional development of faculty and contribute dramatically to the
education of undergraduates, thereby occupying a place of major importance in the promotion
of the university’s values in education and research.

II. Mission

The mission statement of the SSU Biological Sciences department is organized around modern
and practical goals for training students to become scientists, perform original research, and
move on to the next step in their careers. They include: 1) develop in students a skill set that
includes critical reasoning, creativity, self-expression, and the ability to collect, synthesize, and
analyze information from a variety of sources, 2) prepare students for a career or career shift
either by pursuing a PhD. or by obtaining a job that uses their biological knowledge and skills,
and 3) generate new knowledge about the biological world.

a. Is it philosophically coherent?
The mission and goals of SSU’s Biological Sciences graduate program is clearly articulated and
focused around skill development and job placement after graduation.
b. Is it appropriate for a comprehensive undergraduate institution that aspires to provide a strong liberal arts education for all undergraduates and to provide selected graduate programs in response to the professional development needs of the region?
The practicality of the mission is very well-suited for a university with the major aspiration of producing graduates with Master’s degrees who can enter the local workforce. The skills-based curriculum provides students with a modern and applied approach to problem-solving in the biological sciences. This clearly has resulted in the development of high quality graduates well-suited to meet the needs of local employers in science-related fields.

c. Does it uphold the SSU Mission Statement and Diversity Vision Statement in its dedication to perspectives of diversity?
The mission of the Biological Sciences department upholds the university’s mission statement in that they mutually promote learning, appreciation of intellectual achievement, leadership, and pursuing careers. Although it is difficult for a biological sciences program to inherently promote diversity-related issues, the self-study specifically addresses ways in which the department values diversity in its graduate students and seeks to pass on those values to students and society.

III. Curriculum

The SSU Biological Sciences department’s graduate curriculum consists of 30 units, at least 15 of which must be graduate coursework (the remaining 15 units can consist of upper division, undergraduate coursework). Up to twelve of the units may be non-coursework units (e.g., Biol 595 and 599), where students earn credit for completing projects and conducting research. The remainder of the graduate coursework at SSU consists of various sections of Biol 500S (graduate seminar), which are special topics courses with revolving subjects. This curriculum has the major advantages of being stream-lined, flexible, and skills-oriented, but it also should be acknowledged that it is coursework-light in comparison to many other similar Master’s programs.

a. Is it current?
The seminar-based curriculum benefits students by providing them with learning experiences focused around current topics in the biological sciences, where students can choose topics of interest to them and related to their research and future goals, and where they can gain insight into the background, techniques, and current research in specific areas. This highly specialized curricular model resembles a doctoral program approach, where students are encouraged to focus on skill development and current topics in fields related to their research. In this way, the curriculum represents a departure from traditional course-based approaches where students learn a broad range of material and apply their knowledge in the laboratory. While the curriculum is to be commended for its focus on skills and current research, I encourage the department to devise ways to assess the impact of this curriculum on the knowledge and skills of the students, as currently there is no assessment protocol directed at curricular effectiveness. Currently the assessment relies on aligning courses with program learning objectives, but it fails to take it to the next step by addressing how well the courses perform in
helping students achieve/attain the learning objectives. In addition, faculty could consider examining whether any SSU graduate students are receiving their Master’s degrees without any experience in laboratory courses where they have opportunities to practice the course content in a hands-on setting. Laboratory coursework is one of many experiences that should be considered essential for a student garnering a Master’s degree.

b. Does it have clearly stated goals that are consistent with the department’s mission?
The curriculum does not have clearly stated goals of its own. However, it is evident in the self-study that the curriculum is well-aligned with the department’s goals of engaging students in original research and producing graduates prepared for careers in biology.

c. Is it well focused?
See above. The curriculum is highly focused on skill development and current topics in biology.

d. Does it reflect an appreciation of the richness of differences among us?
The focus of the curriculum on seminars and its flexibility to include undergraduate courses allows students to choose the courses that best suit their needs. However, during my visit many students noted the need for additional graduate courses, a goal that could be achieved by encouraging faculty to teach graduate courses and hiring additional faculty members.

e. What are its greatest strengths? Its weaknesses?
As described above, the greatest strength of the curriculum is its modern focus on current research. The greatest weakness is a lack of assessment of the curriculum’s effectiveness in terms of the program’s learning objectives.

f. Is the faculty appropriately prepared to deliver it?
The SSU Biological Sciences faculty are clearly well-qualified and motivated to teach biology seminars. Both the faculty and the students said that the faculty often strain to find time in their schedules to teach graduate courses, with some students noting that they feel they would benefit from additional sections with widely ranging topics. This strain is understandable given a faculty of only 11 in a department focused primarily on undergraduate coursework. From this perspective, the faculty are to be commended for providing such a diversity of seminar courses. Nonetheless, additional faculty hires, with due emphasis placed on graduate teaching in addition to undergraduate teaching, would help in this area. During my visit I learned that approximately half of the faculty regularly teach graduate seminars. Given that the faculty is so small, it is imperative that the majority of the faculty teach graduate seminars. The department chair/scheduler should consider ways to assign most or all faculty to seminars, and hiring committees should place emphasis on applicants’ willingness to teach graduate courses.
IV. Program Effectiveness

a. How effective does the department seem to be in preparing its students (both majors and GE students) as it wishes?

Based on graduation rate, publications, and career placement data along with interviews with current students, the graduate program is highly successful in preparing its students to meet the goals outlined by the department. This success is especially noteworthy given the small size of the department. The SSU Biological Sciences faculty are doing a lot for their students with very few resources. Below I outline specific program strengths and challenges.

Program Strengths

SSU’s graduate program in Biological Sciences is very strong as measured by the program size (number of graduates relative to faculty), efficiency (3-year and 7-year graduation rates), and metrics of student success (publications, placement in jobs and/or further graduate study).

i. Program size: In 2016, 35 students are currently enrolled in the Biological Sciences graduate program, which has 11 full-time faculty and two additional faculty mentors from other departments. This amounts to a current average of 2.7 graduate students per faculty, although it should be noted that the distribution of students to faculty is actually very skewed (e.g., some have very few and some have very many students). The average is a high number of graduate students per faculty and indicates that SSU faculty place an emphasis on mentoring graduate students. During the review period, 42 students successfully completed the program and 5 students dropped the program. The self-study reports that the program is slowly growing as the department hires new faculty who are interested in mentoring multiple graduate students.

ii. Program efficiency: During the review period, the 3-year graduation rate was 72%, and the 7-year rate was 92%. It should be noted that this does not include students who dropped the program (5 students dropped the program out of a total of 47 enrolled students). So, the data can be interpreted as 72% of students who finished the program did so within 3 years, and 92 did so within 7 years. The modal time to completion was 2.5 years (22 of 42 students). Although comparative data from other similar programs are hard to come by, I can assert that SSU’s graduation rates are near the high end of the spectrum based on conversations I have had with other CSU graduate coordinators. This is especially noteworthy given the paucity of financial support for students (see Challenges below) because it shows that many students are able to successfully complete the program in a timely manner despite potentially having to work other jobs or otherwise go into debt. One reason that the program is so efficient is that the curriculum is very stream-lined (see above), allowing students to spend more time on scholarly activity.

iii. Student success: Metrics of success of a graduate program are to be found less in GPAs and other such academic performance measures, and more in research productivity and job placement. During the 5-year review period, SSU graduate students published a total of 40 papers, many of these with faculty and undergraduate co-authors. SSU graduate students are to be applauded for their success in publishing their work, and similarly the
faculty for having mentored the students to this strong publication record. Some graduate students published multiple papers and some published none, which is to be expected. SSU faculty told me that graduate students are expected to publish their work, or at least submit it for publication. Clearly this expectation is voiced to the students and they take it seriously. Similarly, the SSU graduate program has an excellent record of placing graduate students in further graduate study (e.g., PhD or other graduate programs) and jobs, with at least 40 of 42 graduates during the 5-year review period successfully obtaining positions in scientific fields following graduation from the program. This is a very high percentage and speaks both to the students’ preparation by the program and to a strong market demand for biologists. Notably, many of the graduates are employed in Sonoma County, underscoring this local need for qualified graduates with Master’s degrees in Biological Sciences.

b. Does the department have an assessment strategy adequate to reveal what is working very well and what is not?
The Biological Sciences department’s assessment plan seems to consist solely of analyzing and responding to previous reviews and creating a self-study for the current review. While the external review is a major part of an assessment, the department should itself begin assessing the program by collecting data to include in future reviews. Some of the most important data are in fact already included in the current self-study. These include graduation rates, publications, and career placement data. Clearly these data are essential components of assessing the degree to which the department is meeting its goals and learning objectives. However, I recommend that the department create an assessment plan to quantify as best as possible how well students in the program are achieving the learning objectives. In the last review, some progress was made in creating such assessment procedures, but most of these have since been abandoned. I discuss this in more detail in the Recommendations section below.

c. Is there evidence that the department has used assessment findings to guide program change?
The self-study outlines how the graduate committee and the department have responded to the previous review. Many of the responses have appropriately included continuation of efforts to improve the curriculum and financial support for students. These are not short-term, easy fixes, and the faculty continue to work on their students’ behalf. It is not clear that there has been tremendous change per se since the last review, but I am not sure that a vast amount of change was warranted based on the positive review and the excellent current state of the program. As noted above, the department should invest resources into assessing the extent to which students are achieving its program learning objectives.

Program Challenges

A list of challenges limiting the success of the SSU Biological Sciences graduate program is below. Recommended solutions, when possible, are provided in the Recommendations section following this section.
i. **Assessment**: The department generally lacks a solid program assessment plan and therefore lacks data assessing the program. Above I have highlighted some data that are relevant here, including the strong publication rates and post-graduation career placement of students. While these data are highly valuable, they do not provide a complete assessment of the program.

ii. **Financial support for students**: Like other CSU campuses, providing graduate students with sufficient funding is a continual challenge. The advent of tuition waivers for teaching associates (TAs) was a major advance in helping students financially. However, the faculty and students told me that there are not enough waivers and that the teaching salary is not close to enough to meet the financial demands of living in Sonoma County. Many students go into debt by taking out loans or are forced to work other jobs, which can compete for time with research. At SSU it is very common for students to take paid summer internships or jobs, whereas if provided with summer support by SSU they could be continuing their research, writing papers to submit for publication, and mentoring undergraduates. SSU faculty reported losing many highly qualified applicants to other universities with better financial packages for students.

iii. **Space**: It was evident in the self-study and during my site visit that space is extremely tight in the SSU Biological Sciences Department. Most graduate students have desks in their faculty advisor’s research labs, which makes for very cramped research, collaboration, and writing space. Issues with space run deep in the CSU, and are classically difficult to solve. Although there are no clear solutions at present, I underscore the importance of sufficient space when running a successful research laboratory. My very clear impression when visiting was that SSU graduate students and faculty are doing an excellent job with the limited space and resources available to them, but that they are uncomfortably cramped and that sustained growth of the program will occur only with additional space.

iv. **Compensation for Graduate Coordinator**: The SSU Biological Sciences Graduate Coordinator currently receives no release time for their important duties. The duties of a graduate coordinator extend far beyond managing applications and student paperwork (in itself requiring a lot of time)—see SSU Self Study Appendix III for a list of the duties identified by the graduate coordinator. This is a serious problem because this list of duties is clearly extensive, and the coordinator must do them on top of their other duties. It is not surprising at all that little formal quantitative program assessment has been attempted since the last review given that the coordinator does not have the time or compensation to perform this major task. The majority of Biological Sciences programs in the CSU provide release time for graduate coordinators to facilitate the large amount of work managing a graduate program entails, and SSU should follow suit.

V. Resource Use

Are existing program resources being used to the greatest effect?
The SSU Biological Sciences department is a small department focused, as all CSU campuses are, on undergraduate education. That said, I was impressed by how the department strategically stretches its resources to manage a graduate program with students producing.
excellent publications and going on to secure positions in PhD programs or careers in the sciences. A tour of the department showed me that faculty have small but modern and well-equipped laboratory spaces. Graduate student offices tend to be housed inside laboratories, a situation which might be logistically productive if not for the small spaces (i.e., the spaces were clearly crowded and cramped). Despite the fact that start-up funding is low, the 11 faculty members in the department tend to share resources such that graduate students can perform all of the techniques they need for their research. Additionally, several faculty members have been highly successful in obtaining major external funding, which benefits the graduate students tremendously. All in all, the department is doing an excellent—actually a truly noteworthy—job with the relatively small amount of resources they possess.

To the extent that faculty workload can be considered a resource, workload related to mentoring graduate students is well spent. SSU Biological Sciences faculty currently receive 0.5 WTU per semester for mentoring a graduate student, up to a total of 6 WTU per year. The total 6 WTU is often combined with release for supervising undergraduate research. Faculty members routinely exceed this number as they supervise additional students. This release time for mentoring students is extremely important, as it provides a small reduction in in-class teaching time to facilitate laboratory and field research with students. Faculty could not maintain their research productivity, publication rates, and grant funding success without this valuable release time. The 25% maximum release for student supervision is, in fact, an absolute minimum for conducting successful research with students. If additional faculty could be hired, or if specific courses could be taken over by lecturers so that tenure-track faculty could receive additional release time for research, productivity would skyrocket. Understanding the delicate balance between teaching and professional development at a CSU, my recommendation would be to explore ways to obtain additional release time for supervising student research to meet the great demand for such opportunities from graduate (and undergraduate) students.

VI. Recommendations

The self-study outlines several action items addressed since the last review, many of which are long-term and thus require continued attention. In addition, the self-study identifies several new or continuing action items that the graduate committee plans to address in the near future. These action items focus on improved support from the university administration in the following areas:

- Improved financial support for graduate students, including more tuition waivers, internal funding for research supplies and equipment, and increased TA salaries
- Creative solutions to space problems such that graduate students have the space they need to pursue scholarly activity
- Additional faculty hires in the biological sciences, with due focus on desire and potential to teach and mentor graduate students
- Support mechanisms for faculty to apply for external funding, including workload release for grant-writing

The action items above are highly worthy because they would provide obvious assistance to faculty and graduate students in meeting their professional goals. Graduate students conduct
most of the bench and field work that forms the life blood of faculty research programs. What might not be so immediately obvious is the additional benefits they could provide to SSU undergraduates and to the university as a whole. Supposing such resources were provided to the Biological Sciences department, it could begin attracting the highest quality graduate students, who would have a greater work ethic and productivity, leading to improved publication rates and success in acquiring external funding. This is essential: faculty cannot obtain large grants (e.g., NSF) without the graduate students to perform the work. These grants come with large overhead that benefits the university in many ways. In addition, graduate students are important mentors of undergraduate researchers, in addition to the essential roles they play as TAs. These roles are important both educationally (e.g., graduate TAs free up faculty from introductory laboratories so that they can focus on upper division specialty courses that are in high demand from undergraduates) and financially (e.g., graduate TAs, even if they were to receive increased salaries, represent a major cost savings in instruction for departments with graduate programs).

In addition to support for the action items described above, I have outlined several suggestions for things that the department can consider implementing over the next five years to improve the program.

1. **Continue to offer graduate seminars as core offerings in the curriculum, and increase the number of graduate course offerings if possible.** The seminar-based curriculum is key to the success of students in the SSU Biological Sciences graduate program because it allows them to focus on current issues in biology as well as skills important to all graduate students rather than being bogged down in extensive coursework. In my interviews with graduate students, several of them noted that they wished there was more variety from which to choose. Clearly, in a program with 11 full-time faculty members, it is difficult to balance graduate student seminar demand with other compelling needs like undergraduate teaching. However, future hires to the Biological Sciences department should be evaluated based on their interest in teaching graduate seminars, and faculty should be expected to contribute annually to the program by teaching a graduate course. During interviews, graduate students complained about what they saw as a relatively narrow selection of courses taught by a select few faculty members. They also said that many of the undergraduate courses that they are encouraged to take are at a level too low for a graduate program. Graduate students need to be challenged and they need exposure to diverse faculty. Therefore, SSU Biological Sciences needs additional faculty hires and graduate course offerings.

2. **Consider generating a formal system of checks and balances that requires students to take oral exams before beginning major data collection, not after.** Some faculty and students lamented the fact that the oral exam is not always used in the way it was designed, which was to establish whether the student’s research ideas and preparation are suitable and sufficient before they begin the project. A simple formalization of the process would go a long way to improving this, which would help students avoid mistakes in experimental design and avoid alienating committee members who would have liked to give their input on design.
3. **Consider reevaluating the requirement that faculty accept at least three graduate students prior to tenure and promotion.** From my interviews with SSU faculty, I learned that this requirement was put in place to underscore the department’s values, which include the philosophy that all faculty should mentor graduate students. In addition, the requirement helps ensure the continued healthy size of a graduate program in a department with a small number of faculty. However, a problem with this requirement is that it essentially forces faculty to take on graduate students even if they do not want to. This “one size fits all” approach can cause problems because the graduate students might not receive the strong mentoring that they deserve. A solution to this problem is not obvious, because the fear is that eliminating the requirement could cause a decline in the rate of faculty accepting graduate students and thus a reduction in program size.

One idea is not to require graduate student mentorship per se, but instead to include it as one of many implicit responsibilities required for retention, promotion, and tenure, along with teaching, undergraduate mentorship, and service. During faculty recruitment, search committees should evaluate applicants based on their commitment to providing graduate research opportunities and courses in addition to other responsibilities. I encourage the SSU graduate committee and faculty to reevaluate this requirement in the coming years as they seek to improve their program.

4. **Consider implementing a TA training program for first semester graduate students.** This could either be an all-day training during orientation, or a semester long seminar. During my visit and interviews with students, it was clear that such training would help them develop as teachers, experience less stress during their first semester, and gain skills needed for post-graduation employment in those interested in careers in education.

5. **Continue to underscore the importance of faculty release time for mentoring graduate students.** The 0.5 WTU per graduate student release should be defended vigorously to the administration according to the following principles: (1) Mentoring students is an enormous amount of work, and faculty should be compensated for their work; (2) Graduate student success is tightly linked to attention from their advisors, and faculty need time to give this needed attention; (3) Success of graduate students brings attention and funding to SSU in the form of publications and grants.

6. **Provide release time for the Graduate Coordinator.** The coordinator should be given appropriate release time (20-25% release) to complete the many duties required to manage the graduate program, and also to contemplate new ideas for ways to improve the program, something that is difficult to do when given no compensation for such an important task.

7. **Work on developing assessment procedures to analyze the efficacy of the program.** The component most lacking from the self-study is a thoughtful attempt to assess the program. This is not surprising nor damning considering the overloaded workloads of the Biological Sciences faculty, especially the graduate coordinator who receives no compensation for their work and thus likely does not have the necessary time to develop new assessment techniques. However, the department will need to develop a comprehensive assessment plan for the next review cycle. Such plans are valuable in identifying program weaknesses, but are equally important in highlighting the strengths.
that can be used to promote program interests to applicants, funding sources, and the university administration. I recommend that the graduate committee focus on aligning their program learning objectives with assessment techniques. The learning objectives are already written with demonstrable verbs that can be evaluated quantitatively (e.g., “identify,” “communicate,” “analyze,” “assess”). However, few attempts have been made to quantify how well students are achieving these objectives. For example, the objective “Effectively and accurately communicate concepts and ideas in verbal and written forms” could be assessed by means of faculty evaluations of the defense and the thesis using rubrics. Apparently a rubric for the thesis exists already but was discontinued because it seemed redundant to the comments provided on the thesis to the student. However, the purpose of the rubric is not to help the student, but is to provide data to help the faculty assess the health of the program. For example, nowhere in the self-study was the quality of the written thesis assessed. Given the central importance of the thesis as the culmination of the student’s research, its quality need to be assessed to evaluate what aspects students are doing well and what could be improved, thereby generating potential future action items. I therefore recommend reintituting the rubric to evaluate the thesis (to be completed by all committee members), developing a new rubric to evaluate the defense (to be completed by all faculty in attendance), and by creating assessment plans for the other program learning objectives.

8. **Re-implement the exit survey as a means of collecting data on the program from recent graduates.** The exit survey was discontinued because faculty noted it was not particularly useful, especially because graduate students seemed to avoid answering certain questions fully due to concerns about their anonymity in such a small program, where the identity of the student could easily be ascertained. If this is the case, then the exit survey could be reassessed and/or rewritten to ensure that it asks questions that request students to provide thoughtful suggestions or evaluations of the program. If anonymity continues to be an issue, then perhaps the surveys could be routed through a staff member and accessible to the graduate committee only as a review cycle approaches. I encourage the graduate committee to brainstorm ways in which they could re-implement this survey and use it to obtain valuable information from graduating students. After all, they are the ones in the program, and therefore the graduate committee should tap into their experiences to get ideas for improving the program’s performance.

9. **Discuss fundraising opportunities with representatives from SSU’s advancement office.** Currently, fundraising from alumni, local companies, and other potential donors appears to be driven primarily by the faculty itself. This is an unacceptable use of faculty time, especially in a small program where faculty members are already so impacted. Fundraising should be headed by dedicated fundraisers from the university’s advancement office or similar fundraising body. I recommend that the graduate committee schedule a meeting with a representative from this body and brainstorm ideas to generate funding for graduate students, including topic-based scholarships and competitive summer support packages.