Report for the Review for the Department of Biology, Sonoma State University

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Introduction

At the request of Dr. Stacey Brosick (Associate Vice President for Academic Affairs & Dean of Undergraduate and Graduate Programs), I was invited by Dr. Sean Place (Chair, Department of Biology) to visit the Sonoma State University campus on November 13, 2024 to conduct an academic review of the university's Biology department. During this one-day visit, I met with administrators, faculty, lecturers, support staff, and students. I toured the department's teaching and research facilities. Dr. Brosick, Dr. Elizabeth Wade (Dean of the School of Science & Technology), Dr. Place, and all faculty, staff and students were forthcoming, open and engaging. The information discussed in the review is based on in-person interviews with the faculty, staff, students and administrators, and on my review of the department's own self-study. The contents of this review represent my evaluation of the department's resources, strengths, and weaknesses, and offer my best recommendations for its future success.

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Department metrics and strengths

The Department of Biology is one of fifteen departments in the College of Science, Technology and Business at Sonoma State University (SSU). It is the 3rd largest major on the SSU campus, serving 383 majors and 14 minors during the 2024-25 academic year, and it is one of two departments that regularly uses graduate students as Teaching Assistants in is classrooms. The faculty consist of eleven tenure track faculty, seven of whom are Professors, three are Associate Professors, and one is an Assistant Professor who is currently going through tenure review. There are also two full-time lecturers assigned under 3-year contracts who assist with teaching large General Education courses for non-majors, such as Biol 110 and Biol 115, and they assist with lower and upper division core courses. There are 1.5 Administrative Coordinators and two Support Technicians who serve the department's education and research activities. The department offers BA, BS, and MS degrees, and its curriculum has a strong emphasis on laboratory and field courses, offering its students research opportunities as part of their degree requirements. The full-time faculty are research active, securing $5.4 M in extramural funding since 2017 and publishing more than 100 papers in high-quality peer-reviewed journals. It will be important to continue to support the faculty so they can maintain such research activity, as this is crucial to recruiting new faculty in the future and involving undergraduate students in cutting edge research. The department's mission is stated as "The overall mission of our undergraduate and graduate programs is to educate the next generation of scholars, professionals and citizens so that they are prepared to meet the biological, environmental and technological challenges of the future".

Facilities and resources

The department has eight teaching laboratories, each of which seats 18-24 students. These are well maintained and equipped. There as a greenhouse (Raymond Burr Greenhouse), a small walk-in temperature-controlled room that houses a recirculating seawater system, and several museums. These facilities support live and dead material for use in classes and student research. The seawater system is maintained by the support staff, with seawater delivered as needed from UC Davius' Bodega Bay marine Lab. There are two lab preparatory rooms and a well-stocked museum of vertebrate and invertebrate animals, and a plant herbarium that are available for classroom activities. The department also has ten faculty research laboratories and 16 offices that are occupied by full- and part-time faculty, with one office occupied by graduate students. There are also research facilities that provide access to a variety of physiological equipment, ultracentrifugation, PCR, electrophoresis, epifluorescence and laser scanning confocal microscopy, and a radioisotope laboratory. The operating budget provided to the biology department by SSU has been maintained at $23,524 per year over the past five years. These funds support office and laboratory costs, and field supplies. The department's budget has been supplemented by modest laboratory fees,

faculty research grants, and donations by the community. While the facilities and budget have supported the teaching and research mission of the department, increased university support would benefit aging equipment such as microscopes and lap top computers, which will improve overall classroom quality. Failure to do this results in asking to department to continue “doing more with less”, and this will be increasingly important in the future as operational costs increase. Further, there should be funds available for catastrophic losses of equipment such as microscopes that are used in classrooms. In the past, the Provost’s Office has supplied funds to support cost associated with class field trips, which were primarily related to vehicle rental charges. However, these funds were unfortunately eliminated in 2018, and the department has relied on donations to cover the costs of field trips since then. Given the importance of field experience in undergraduate education in biology, and the unreliable nature of donor funds in the future, it is strongly recommended that the university return to funding the cost of field trips. Also, it is important to note that there are limited number of vehicles in the local area to rent and that these vehicles are in high demand, putting their continued availability in question. Therefore, it is recommended that the university assist the department in securing long-term access to vehicles the can transport students to the field. Beyond this, investment in the seawater system, such as installing a larger roof-top holding tank, would benefit the teaching support for the marine classes.

Major challenges and opportunities

I believe the primary concern the biology department faces centers on the fact that the eleven tenure track faculty are very top heavy, with seven Professors, three Associate Professors, and only one Assistant Professor, who is currently under review for promotion to Associate Professor. These faculty are currently teaching at maximum capacity, with the teaching load assisted by two lecturers who are hired on three-year contracts. The department can benefit by hiring additional lecturers to further reduce this burden and create new teaching opportunities for the permanent faculty. However, it is important to note that as many as five of the seven Professors will be eligible to retire in the next three to five years, which would leave a large hole in the department’s teaching and research abilities. If this occurs, it will provide the department an opportunity to not only replace these retiring faculty, but also to re-define the department’s direction of teaching and research activities, and to hire young diverse faculty who will lead the department for the next 20 years. But this will require planning ahead for these. It is also important to realize that that some of the staff will be eligible to retire in the next five years, and it is recommended that replacements be identified and trained before this occurs in order to maintain institutional knowledge. Losing such knowledge can negatively affect the efficient operation of the department, and addressing these pending vacancies will be important to its future success. I realize there is a budget crisis, and all hires are on hold, but it is important the department and the university plan ahead to secure these hires in a timely manner once vacancies

occur so it can maintain faculty at the eleven it currently has, at a minimum, and retain the institutional knowledge in how the department is run.

Teaching and student learning

The biology department teaching allocation operates under a 9+3 model, which seems to be working very well. Under this model, faculty receive 1/3 unit for each undergraduate and 1/2 unit for each graduate student they train in their laboratories, with a maximum potential of receiving three units total per semester. The remaining nine units are received for classroom instruction or are given for assigned time for service such as the Department Chair, Radiation Safety Officer, and the Health Profession Advisory Committee Chair. Faculty can also buy out teaching on extramural grants. This encourages faculty to be active in research and training students, which is a strength of the department and should be maintained. In support of this, the department has an active graduate program and there is great integration between undergrad and graduate programs. Indeed, the department is one of two departments on campus that regularly use graduate students as Teaching Assistants. This not only helps fund graduate students during their academic training, but it also better integrates them with undergraduate education. Other funding comes from extramural research grants awarded to their faculty mentors. Given it is common for undergraduate students to become better involved in research when they can work with graduate students, these programs are crucial and should be kept as they are a strength of the biology department. It is recommended that the university continue to invest in the graduate program, and if possible, increase its support in the way of funding opportunities and tuition waivers. Additionally, the faculty should remain research active, as exposure to research is often an important part of student experiences, and it will be important in recruiting future high-quality faculty to address the department's future needs. In support of this, it is recommended that the department keep its 9+3 model.

The eleven full-time faculty and two lecturers are doing an excellent job teaching their classes. This was strongly echoed by the undergraduate students who felt the personal interactions with their professors was one of the most important aspects of coming to SSU. More than one mentioned the fact that the faculty were approachable and engaging, even remembering who they were a year after taking their classes. This seems to be one of the stronger as aspects of the department and it should be a priority to maintain this. Another highly regarded aspect of the teaching curriculum is the Biol 494 and 496 courses, where students seeking a BS degree work in faculty labs on research projects. The students appreciate this and note it was one of their favorite aspects of their time at SSU. They also say it is easy to get into the labs they want. However, given the number of biology majors and faculty, it is important to note that some faculty can become overburdened with undergraduate students, especially if not all faculty participate equally in this program. To resolve this, it is recommended that effort be made to ensure all faculty participate equally in this program. Also, the offering

of the BA degree option where students do not need to enroll in Biol 494 or 496 and do independent research projects is a good avenue for the students who do not wish to pursue such pathways. However, there was some concern by the students that there was some inconsistency in the way different faculty administered these courses, and some uncertainty with how to choose the right lab to work in. I recommend that some form of an “advising workshop” be set where the students gather in a lecture hall and each of the faculty present what their labs do and what opportunities are available. This should also detail how to navigate enrollment in these courses and expectations. While this may create a small amount of work for each of the faculty on that day, it is my belief that the benefits in the long run will outweigh this.

While the faculty are doing an excellent job teaching, they are teaching at maximum capacity and morale is an issue. This can be an impediment to faculty developing new upper division specialty courses in their field of expertise, and in the long run it can be an impediment to recruiting high quality students. A recommendation was made to bring in lecturers from local colleges to teach large lecture courses, especially in MCB, which would free up faculty to teach upper division specialty courses that draw on their research expertise. Indeed, students often find these specialty classes more interesting and impactful, and they are often an important part of their college education. It might therefore best serve the students if the introductory courses in the major and large non-major courses were taught by lecturers, allowing the tenured faculty to develop and teach these upper division specialty courses to their majors. For example, some of the students expressed interest in a larger diversity of classes related to cellular biology, and in having access to classes or workshops such as PCR techniques that covered more in-depth skills related to their desired careers. Class sizes for these and current upper division courses should target 20-24 students to fill classrooms. Also, using lecturers to teach large entry courses can improve the students’ time to graduation and allow more offerings of the larger required courses and such workshops. I recommend the university explore options to pursue these issues.

Staffing and administrative assistance

There are 1.5 administrative assistants and two full time support staff. The staff are responsible for setting up labs and maintaining equipment for class instruction (e.g., microscopes, museum animals, and the seawater system). The staff are also responsible for maintaining the department web page. The students were especially appreciative of the staff and noted that they are very responsive to student requests. However, workloads on staff have increased in recent years due to the transfer of job tasks to them and reorganization in the college. This has led to issues with morale. As example, the staff are responsible for maintaining the department web page. It is recommended that university IT staff assist with web page development and maintenance. The biology staff are also burdened with purchasing activities related to

needed class materials. It is recommended that the staff receive assistance in these activities, at least in the form of better training.

Student enrollment

Student enrollment at SSU declined substantially over the last six years and it has been slow to recover. However, enrollment within the department of biology has outpaced the university at large, with enrollment of first-year freshman students declaring biology as their major in 2024 returning to approximately 80% of its peak in 2018. This was likely aided by the department's decision to remove its declaration of impaction in 2023/23. In 2024, the number of biology majors was 383, with 101 incoming freshmen and 34 transfer students declaring the major. The first-year enrollment represents 11% of the total SSU freshmen students. The majority of these students are first generation college students, and more than 50% identify as minority students from underrepresented groups. While some of this is likely in part due to simple demographics of the local communities, the department has been active in recruiting underrepresented groups in research activities and providing educational opportunities. This is certainly a strength of the department and should be maintained. Further, the number of students graduating SSU with a biology degree has also increased, with 97 students graduating in 2023. Together this indicates that biology is a healthy major on the SSU campus and should be recognized and supported as such.

In addition to its undergraduate student body, the department currently has 34 graduate students pursuing master's degrees. These students are conducting independent research along with their faculty mentors. Support for these students comes in the form of TAships and external funding awarded to their faculty mentors. Concern was raised that there are not enough TAships to cover all the graduate students who want one. As stated elsewhere in this review, graduate students are a cornerstone of maintaining a research active department and in involving undergraduates in cutting edge research. Undergraduate students often relate well with graduate students and find inspiration to move on in their careers and even enter graduate school themselves. I believe it important that the graduate program be maintained, and if possible, better supported.

Curriculum changes and needs

The department of biology offers BS and BA within the undergraduate curriculum. Within these, the department offers its students options for concentrations that are tailored to meet their interests and/or career goals. Specifically, the department currently offers concentrations in Zoology, Molecular Cell Biology, Physiology, Marine Biology, and Ecology and Evolutionary Biology. However, according to their own self-study, the department has recently revised these concentrations to "balance offerings across the BA and BS degrees, provide more substance to the concentrations, and re-brand some

existing concentrations to better reflect the needs and interests of incoming students". This has resulted in small changes to the list of courses needed to meet the concentration requirements, and it created a new concentration in Biomedical Sciences. This appears to be a good change and should better meet the students' needs. Additionally, the biology department has gone through significant efforts to address issues with their curriculum that were raised during a previous departmental review and their own self-study, and this should be commended. For example, the biology curriculum currently consists of two tiers of introductory courses, one tier being lower division that consists of one semester of Introductory Cell Biology & Genetics (Biol 130) and one semester of Biological Diversity & Ecology (Biol 131), and the other tier being upper division that consists of one semester of Ecology & Evolution - an Integrated Approach (Biol 320) and one semester of Molecular Biology, Cell Biology & Physiology (Biol 321). Following this, the students are required to take one course that satisfies an organism/diversity requirement, plus upper division specialty courses related to their chosen concentration. However, because the completion of the lower division tier courses (Biol 130 and Biol 131) is required for admission into the upper division tier courses (Biol 320 and Biol 321), and because the lower division tier courses are only offered once per year, concern was raised that some students' progress toward their degree may be delayed if a student missed one of the lower division tier courses. However, the department's own self-study suggested that this did not occur, and that graduation rates for biology majors have remained between 35% and 45% through 2020. In contrast, this course scheduling does appear to have resulted in a bottleneck for transfer students, which has delayed their two-year graduation rates because these students could not take the upper division courses until they completed the lower division pre-requisite courses. This issue has been partially addressed by allowing these students to enroll in the upper division courses via permission codes and course substitutions. However, this solution has been deemed unsustainable in the long-term due to increases in the number of transfer students over the past several years and thus required correction. Another issue that the department has endeavored to correct relates to class sequence and how this affects success in upper division courses and retention in the major. Specifically, the department recognizes that the students needed a stronger foundation in some of the basics principles of biology and chemistry before they took Biology 320 and 321. The department also recognizes that that material in the first semester of the students' freshman year focused on Cell Biology & Genetics (Biol 131), and this was perhaps too difficult for early students who are just entering the major.

To address the above issues, the department is reorganizing its curriculum. Specifically, the department has proposed a new sequence for its lower division courses, which will move these courses from a two-course sequence (Biol 130 & Biol 131) in their freshman year to a three-course sequence that focuses on Diversity, Structure & Function (Biol 130) and Genetics & Evolution (Biol 131) in their freshman year, and Molecular & cell Biology (Biol 232) in their sophomore year. This change will start the students with more relatable topics that focus on the diversity of life, biological systems, and ecology, and

general chemistry before they move on to more complex material related to cell and molecular biology. This will provide the added benefit of allowing the cellular and molecular biology classes to be taught twice per year and as smaller class sizes, offering greater opportunity for the students. It will also not be considered as a pre-requisite for enrollment in upper division core courses, which will allow transfer students to enroll in these courses earlier and help correct issues with transfer student graduation timelines. My own experience with early biology students suggests this will make a significant positive impact on retention and success in the major, and I believe these changes demonstrate the department's commitment to solving curricular issues. Beyond this, it is my recommendation that the department work with the two-year colleges from where these students are transferring to increase course articulation and enhance its long-term framework that allows courses taken at those colleges to satisfy the requirements for entry into the upper division courses. Lastly, the requirement that all seniors pursuing BS degrees enroll in Capstone Research, either as one or two semesters of research experience (Biol 494) or as two semesters of Honors Thesis (Biol 496A&B) is a positive one and should be maintained. However, changes suggested by the department seem to offer improvements to this. Specifically, the department recognized that few students enrolled in the Honors Thesis pathway, so they revised the curriculum to keep the two-semester Biol 496A&B course as 'hands on research' for students who are interested in pursuing more in-depth research opportunities, and it revised their Biol 494 course into a Research Synthesis paper for students who do not have a strong interest in undertaking a two-semester research project but rather simply wished to gain deeper insights in a research. In Biol 494, which is also taken by some students pursuing BA degrees, the students work under the guidance of a faculty member to write a synthesis paper that integrates a comprehensive literature review, meta-analyses, and information they learned in their upper division courses. This ultimately gave the BS students two pathways to satisfy the research requirement, which seems to have been well received by the faculty and students. Finally, the department has proposed a Health Sciences program, which is a natural extension of what the department already does by training students in various health professions and advising them along health career paths. This seems a good fit for the department and will serve its students well.

Another important part of the undergraduate education on Biology is being able to take part in class field trips. These are valued in any department and SSU has historically done a great job in offering these. Unfortunately, these types of trips appear to be in danger given the lack of vehicles to transport students to the field and dwindling support from the university. The university does not maintain a vehicle fleet, although it appears that the university had vehicles for class use in the past. Rather, the lone option in town is Enterprise Rental cars. However, the few vehicles Enterprise has are under heavy demand from the surrounding cities as well and there seems to be a move to get rid of the smaller vans in exchange for larger 15 person vans, which require a commercial driving license to operate. This is putting class field trips in danger of not being accessible, which would be a huge loss to the students. I strongly recommend the

university seek to either secure an agreement with Enterprise or another rental company for priority van vans.

Regarding class scheduling, the department is doing a good job of internal coordination among classes to avoid conflicts. However, better coordination with other departments, especially Chemistry, can improve this and avoid scheduling conflicts that prevent some students from taking the classes they need for graduation. A few students expressed frustration with the inability of getting classes they need, especially organismal courses, but other students thought this was a minor issue. The students also discussed concerns that some required classes are only offered during one semester each year (e.g. Biology 325 is only offered in the spring), which can make them difficult to get.

Lastly, the online course catalog needs to be updated. For example, Bacteriology, Plant Physiology and Biology of Fishes are still listed in catalog but these are no longer offered. This has caused some confusion among the undergraduate students. I know the faculty realize this and that there have been efforts made to correct this. But technological issues have prevented the course catalog from being updated. I strongly recommend this be addressed moving forward.

Advising

The department maintains a web page that gives the students general advising information, but this may not be sufficient for many students. To address this and ensure proper advising, the department assigns 30-40 students to each faculty member who then acts as the students' advisor. These faculty can point students to other faculty who may be more appropriate for each student's needs if the fit is poor. Additionally, the department Chair assists with general advising, takes on the transfer students and summer advising duties, and assists with freshman orientation, unless these duties are given to another faculty. While the faculty and students seem to appreciate this advising format, and large changes are not recommended, I believe there a few ways that advising may be improved. Specifically, better equity among faculty in advising activities and better coordination among faculty in advising procedures can improve this. Further, there is only faculty advisor for pre-med students and more faculty assisting these students may also help. Perhaps most important, and from the point of view of a former Director of Undergraduate Advising in Biology at SDSU, a single person who serves as a Director of Advising can help coordinate advising duties. This has been in place in the past, with a 12-month appointment being given to the department Chair. However, this position was lost in 2009 due to budget constraints and now the Dean funds 10 days for a summer faculty to advise students. It is my opinion that a permanent Advising Director will benefit the students and help avoid possible misconceptions about what the students need to finalize their degree requirements. While creating a new position may not be realistic, I recommend that the 12-month appointment be returned to the department, allowing the Chair to fill this role. Beyond this, it may be prudent to make it

mandatory that each student meets with their faculty advisor at least once before graduation (with a recommendation that they meet once per year). Lastly, the department can be well served by establishing a central place where students can go for career advice. It appears that the department lack's a centralized Career Center that serves its students with job boards and advertisements. Resolving this may be as simple as increasing visibility of job postings by placing a bulletin board outside the biology department's administrative offices. This will require some added university support, but it can be vital to student success following graduation.

Concluding recommendations

The Department of Biology at Sonoma State University is doing an excellent job in meeting the needs of its students and maintaining a high-quality educational experience. This is being done during a period of economic uncertainty and reduced financial support. The faculty are engaged with student learning both inside and outside the classroom, with many running extramurally funded research labs that involve students. The department has done an excellent job of self-evaluation and addressing the concerns raised in previous reviews. It has taken significant steps in revising its curriculum, and it should be commended for this. Thus, I find the biology department to be of high quality. However, there are some problems facing the department that I urge the university to address, as these will test the long-term continued success of the department.

Faculty and Staff retirements: There are as many as five tenured faculty and two staff that will be eligible to retire in the next three to five years. While this is uncertain, if it occurs it will leave a huge hole in ability of the department to maintain its course offerings, train its students in research labs, and maintain institutional knowledge about how the department is run administratively. I understand budgets are tight and new faculty/staff hires are difficult, but I recommend the university plan for these so there are only small gaps in faculty numbers, and there is overlap in staffing so existing staff can train new staff.

Teaching loads and course availability: The 9+3 model of faculty teaching seems to be an excellent one and is greatly appreciated by the students. This should be kept in place as it creates great opportunities for students to get involved in research and better prepare them for their careers. However, the faculty are teaching at maximum capacity and the hiring of lecturers from local colleges who can teach high enrollment non-major and introductory major courses can be a good way to enhance course offering, reduce course conflicts and the inability to get needed courses, speed the time to graduation, and free up faculty to teach upper division specialty courses. These courses are highly desired by students, and this will only increase the appeal for recruiting high quality students and faculty in the future.

Class field trips: Field trips are often a pivotal part of undergraduate education in biology, and they can be the most memorable classes students take. The threat of losing these classes because access to large vehicles to transport students to and from field sites should be addressed. This will involve either the university establishing permanent agreements with local car rental places, securing their own vehicles, or allowing students to drive themselves to the field sites. I do not believe the current model of relying on donor funds for these classes is reliable in the long-run, and it can be hard to plan field trips when this is uncertain.

Graduate program: The master's program is a valuable part of the department and should be maintained. The use of Teaching Assistants allows greater educational opportunities to the undergraduate students, and it increases the research activities of the university. This is a win-win situation as it increases extramural funding and allows the student body the opportunity to get more involve in research by working with graduate students. I urge the university to seek ways to enhance this aspect of the department and if possible, find ways of further supporting these students.