

Academic Program Review MS Biological Sciences

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APRC Recommendation to Faculty Senate
MS Biological Sciences

The Academic Program Review Committee (APRC) affirms that the Department of Biological Sciences has completed program review as per policy, including self-study, external review, internal review, and action plan submission for the MS Biological Sciences. APRC recommends that the next program review be scheduled for six years from Faculty Senate approval; or, should the College of Natural Sciences and Mathematics decide to schedule a college-wide program review, the next program review will occur at that time.

APRC Chair: Jeffrey Brodd, Professor of Humanities and Religious Studies

Date: *Fall 2021*

Date of Last Review: *2014*

Department: *Biological Sciences*

Element One: Mission and Context

A. Missions

- a. University: *In support of the University's Mission: Academic Affairs cultivates and supports inclusive and dynamic learning, meaningful scholarship, and vibrant community engagement.*
- b. College: *The College of Natural Sciences and Mathematics prepares students for future success, produces meaningful scholarship, and engages with broader communities to promote quantitative, scientific, and spatial literacy.*
- c. Departmental: *The Department of Biological Sciences provide an evolving curriculum covering a breadth of biological disciplines with an emphasis on participation in research, mentorship, and community service activities.*

B. Degrees offered, with link to the University Catalog

- a. [BA in Biological Science](#)
- b. [BS in Biological Science](#)
- c. [BS in Biological Science \(Biomedical Sciences\)](#)
- d. [BS in Biological Science \(Cell and Molecular Biology\)](#)
- e. [BS in Biological Science \(Clinical Laboratory\)](#)
- f. [BS in Biological Science \(Ecology, Evolution, and Conservation\)](#)
- g. [BS in Biological Science \(General Biology\)](#)
- h. [BS in Biological Science \(Microbiology\)](#)
- i. [Biological Sciences Honors Program](#)
- j. [Subject Matter Program \(Pre-Credential Preparation\)](#)
- k. [Certificate in Issues in Natural Resource Management](#)
- l. [Cooperative Education Program \(Work Experience\)](#)
- m. [MA in Biological Science \(General\)](#)
- n. [MA in Biological Science \(Stem Cell\)](#)
- o. [MS in Biological Science \(Ecology, Evolution, and Conservation\)](#)
- p. [MS in Biological Science \(General\)](#)
- q. [MS in Biological Science \(Molecular and Cellular Biology\)](#)

C. Minors offered, with link to the University Catalog

- a. [Minor in Biological Science](#)

D. Service to or from other departments, degree programs, and/or general education

- a. GE Courses: Bio 1, 7, 9, 10, 15L, 20, 100, 105 (B5), 109 (B5)
- b. Service Courses: Bio 22, 25, 26 (Anatomy and Physiology courses), 39 (Allied Health Students)

E. External educational partnerships

- a. UC Davis: Stem Cell MA Program

- F. Major structural changes in academic unit since last review (new, moved, or discontinued degrees, concentrations, minors, etc.)
- a. Department moved to Tschannen Science Complex (August 2019)
 - b. BS in Biological Science (Forensic Biology) *CONCENTRATION SUSPENDED*

Elements Two and Three: Learning Outcomes, Student Success, and Assessment to Maintain Success and Engage in Continuous Improvement

For each degree offered:

BA Biological Sciences

BS Biological Sciences

MA Biological Sciences

MS Biological Sciences

1. *BA Biological Sciences*

Learning

A. List program learning outcomes.

LEARNING GOALS/OUTCOMES FOR BIOLOGICAL SCIENCES

Learning Goal 1: Students will demonstrate foundational knowledge in the Biological Sciences in the following core concepts (From V&C Core Concepts for Biological Literacy):

Subgoal A. Evolution: The diversity of life evolved over time by mutation, natural selection changes in allele frequencies.

Department Outcome 1. *Mechanisms of genomic change.* Students will differentiate the processes by which genomic change occurs in living organisms, including mutation, genome rearrangement and changes in gene expression. Furthermore, students will predict the role of genomic change in diversification of life on earth.

Department Outcome 2. *Evolutionary Mechanisms within Populations.* Students will analyze allele frequencies to infer the role of selection, mutation, drift and nonrandom mating within populations.

Department Outcome 3. *Natural Selection and Adaptive Evolution.* Students will describe the process of natural selection within populations and the role of selection in the diversity of life on earth. Students will also integrate comparative (phylogeny-based) and experimental approaches to test hypotheses of adaptation.

Department Outcome 4. *Diversity of organisms on earth.* Students will read, interpret, and infer relationships from a phylogenetic tree for the Domains, Kingdoms, and representative Phyla of life on earth. Students will also describe the characteristics that define each of these monophyletic groups.

Subgoal B. Structure and Function: The structure of an organism or one of its components will produce a predictable function within the context of its environment and that, vice versa, a given function will require a predictable structure.

Department Outcome 1. *Molecular Structure and Function.* Students will explain how the function of molecules is determined by their three-dimensional structure and the resulting interactions with other molecules.

Department Outcome 2. *Cellular Structure and Function.* Students will explain how the function of cellular structures and, therefore, cells is determined by the three-dimensional structure created by multiple molecules and the resulting interactions with their environment.

Department Outcome 3. *Organismal Structure and Function. Department Outcome 3. *Informational Organization in Multicellular Organisms.** Students will explain how organisms regulate their signal transduction, cellular homeostasis and physiological regulation; and how that might change in response to internal or environmental changes.

Department Outcome 4. *Ecological Structure and Function. Ecological Structure and Function.* Students will explain how the function of ecological structures is determined by the structures and functions of multiple organisms and the resulting interactions with the environment.

Subgoal C. Information flow, exchange and storage: The growth and behavior of organisms is activated through the expression of genetic information in context

Department Outcome 1. *Informational Organization in the Cell.* Students will explain how individual cells regulate their gene expression and movement of materials; and how that can change in response to environmental change.

Department Outcome 2. *Informational Organization in Single-Celled Populations.* Students will explain how groups of cells regulate their cellular recognition, communication and quorum sensing; and how that can change in response to environmental change.

Department Outcome 3. *Informational Organization in Multicellular Organisms.* Students will explain how organisms regulate their signal transduction, cellular homeostasis and physiological regulation; and how that can change in response to environmental change.

Department Outcome 4. *Informational Organization in Communities of Organisms.* Students will explain how organisms within populations and populations within communities exchange signals; and how that might change in response to the environment.

Subgoal D. Pathways and transformations of energy and matter: Biological systems grow and change by processes based upon chemical transformation pathways and are governed by the laws of thermodynamics.

Department Outcome 1. *Cellular Energy Dynamics.* Students will explain the chemical and physical laws underlying metabolic pathways, membrane dynamics, homeostasis and nutrient cycling.

Department Outcome 2. *Organismal Energy Dynamics.* Students will explain the energy requirements, sources and costs of actions for living organisms.

Department Outcome 3. *Ecological Energy Dynamics.* Students will explain the energy requirements, sources and costs of ecological systems.

Subgoal E. Interconnectedness and interactions of living systems: Living systems and their environments are interconnected and interacting at every level of organization, from the planet's biome to individual cells in a population.

Department Outcome 1. *Population Distribution and Growth.* Students will discriminate between the role of biotic and abiotic factors in determining population distributions and growth. Students will differentiate between alternate patterns of population growth and use models to predict how populations will change over time, including the human population.

Department Outcome 2. *Community Dynamics.* Students will evaluate species interactions with their abiotic and biotic environment to make predictions about changes to an ecological community in space and time. Students will also be able to identify differences among species interactions, including competition, predation, and mutualisms.

Department Outcome 3. *Energy and Nutrient Exchange.* Students will use knowledge of the role of species metabolic rates, nutrient cycling and energy flow within an ecosystem to make predictions about the role of both abiotic and biotic factors in productivity and ecosystem change.

Department Outcome 4. *Global Ecology and Human Interactions.* Students will describe major patterns of biodiversity across Earth and the array of factors that drive these patterns and will identify the dependency and effects of humans on ecological systems on local, regional, and global scales.

Learning Goal 2: Students will demonstrate functional skills in the Biological Sciences in the following core competencies (Adapted from V&C Core Competencies):

Subgoal A. Students will demonstrate the ability to communicate in the Biological Sciences

Department Outcome 1. *Written Communication.* Students will write a paper, research poster and/or research proposal in the format used in common scientific venues. This product will demonstrate adequate consideration of the purpose of the assignment, use appropriate content for the topic of the product, consistently use discipline-specific conventions, consistently use relevant and credible sources and use language that clearly conveys the meaning to readers.

Department Outcome 2. *Oral Communication.* Students will organize material into a clear presentation, use language appropriate to the audience, develop visual aids for the presentation and deliver a clear and consistent message.

Department Outcome 3. *Information Literacy.* Students will use appropriate sources in oral and written communication. Specifically, students will effectively define the scope of the research question and define key concepts (determine information needed), analyze the students' and authors' assumptions in the context of the research question (critical evaluation), communicate, organize and synthesize information from sources to accomplish a specific purpose, and correctly use citations, paraphrasing, use information in a manner true to the original context of sources, and distinguish between common knowledge and ideas requiring attribution (use information in an ethical and legal manner).

Subgoal B. Students will demonstrate the ability to apply critical thinking, hypothesis testing, and quantitative analysis

Department Outcome 1. *Critical Thinking.* Students will state a testable hypothesis, provide and interpret background information in a coherent summary (evidence), recognize the complexities of the hypothesis and acknowledge opposing viewpoints (position/perspective), and provide a conclusion that is logically tied to the information provided (conclusions and related outcomes).

Department Outcome 2. *Quantitative Reasoning.* Students will perform necessary statistical calculations needed to solve a problem, provide accurate interpretations of results, portray results in an

appropriate graphical or tabular format, and use of the quantitative information to address the specific hypothesis associated with the work.

Subgoal C. Students will be able to understand and articulate the relevance of their training in biology to their own life-long learning and to larger global and social issues.

Department Outcome 1. Evidence-Based Personal Values. Students will develop and express evidence-based personal values on current implications and applications of biological science.

Department Outcome 2. Relationship to other Disciplines. Students will not only explain the importance of connections within the disciplines of biology, but also between biological disciplines and other disciplines.

Department Outcome 3. Social Relevance. Students will critically evaluate and explain the social relevance of biology, particularly those issues that might have wide-ranging social impacts and/or generate controversy.

Department Outcome 4. Collaboration. Students will collaborate to solve scientific problems and explain the importance of collaboration.

Department Outcome 5. Life-Long learning. Students will demonstrate self-regulatory behaviors that deepen, monitor, manipulate and improve their own learning.

B. Provide a summary of data for each learning outcome.

2017-18 Self Assessment: https://mysacstate-my.sharepoint.com/:w:/r/personal/kneitel_csus_edu/Documents/Program%20Review%202021/AssessmentReport_BioSci_17-18_Excerpts.docx?d=wf6e1e6b46b9446e99c611d1d7f4b4c70&csf=1&web=1&e=IMwJR8

C. Provide analysis for each learning outcome by degree program, including how to maintain success and improve learning.

D. Summarize other relevant data (student surveys, alumni, licensure passage rates, grad school acceptance, internships, etc.) and how the data is used to maintain success and improve learning. NA

E. Provide updated comprehensive assessment plan for each degree program (<https://www.calstate.edu/app/documents/Program-Assessment-Plan-Template.docx>). NA

Student Success

A. Provide admission data disaggregated by gender and ethnicity for each degree:

<https://www.csus.edu/president/institutional-research-effectiveness-planning/dashboards/admissions.html>

B. Provide retention data disaggregated by gender and ethnicity for each degree

Pre-major: <https://www.csus.edu/president/institutional-research-effectiveness-planning/dashboards/student-success.html>

Major (General Bio): <https://www.csus.edu/president/institutional-research-effectiveness-planning/dashboards/student-success.html>

C. Provide 4-year and 6-year graduation data disaggregated by gender and ethnicity for each degree.

Pre-major: <https://www.csus.edu/president/institutional-research-effectiveness-planning/dashboards/student-success.html>

Major (General Bio): <https://www.csus.edu/president/institutional-research-effectiveness-planning/dashboards/student-success.html>

D. Provide analysis on admission, retention, and graduation data, including how to maintain success and improve time to degree, and consider concentrations as needed.

E. If the program is impacted, summarize data and future impact plan. **NA**

F. Summarize current partnerships in success efforts (Advising, Writing Center, Library Student Success Center, internship sites, etc.) and consider ways to better work together to maintain success and improve time to degree. **NA**

2. *BS Biological Sciences*

Learning

A. List program learning outcomes.

SEE BA ABOVE

B. Provide a summary of data for each learning outcome.

2017-18 Self Assessment: https://mysacstate-my.sharepoint.com/:w:/r/personal/kneitel_csus_edu/Documents/Program%20Review%202021/AssessmentReport_BioSci_17-18_Excerpts.docx?d=wf6e1e6b46b9446e99c611d1d7f4b4c70&csf=1&web=1&e=IMwJR8

C. Provide analysis for each learning outcome by degree program, including how to maintain success and improve learning.

D. Summarize other relevant data (student surveys, alumni, licensure passage rates, grad school acceptance, internships, etc.) and how the data is used to maintain success and improve learning. **NA**

E. Provide updated comprehensive assessment plan for each degree program (<https://www.calstate.edu/app/documents/Program-Assessment-Plan-Template.docx>). **NA**

Student Success

A. Provide admission data disaggregated by gender and ethnicity for each degree.

<https://www.csus.edu/president/institutional-research-effectiveness-planning/dashboards/admissions.html>

B. Provide retention data disaggregated by gender and ethnicity for each degree.

<https://www.csus.edu/president/institutional-research-effectiveness-planning/dashboards/admissions.html>

C. Provide 4-year and 6-year graduation data disaggregated by gender and ethnicity for each degree.

<https://www.csus.edu/president/institutional-research-effectiveness-planning/dashboards/admissions.html>

D. Provide analysis on admission, retention, and graduation data, including how to maintain success and improve time to degree, and consider concentrations as needed.

<https://www.csus.edu/president/institutional-research-effectiveness-planning/dashboards/admissions.html>

E. If the program is impacted, summarize data and future impact plan. **NA**

F. Summarize current partnerships in success efforts (Advising, Writing Center, Library Student Success Center, internship sites, etc.) and consider ways to better work together to maintain success and improve time to degree. **NA**

3. MA Biological Sciences

Learning

A. List program learning outcomes.

Graduate Student Learning Outcomes

1. *Students will demonstrate critical thinking through their ability to effectively search the scientific literature; read, understand and critically evaluate that literature; and draw appropriate conclusions from that literature.*
2. *Students will demonstrate acquisition of discipline-specific knowledge*
3. *Students will be able to design original experiments, or conduct observations, with appropriate controls that test alternative hypotheses.*
4. *Students will be able to collect experimental data using appropriate theoretical, laboratory or field techniques and/or instrumentation.*
5. *Students will be able to analyze and evaluate scientific data using appropriate statistical and other analytical tools (e.g., phylogenetic, bioinformatic, and/or mathematical software)*
6. *Students will be able to communicate science and particularly their own scientific discoveries through a variety of media, including oral communication (e.g., presentations, seminars), visual communication (e.g., graphs, figures, posters) and written communication (e.g., research papers, final thesis, grant proposal or project, as appropriate for their concentration).*

B. Provide a summary of data for each learning outcome.

C. Provide analysis for each learning outcome by degree program, including how to maintain success and improve learning.

D. Summarize other relevant data (student surveys, alumni, licensure passage rates, grad school acceptance, internships, etc.) and how the data is used to maintain success and improve learning.

E. Provide updated comprehensive assessment plan for each degree program

(<https://www.calstate.edu/app/documents/Program-Assessment-Plan-Template.docx>).

Student Success

A. Provide admission data disaggregated by gender and ethnicity for each degree.

<https://www.csus.edu/president/institutional-research-effectiveness-planning/dashboards/admissions.html>

B. Provide retention data disaggregated by gender and ethnicity for each degree.

<https://www.csus.edu/president/institutional-research-effectiveness-planning/dashboards/admissions.html>

C. Provide 4-year and 6-year graduation data disaggregated by gender and ethnicity for each degree.

<https://www.csus.edu/president/institutional-research-effectiveness-planning/dashboards/admissions.html>

D. Provide analysis on admission, retention, and graduation data, including how to maintain success and improve time to degree, and consider concentrations as needed.

<https://www.csus.edu/president/institutional-research-effectiveness-planning/dashboards/admissions.html>

E. If the program is impacted, summarize data and future impact plan. NA

F. Summarize current partnerships in success efforts (Advising, Writing Center, Library Student Success Center, internship sites, etc.) and consider ways to better work together to maintain success and improve time to degree.

4. *MS Biological Sciences*

Learning

A. List program learning outcomes.

SEE MA ABOVE

B. Provide a summary of data for each learning outcome.

Graduate courses and thesis completion

C. Provide analysis for each learning outcome by degree program, including how to maintain success and improve learning.

D. Summarize other relevant data (student surveys, alumni, licensure passage rates, grad school acceptance, internships, etc.) and how the data is used to maintain success and improve learning.

E. Provide updated comprehensive assessment plan for each degree program
(<https://www.calstate.edu/app/documents/Program-Assessment-Plan-Template.docx>).

Student Success

Student Success

A. Provide admission data disaggregated by gender and ethnicity for each degree.

<https://www.csus.edu/president/institutional-research-effectiveness-planning/dashboards/admissions.html>

B. Provide retention data disaggregated by gender and ethnicity for each degree.

<https://www.csus.edu/president/institutional-research-effectiveness-planning/dashboards/admissions.html>

C. Provide 4-year and 6-year graduation data disaggregated by gender and ethnicity for each degree.

<https://www.csus.edu/president/institutional-research-effectiveness-planning/dashboards/admissions.html>

D. Provide analysis on admission, retention, and graduation data, including how to maintain success and improve time to degree, and consider concentrations as needed.

<https://www.csus.edu/president/institutional-research-effectiveness-planning/dashboards/admissions.html>

E. If the program is impacted, summarize data and future impact plan. **NA**

F. Summarize current partnerships in success efforts (Advising, Writing Center, Library Student Success Center, internship sites, etc.) and consider ways to better work together to maintain success and improve time to degree.

Element Four: Developing Resources to Ensure Sustainability

A. List key strategic initiatives for the academic unit, and append any strategic plan. These can be structural, such as new or discontinuations of degrees, concentrations, minors; tied to university strategic initiatives, such as Anchor University; or operational, such as ways to be more inclusive in the academic unit's planning.

[Strategic Plan from 2019 highlights concerns and vision](#). The department developed areas to concentrate efforts. Several items have been addressed and worked on, but much of it has yet to be implemented.

B. Summarize hiring needs for the academic unit, and append the multi-year faculty and staff hiring plan.

Biological Sciences Faculty Hiring Request/Hiring Plan

2019-20 Academic Year

The Department of Biological Sciences requests *six faculty positions from four searches in the 2019-2020 Academic Year*. The specific areas for these requests are given below but are based on the following criteria: (1) the low tenure density in Biological Sciences (currently 35.7% of WTU and 39% of FTES are taught by permanent faculty), (2) needs for faculty to mentor student research, (3) needs for developing connections with community partners including regional K-14 educational institutions, businesses, and governmental agencies, (4) anticipated development of programs including a Professional Science Masters (PSM) in Biotechnology and a potential PSM in Environmental Science, (5) anticipated growth in GE area B, particularly upper division GE in area B, and (6) retirements in the areas of Forensics, EEC (Vertebrates), Anatomy, and Cell Biology.

A. Current State of the Department and Immediate Needs:

In the last four years, the Biological Sciences Department has seen a significant growth in both FTES (Table 1) and WTU (Table 2) offered by the Department. Since the 14-15 academic year, we have increased the number of FTES in the Department by 31.6% and WTU by 22.6%. While we have added 13 additional tenure-track faculty during this time, we have also had two retirements and three FERP, resulting in a net increase of eight faculty. During the same time period, the Full Time Equivalent Faculty in the Department has increased from 34 to 41, resulting in a 7% decrease in the tenure density in Biological Sciences in the last four years.

The three instructional areas with the lowest proportion of WTU and FTES taught by full time faculty are (1) Introductory (i.e., GE) courses (24.3% of 328 WTU and 43.8% of 1024.5 FTES), (2) Anatomy and Physiology (33.1% of 281 WTU and 28.1% of 646.9 FTES), and Scientific Analysis (22.9% of 30.6 WTU and 8.3% of 40.3 FTES). The remaining instructional areas within the Department (Cell and Molecular Biology, Ecology, Evolution and Conservation, Microbiology and Clinical Laboratory Sciences) all hover around 50% of both WTU and FTES taught by full-time faculty. These statistics indicate the need for faculty in all areas of Biological Sciences, but particularly in disciplines that can contribute to general education coursework (i.e., Bio 1 through Bio 20) and anatomy and physiology courses (particularly Bio 22, 25, 26 and 30). The two area groups in Biological Sciences with the greatest contributions to General Education are those in (1) ecology, evolution and conservation (53.4 WTU, or 50.4% of FTF WTU in Intro Bio) and (2) cell and molecular biology (17.3 WTU, or 21.8% of FTF WTU in Intro Bio).

Based on a target tenure density of 60%, Biological Sciences should have 33 full-time faculty. We currently have 28, not including 4 in FERP and 1 in administration. Therefore, ***we would need to add six faculty members to reach a tenure density of 60%*** at current levels of course offerings. We are currently meeting this demand by hiring large numbers of part-time instructors. There are several consequences to the larger proportion of part time instructors, including (1) questions about the quality of instruction, (2) increased workload for course coordinators related to training part-time instructors that may teach only one or two semesters, and (3) increased workload for full-time faculty associated with annual evaluation of temporary lecturers.

While we realize that a request to conduct four searches, with up to six hires is a large request in one year, the faculty hired during the 18-19 hiring cycle will begin at the same time that the Tschannen Science Complex opens for classes. Opening of the Science complex will provide ample office space for 35 full-time faculty in Biological Sciences (in single offices in the Tschannen Science Complex), additional instructional laboratories in several bottleneck courses including Bio 1 (Biodiversity, Evolution and Ecology; First Bio Major course) and Bio 184 (Genetics), and additional research laboratory space (both in Tschannen Science Complex and vacated space in Sequoia Hall). These changes are likely to increase our needs for instructors in both of these courses, particularly for faculty in the ecology, evolution and conservation and

Cell/Molecular Biology (or microbiology) areas. The additional instructional laboratory space and faculty to teach in these laboratories will positively impact graduation rates for students in both the Biological Sciences and in Chemistry/Biochemistry majors. Genetics has historically been a bottleneck for students in these disciplines. With the move to the Tschannen Science Complex and addition of more faculty, our capacity to offer laboratory experiences in these classes will increase by 30-50%. Likewise, the capacity to offer laboratory experiences for students in Bio 1 will increase by approximately 40-50%.

Table 1. FTES by instructional category for the last four academic years.

	14-15		14-15		16-17		17-18		18-19	
	FTES Total	% FTES	FTES Total	% FTES	FTES Total	% FTES	FTES Total	% FTES	FTES Total	% FTES
FT	804.3	47.8%	815.3	45.4%	817.6	36.2%	910.6	41.1%	820.3	39.0%
PT	656.5	39.0%	741.1	41.3%	1193.5	52.8%	1040.3	47.0%	929.2	44.2%
FTL	162.5	9.7%	168.0	9.4%	164.6	7.3%	195.1	8.8%	250.1	11.9%
GTA	58.7	3.5%	70.1	3.9%	74.5	3.3%	61.4	2.8%	69.0	3.3%
FERP	0.0	0.0%	0.0	0.0%	9.0	0.4%	6.5	0.3%	32.7	1.6%
Sum	1682		1794.4		2259.2		2213.9		2101.3	

Table 2. Distribution of WTU taught by instructional category for the last four academic years.

	14-15		15-16		16-17		17-18		18-19	
	WTU Total	% WTU	WTU Total	% WTU	WTU Total	% WTU	WTU Total	% WTU	WTU Total	% WTU
FT	353.3	43.7%	363.9	42.7%	344.9	36.0%	360.7	36.5%	339.1	35.7%
PT	350.8	43.8%	338.9	39.8%	481.3	50.2%	480.3	48.6%	394.4	41.5%
FTL	42	5.1%	68	8.0%	65	6.8%	68	6.9%	103	10.8%
GTA	60.9	7.4%	81	9.5%	55.6	5.8%	70.2	7.1%	89.1	9.4%
FERP	0	0.0%	0	0.0%	12	1.3%	10	1.0%	24.3	2.6%
Sum	807		851.8		958.8		989.2		949.9	
FTF Target	27		28		32		33		32	
FTEF	34		35		40		41		40	
FTF Head Count	21		22		23		25			

B. Anticipated needs in response to EO 1100:

Based on a recent Platinum Analytics run, the University has significant pent-up demand in GE area B2 (679 seats) and B3 (1,918 seats). This translates to approximately 262 FTES for the University. While Biological Sciences is not the sole contributor to these courses, we could play an important role (i.e., 100-150 FTES per year) in helping to close this gap. Furthermore, the anticipated need for upper division General Education courses in area B is substantial. We have proposed two GE area B5 courses with initial offerings in the 18-19 academic year (approx. 25-30 FTES), but additional sections and courses will be necessary to meet demand in Upper Division GE in Area B. These needs may be met by faculty in a variety of different subdisciplines within the Biological Sciences. While not all students will take courses in Biological Sciences to fulfill this requirement, we have an opportunity to develop socially relevant offerings that will be very popular among students. We anticipate that the need for upper division area B courses will result in an increase of 150-200 FTES in the Department. In order to address the shortage and anticipated increased in upper division GE, we

anticipate an increase of 250-500 FTES in Biological Sciences. ***In order to maintain a tenure density of 60%, Biological Sciences would need to add an additional five full-time faculty (in addition to the 8 FTF needed to meet current demands) to address the new executive order and alleviate existing bottlenecks in GE area B.*** We anticipate that this will have a positive impact on timely graduation across campus through offering sufficient coursework in GE Area B.

C. Anticipated Program Development:

Faculty in Biological Sciences, in collaboration with faculty from the College of Business, have had preliminary discussions about the development of a PSM in Biotechnology. While we are still in the early development stage of this conversation, there is a need for additional faculty with expertise in the biotechnology realm in order to have expertise to make this program successful. Preliminary discussions have pointed to several areas in which Sacramento State can provide an innovative program to students. With this in mind, there is interest in developing a program that includes several threads such as (1) agricultural biotechnology, (2) genomics and computational biology, (3) production and fermentation, and (4) project management. While we have several faculty in these areas of expertise, development and implementation of such a program will not be feasible with our current tenure density. At least two of the searches indicated below (plant biology and microbiology) could contribute to curriculum development and instruction for a PSM in Biotechnology.

In addition, faculty in Biological Sciences have expressed interest in contributing to a PSM-style program in Environmental Sciences (in collaboration with other NSM Departments and Environmental Studies in SSIS). While faculty in Biological Sciences will participate in both curriculum development and instruction for such a program, the program will likely be housed in the Department of Geology. The goal of such a program would be to provide a program for recent graduates or individuals currently working in the realm of environmental science in state and federal agencies, or environmental consulting firms to advance into management positions in their careers.

Both of these programs are anticipated as graduate-level programs and are likely to attract both domestic and international students, fulfilling the University's priority to increase graduate program enrollment and international student enrollment.

D. Prioritized Requests for 2020-21 Hiring Cycle:

1. Mammalian Physiologist (*In progress*)
2. **Terrestrial Vertebrate Biology/Wildlife Management (1 position).** The Department of Biological Sciences does not currently have any faculty with expertise in terrestrial vertebrate biology (excluding comparative anatomy). Ecology, Evolution and Conservation was once a strength of our department, but with a series of retirements 10+ years ago and lack of replacement in this area, the number of Biological Science majors in this area, and relationships with state and federal agencies, have dwindled. We anticipate that a faculty member in this area will contribute to coursework in the upper division courses in the EEC area and also contribute to teaching in BIO 1, BIO 179, BIO 118. Currently, only 34% of WTU in Bio 1 are taught by full-time faculty. We anticipate that placing young, vibrant faculty that are connected to job opportunities in wildlife biology and environmental science, we will create more opportunities for students in the area. There has also been preliminary discussion of developing an interdisciplinary Environmental Science program (PSM) with Geology, Geography and Environmental Studies. A hire in this area would bolster our expertise and provide an opportunity to develop partnerships with state and federal agencies involved in wildlife management.

3. **Anatomy and Physiology.** The areas of anatomy and physiology include the largest number of courses and FTES that we offer as service courses in Biological Sciences. Most of the FTES in Anatomy and Physiology are for the lower-division courses that are taken by students in KHS, RPTA, Pre-Nursing and a few other smaller constituents around the University. We have hired four faculty, two in Anatomy and two in Physiology in the last three years. We also have three full-time lecturers in the area of anatomy and physiology. Despite the lecturers and recent hires, we still have a significant number of WTU and FTES taught by part-time lecturers. Furthermore, this is one of the most challenging areas to recruit and retain part time faculty. The addition of one more faculty member in either anatomy or physiology will increase the percentage of WTU taught by full-time faculty to 42%, thereby decreasing the number of WTU taught by temporary part-time faculty to 30% based on current WTU/FTES.
 4. **Cell Biology.** While we have several faculty in the area of cell biology, an additional faculty member in this area would provide more depth and bring greater expertise to the Department, particularly for lab-based courses involving mammalian cell culture. A faculty member in this area could contribute to the stem cell MA program or Biotechnology Masters program by teaching techniques courses and developing additional courses in the area of cell biology. As in many areas of the Department, we have a very limited ability to provide backup teaching expertise in the area of cell biology. Bio 187 and Bio 221A, for example, rely heavily on mammalian cell culture as part of the laboratory course curriculum. We have struggled to find qualified part-time instructors to teach within this area. Prior college-level teaching experience and a demonstrated commitment to teaching excellence.
- C. Summarize other major budget concerns (facilities, equipment, student assistants, etc.).
- a. **Assistant Chair support:** The workload of the Department Chair and Assistant Chair has markedly increased in recent years. This has been the result of the growing number of students, staff, and faculty; a doubling of the number of faculty-advised students in the department. Relatedly, the department inherited bureaucratic duties associated with completing the major declaration process for students including: (a) communication and tracking, (b) checking grades, (c) submitting forms in OnBase, (d) re-assigning students to faculty advisors, and (e) creating forms to advertise office hours, coordinate with NSM AC, check grades, maintain equity in faculty-student advising assignments, and document student progression. Coordinating these efforts is immense and has been entirely by the Assistant Chair as an added workload to duties already allocated to this position. It is important to note that these changes were implemented in the middle of a pandemic where the campus was closed, making coordination among faculty and communication with students even more challenging. While the Department will be eliminating the pre-major, it does not eliminate the bureaucratic duties associated with the doubling of total students needing advising including (a) workload to office staff, (b) coordination with NSM AC and (c) maintaining faculty-student equity and making assignments in Central Management System. Regularly prescribed duties of the Assistant Chair have also increased, including management of evaluating lecturer teaching effectiveness and advertising, evaluating, and awarding scholarships. New systems have been created as a result of the pandemic and new systems have been learned as a result of changes to how the campus asks students to submit scholarship applications. The number of new part-time lecturers has also increased significantly over the past few years and represents a continuing need as tenure-track faculty earn buy-out time for service and research duties, and the number of courses (and sections) needing to be taught increases. Similarly, the number of students applying for department scholarships, and therefore needing evaluation, has also

increased significantly. The Assistant Chair has also helped the Chair onboard new Tenure Track faculty hires by providing training on topics including: (a) academic advising, (b) ordering supplies and other things related to running a research lab, and (c) navigating teaching-related challenges including implementing policies about grading, switching to online modalities, etc. The Assistant Chair has also helped the Chair oversee maintenance and repair of new lab equipment in shared teaching and research spaces; see next section for scope. These and other growing needs for a department as large as this one warrant increased support for Assistant Chair or the creation of two Assistant Chairs. One proposed idea is to split some of the administrative work of the department for two Assistant Chairs, one focused on student administrative duties. This would include overseeing (1) the evaluation and approval of graduation applications, transfer course equivalencies, major course substitutions, major declarations, (2) overall advising in the department, and (3) chairing Scholarship Committee. The other Assistant Chair would focus on more faculty- and staff-centered duties. This would include overseeing (1) the mentoring and onboarding of staff, tenure track and part-time faculty (creating and updating documents and organizing workshops), (2) overseeing the training and safety in the department, (3) managing the training and usage of shared research spaces, and (3) chairing Part-time faculty, Budget, Equipment, and Space, and Departmental Grants (Delisle and G2E) evaluation. These duties would open the Chair to work on expanding programs in the department, scheduling, overseeing personnel evaluations (staff and RTP), student issues and programs, working on departmental improvements and assessments, more outreach to the community, and chairing Executive Committee. Lastly, the Chair can begin the work needed to work towards the goals of the [Strategic Plan](#).

- b. Maintenance and repair of shared research equipment:** the opening of the Tschannen Science Complex provided our department with brand new laboratory tools and equipment housed throughout the building in shared teaching and research spaces. Some of these spaces, and therefore equipment within, serve as both teaching and research space making traffic of student users heavy. These items are collectively worth hundreds of thousands of dollars and range from large mechanical pieces (deep freezers reaching -80 degrees C) to smaller tools for lab work (pipettors and centrifuges). Warranties for most of these items have already expired and longer-term insurance plans were purchased for only a few of these items. Maintenance costs are therefore anticipated to be high and needed soon. Other new and shared items include those linked to facility components such as air and gas, including chemical fume hoods, laminar flow biosafety cabinets, and water purification systems. A full list of new items and their purchase prices are found in this spreadsheet. Beyond TSC, our department continues lab classroom and research activities in other buildings, including Sequoia Hall, where similar shared equipment and tools exist and need maintenance but are much older. Most of these items were received second-hand from donors such as UC Davis and Monsanto and, beyond occasional maintenance provided by NSM Electronics Technician Gordon Zanotti, are considered disposable. Our department is therefore operating in new territory – we have a surplus of new and expensive equipment in shared spaces; it is important to note here that TSC research spaces are designed as shared suites whereas Humboldt and SQU spaces are primarily dedicated to individual faculty. Therefore, our challenges include: (a) identifying staff that will oversee functionality, training, and documentation of training for this new equipment and (b) determining how much budget will be needed to maintain shared lab equipment in lab and research spaces. Our Budget, Equipment and Space committee has begun deliberations to propose solutions to these problems, including: (a) differentiating items by discipline so that appropriate staff can be identified for tracking training, use, and upkeep and (b) creating and

comprehensive list of all department equipment and differentiating upkeep and maintenance costs for those items as those covered by the college/department vs those covered by faculty. A sustainable plan and revenue source are needed to address the pending training needs and maintenance costs.

- c. **Static budgets for lab classes:** Monies allocated to support lab classes have remained flat despite ongoing changes including increases in: (a) the number of sections and students per section in lab classes across the curriculum (b) the number of new courses needing support and frequency of semesters being offered, including those that are now dual-listed (cross-listed) as undergraduate and graduate student-serving; (c) the inflation in costs for disposable lab supplies needed to run classes including plastic tips, tubes, Petri plates, etc.; Collectively, these changes have made running lab courses challenging for faculty and support staff, a problem that will continue over time as costs of supplies increase. This ongoing problem is exacerbated by the new equipment described above – many of these items require specialized supplies, for example, use of the Bio-Rad imaging system requires proprietary gels, dyes, etc. These added expenses are making the implementation of existing curriculum more expensive, not to mention the expenses needed to design new, cutting-edge experiments for students using new equipment and resources. As a result of cutting corners, equipment will not be used to its full potential and students will not receive as many job-ready skillsets.

D. Summarize revenue opportunities (grants, gifts, partnerships, etc.).

- a. **Biotechnology partnerships:** To date, biotechnology companies have donated gift funding to support research done by individual faculty labs and their off-campus collaborators (often at UC Davis). These monies have been used to procure lab equipment and supplies and hire support staff. Companies include Burt's Bees, AOBiome, and Microbiome Laboratories. Going forward, these relationship pipelines could be used to create gift funds supporting teaching and research activities at the department-level. These monies could be allocated to address shared needs and budget issues addressed above, such as the training and maintenance of equipment, or distributed as small awards to support individual classes and/or faculty research. The Department also receives in-kind donations of equipment and supplies from Bayer.
- b. **New scholarship for undergraduate and graduate students:** Students in our department have opportunities for approximately 10 scholarships. They are now the beneficiary of a new scholarship created by 2-time CSUS department graduate Christian Torres (BS in 2017, MA Stem Cell in 2019). The scholarship is housed in the Development office and is called the "Torres Fund - Hope for Change in Academic Institutions". Funding for this annual award is acquired in a crowd-sourcing fashion award and thus far has reached \$10,000 in total donations. The mission is "Change starts with diversity". You can learn more [HERE](#) and see a profile of Christian, rationale and criterion for the award, and last year's inaugural winner, Carla Cruz Medina.

Element Five: Planning to Maintain Success and Engage in Continuous Improvement

A. Summary of Areas of Concern and Means of Improving

1. [Strategic Plan from 2019 highlights concerns and vision](#). The department developed areas to concentrate efforts. Several items have been addressed and worked on, but much of it has yet to be implemented.

2. Six faculty received training in [Dynamic Governance](#) from 2018-2020. Many of the principles have been used in meetings (faculty and committee), but more work is needed to incorporate it regularly and consistently.
3. The Department has undergone a substantial revision of our graduate program. The largest in more than a decade. We have approved the [motions](#) for a [new curriculum](#) and are beginning to implement these changes.
4. *Advising*: We have recently undergone a transformation of our advising in order to address the influx of students and our pre-major structure. The following presents our model and rationale:

Implementation of a New Advising Model for the Department of Biological Sciences

Introduction

Our department lacks a structure and standard operating procedures for addressing a range of student advising needs, as well as a training process for onboarding new faculty advisors. Policy changes in NSAC imparted an additional load of 450+ student advisees and increased bureaucratic duties related to submitting major declarations (another 180 students) and assigning faculty advisors.

These issues, as well as other concerns and suggestions raised by faculty, were addressed by an ad hoc committee that hereby proposes a new model for advising in our department.

Problems Being Addressed

- Equitable distribution of workload among faculty advisors (student advising load currently ranges from 14 – 28 per faculty)
- Incompatibility with ratio of students to faculty within concentrations
- Increase in advisee numbers due to NSAC changes (approximately 450 pre-major students beyond year 2)
- Increase in bureaucratic duties in the department due to NSAC changes (submission of all major declarations and assignment of faculty advisors)
- Lack of specialization and choice in advising duties
- Lack of training opportunities for advisors (see [HERE](#) for Padlet discussions)
- Students arriving unprepared for advising sessions
- Need for tools to streamline student and faculty advising sessions and make knowledge easily available for all

Model

The flowchart below (accessible [HERE](#)) shows a revised advising process for students and faculty that focuses on a progression through a series of milestones.

Key Tenets and Specialization of Faculty Advising Duties

1. Advising Group 1 (5 faculty)

Goal: guide students through the pre-major core milestone in preparation for the major

Pre-majors up to year 2 and new transfer students (i.e., transfer students in their first semester at CSUS) will be advised by NSAC. Pre-majors beyond year 2 and transfer students beyond their first semester who have moved out from NSACs umbrella but are not major ready will be advised by a newly created "3rd Year + Advising Committee". This would have a major committee designation within the department due to: (1) large numbers of students falling in this category, (2) requirement for coordination with NSAC and department staff, and (3) workload of managing submission of all major declarations and assignment of students to faculty advisors in Advising Group 2.

2. Advising Group 2 (~20-25 faculty)

Goal: guide students through required major coursework in lower and upper division milestones and other degree requirements including applicable electives. Students in the major will choose courses through degree completion with an assigned faculty advisor. The e-Planner, degree course maps, and FAQ tools are designed to keep students accountable and on track and include information beyond course planning that may arise during advising sessions. Faculty in this group would review and approve graduation applications.

3. Advising Group 3 (5 Faculty)

Goal: provide career-related advising within each concentration

Students in the major will be referred by major advisors from Groups 1 and 2 to career advisors in Group 3, providing opportunities for individual and/or group sessions, professional development workshops, extra-curricular activities while in the major (e.g., internships, volunteering, undergraduate research). Faculty in this group are not assigned students.

Rationale

- Rethinking equity; moving away from an association of the number of students per faculty to a model where all faculty contribute equal amounts of time to a particular milestone within the student experience
- Acknowledgment of milestones throughout the pathway (not just pre-major)
- Creation of a method and tools for dealing with the increased workload
- Standardization of the advising experience for faculty and students
- Clear way to track progression through major coursework through use of the e-Planner, placing increased importance on student contribution to the advising experience and, hopefully, efficiency in the process
- Data gathering opportunities; assessing, for example, efficacy of the pre-major by group 1, common pitfalls to degree completion by group 2, and tracking of post-graduation goals and outcomes by group 3
- Specialization of duties; streamline workload by focusing on consistent set of duties, provide continuity to students receiving advising
- Making knowledge accessible to faculty and students
- Opportunities for group advising and tailored training objectives; empower faculty to work together to help students achieve specific outcomes as defined by each Group

Resources

Items below also accessible in the [“Advising Materials” section](#) of the department website

- [e-Planner](#) modifiable workbook
- Degree course maps [visual flow charts](#)
- [FAQ](#) document with links
- Student [survey](#) for major declaration and e-Planner collection

5. Introductory series: Our Introductory Series (Bio 1 and 2) were developed and implemented in 2009. Both courses have undergone much development since then, but some concerns have been raised about their efficacy in preparation of students. Another issue to take note is the [high DFW](#) rates in Bio 1. There may be many reasons for this, including this is a GE course and students from many majors take it and this is usually the first course FY students take. Nevertheless, URM students have disproportionate DFW levels in this course. The other concerns posed include: Do these courses need an activity? Should students take these courses in this order (Bio 1 and then Bio 2)? Should Bio 1 continue to teach the taxonomic approach or shift to structure/function approach? Are these courses preparing our students for the upper division?

6. We could improve connecting with alumni, biotech and agriculture companies, and governmental agencies to better inform our curriculum and activities. For example, scheduling an annual meeting with regional stakeholders may help to improve our curriculum and preparation of students for the workforce.
7. While we have informal mentorship, this appears to not be an adequate approach for many of our new faculty. We are planning development of documentation to assist new tenure track and lecturer faculty. Further, we are also planning monthly mentorship meetings, which include panel discussions on specific topics.

External Academic Review
Department of Biological Sciences
Sacramento State
10-11 March, 2022

Steve Alas, PhD, Professor
Biological Sciences Department
California State Polytechnic University, Pomona

Stuart C. Wooley, PhD
Interim Associate Vice President for Academic Affairs
Division of Academic Affairs
California State University, Stanislaus

Master of Science degree in Biological Science

Introduction:

The Biological Sciences Department at Sacramento State provided the external review panel with a self-study document prior to our site visit. The document contained almost no information on the Master's programs in the department. It contained learning outcomes and links to dashboards that the panel could mine through. More importantly, there was no reflection on the state of the graduate programs. The two-person panel met with faculty members in general and with the Graduate Committee. Based on the virtual interviews and the materials provided to the panel, we could not develop a good sense of the state of the program. However, we did come to understand the difficulties it has overcome and the challenges that remain to be addressed. The faculty and staff are dedicated individuals to the graduate student population. We only wish that graduate students would have made themselves available in order to gain their perspective regarding the Department and to learn from their experiences within it.

The Department should strive to find a way to support graduate supervisory courses, find funding for graduate student support, increase the offerings of graduate level courses and consider the additional workload required to create & maintain a professional science master's program. Compromises need to be recognized and implemented to be able to address the curricular needs of the graduate students and the freedom given to faculty to develop new courses. Additionally, a desire by faculty to increase research productivity must include the identification of resources to bring more graduate students into the labs full time and incentivize faculty to train more masters students. We strongly encourage the Department to update its long-term strategic plan and vision to encompass the graduate programs and their needs.

Departmental Overview:

The Biological Sciences Department is one of the largest departments in the university at over 1600 student. Of these students, there were 44 graduate students enrolled for fall 2021. Spring 2022 numbers are not available. With 44 graduate students enrolled, this makes the Department's graduate program the thirteenth largest at the University. This number seems on the small side for a department with 31 tenure/tenure-track/FERP faculty. However, some accounts during the interviews put the graduate student population at approximately 90. It is possible that most graduate students are not enrolling for supervisory units once they have completed their coursework, thereby saving money on tuition. A Master's program of nearly 90 students would place it among the largest Master's programs at the University. Graduate students are well-supported by their committees, as observed by faculty. Graduate student presentations are assessed via a rubric so as to ensure consistency across the program. The Department performs an analysis of the schedule to determine if enough graduate-level classes exist or are scheduled for students to complete their degrees in an appropriate time. Our overall evaluation of the department is quite positive, even in the absence of a more robust self-study with analysis and perspective. We highlight a number of challenges facing the department and offer recommendations to address these issues.

Overview: There are currently 31 faculty in the Department, including tenured, tenure-track and FERPs. We found the faculty to be dedicated to their research endeavors and very active in pursuing externally funded resources for their scholarly activity. Limited time was available to explore the graduate programs, but some insight was provided by the Graduate Committee.

Supervisory Units: The faculty in the Biological Sciences Department are very research active and are carrying the load of up to 90 graduate students. It's lamentable that the College has not provided supervisory course units to recognize and support the effort that this truly is. Research is the backbone of scientific discovery and should be interwoven into a Biological Department's mission. The faculty is doing that with little assigned time for advising student and, thus, reduced time for seeking more extramural funding. It was difficult to know from the report whether the graduate students were evenly distributed among the faculty or whether there was only a percentage of the faculty that was research active.

Recommendation: The Department Chair and Dean should discuss a way to support research active faculty in a way that sustains graduate student supervision. The research productivity has resulted in extramural funding that the College and University benefit from. This type of productivity in a department within the College of Natural Sciences and Mathematics, which states to emphasize hands on experience and interaction with professors in the University catalog, needs to be supported at a higher level.

No embedded support for programs: The graduate committee expressed concern that there was no embedded support for the master's programs, outside of the self-funded CIRM Stem Cell program. In addition, as the Professional Science Master's in Stem Cell Research program is funded by CIRM (California Institute for Regenerative Medicine), there is a sustainability concern for this program. The UC Davis Stem Cell Training Program, which financially supports this program, is funded by Proposition 14, which passed by 51% in 2020.

Recommendation: In a separate program review for the bachelor's degrees, the panel brings up the possibility of leveraging mega sections of undergraduate courses in order to fund supervisory units. The Department Chair should discuss with the Dean the flexibility of funding saved through mega sections and know what endeavors can be spent on with these funds. The same goes for ICR (indirect cost recovery) funds. The purpose of ICR is to fund the infrastructure required by the applicant department in order to carry out the work it is awarded to do. This should be recognized by the College and University and the levels of ICR coming back to Biological Sciences ought to be renegotiated.

No embedded support for graduate students: Due to little investment on the part of the College, graduate students spent a lot of time as part of the GTA program, which is also underfunded. Student involvement in the GTA program requires a significant amount of time on the part of the graduate student. Graduate TAs and GAs are good, but seems likely to extend the time to degree. Faculty don't accept as many graduate students because they don't receive as much support for supervision units. Consequently, the program has fewer graduate students than it (probably) would otherwise.

Recommendation: As graduate students form the core of a successful research lab, the faculty of the department must identify resources (grants as well as university funds) that would allow graduate students to work full-time in the lab rather than need to obtain outside employment. The Department has success obtain substantial gifts from biotechnology partnerships. In the past, this funding has been used to procure lab equipment and supplies and hire support staff. If the Department can recover more of the ICR, Open Enrollment, & summer funds for other departmental needs, perhaps the partnership donations can help fund students with fellowships or scholarships. Also, the Department or College should be asked about tuition remission policies for GAs and TAs.

Slim curriculum: The Graduate committee reported to the review panel that it is often difficult for master's students to find courses at the graduate level. That is to say that there are few graduate-level courses offered by the Department across the academic year. There seems to be an imbalance between the freedom faculty get to offer

specialized courses and both the long waitlists in bottleneck courses and the limited graduate level courses.

Recommendation: Streamline the undergraduate curriculum so that graduate-level courses can be offered with a greater frequency. This discussion can be led by the graduate coordinator and the graduate committee, but there needs to be buy-in from the entire faculty.

Grad applications & admissions: It was conveyed to the review panel that approving graduate applications and processing graduate admissions was very time consuming.

Recommendation: The processes of application approval and processing are very mechanical, but it requires time that otherwise could be used to be in the research lab or teaching. As on other CSU campuses, the Department should ask the College to support the graduate coordinator with additional WTU in order to process applications, admissions and be in charge of all forms & petitions required by Master's students during their time in the program, along with leading the policy discussions for the Department.

Professional Science Master's: The Department is considering creating a Professional Science Master's degree program in Biotechnology. It was not clear if students in this new program would work with Sacramento State faculty or at another institution or in industry. It was also not clear if the curriculum for a new program would be devised by the Department faculty or whether a self-support program would hire outside lecturers.

Recommendation: With the faculty stretched very thin with a large undergraduate program, little financial support for graduate students, low curricular offerings at the graduate level, and extremely little WTU reassigned time for grad-level advising, the Department should evaluate what resources a new program will pull away from an already under-resourced graduate program. While PSMs bring in larger tuition sums, the added revenue may not alleviate an overworked faculty that will be called on to lead a new graduate student population.

Isolation: Since moving into the new building faculty feel more isolated because they are scattered across campus and don't see each other as much.

Recommendation: Department meetings should be more frequent, perhaps every other week, in order to increase faculty cohesion/unity/connections, especially coming out of the pandemic. Alternatively, there may be some cohesion events. Before the pandemic, the Biological Sciences Department at Cal Poly Pomona had a Cohesion

Committee (unofficial) and they would organize happy hours at the on-campus pub to destress and socialize.

Assessment: Strategic planning and assessment doesn't appear to be happening at this time. This may be a result of the pandemic. How are the goals assessed? Does the Department know that their students are achieving the learning outcomes? Closing the loop on assessment needs to be a central part to a strategic plan.

Recommendation: Strategic Planning and assessment should begin now that the pandemic restrictions are gone. Examination of previous strategic plans would be a good place to start. Major participation by Junior faculty in strategic planning is recommended. A potential faculty retreat was mentioned during the meetings. An organized, focused retreat based on some pre-planning could be very fruitful to kick-off strategic planning. A portion of that retreat should be dedicated to the master's programs. Coordinating/organizing could be done by the graduate committee who should meet (or discuss the agenda via email) prior to retreat.

Learning Goals follow the Vision & Change document:

Summary recommendations:

The committee noted that graduate programs were not significantly addressed in the self-study document. This was surprising as graduate students are generally the driver for research productivity and should have figured more prominently in the self-study document. One of the greatest challenges for the Department will be to identify resources to pay graduate student stipends at significant levels so that they can spend their time in the lab rather than working at a job to earn living expenses.

The excerpt below, taken from the bachelor's program review, also applies here.

An expected increase in faculty research productivity will also require additional release time to allow scholarly and creative activities. This release time will be required for faculty to develop proposals, write manuscripts, mentor students, perform professional service and have the time to think about science. Additional release time has a cost associated with it as additional resources would be required to cover courses that are no longer staffed by faculty. Some (much?) of this could be minimized by streamlining the current curriculum. Faculty that receive additional release time for research should expect to demonstrate how this release time has resulted in increased research productivity. Additionally increased research expectations will at some point need to be incorporated into the Department's RTP policies.

The main focus of the foreseeable future for the graduate programs should be securing more supervisory units for research active faculty, identifying additional sources to fund graduate students or institute tuition waivers, providing more graduate-level classes, and reassess the creation of a new master's program. In summary, the Biological Sciences Department should be proud of its research productivity and aspire to continue an admirable output and work ethic.

External Review Summary Sheet for Program Review

STAGE	DESCRIPTION
Initial	The program is at a preliminary stage in this practice. The program shows the need for additional policies, resources, or practices in order for it to provide the education program to which it is committed or aspires. Insufficient data is available to make determinations.
Emerging	The program partially satisfies the criterion. Some data is available documenting this dimension. The program has many, but not all, of the policies, practices, and resources it needs to provide the educational program to which it is committed or aspires.
Developed	The program satisfies this criterion, with developed policies and practices. The program has the availability of sufficient resources to accomplish its program goals on this dimension. Data demonstrates accomplishment of this criterion.
Highly Developed	The program fully satisfies this criterion. The program may serve as a model and reference for others on campus. The program's practices, policies, and/or its resources contribute to program excellence on this dimension.

Most of the program was not discernable from the self-study. A separate program review should be performed on the graduate programs to better assess the stages of its various aspects.

Internal Review Report

Internal Review Report:	Department of Biology
College:	Natural Sciences and Mathematics
Biology Degree Programs:	BA in Biological Science BS in Biological Science MA in Biological Science MS in Biological Science
Internal Reviewers:	Ben Amata, Library Poori Assadi, College of Business
Date Submitted:	June 17, 2022

I. Context:

The Department of Biology submitted a 17-page self-study in fall 2021 that structurally conformed to the self-study in the *Academic Program Review Guide*. ***The Internal Reviewers (IR) and External Reviewers (ER) concluded that a significant defect throughout the self-study is the lack of self-reflection and too much missing information. In their report, the External Reviewers stated that the self-study lacked considerable information and therefore made it impossible for them to evaluate many aspects of the program.*** The External Reviewer's seem appropriate. Professor Steve Alas from California State Polytechnic University, Pomona, provided many useful examples from his institution that would help our Department meet some of its challenges. Professor Stuart Wooley who is at CSU Stanislaus is from a department that is half the size of ours but that didn't affect the quality of the review. The scheduled visit using Zoom on March 10 & 11, 2022 was appropriate overall. There were 2 meetings for faculty; the IC would expect that tenure track/tenured faculty and lecturers would have separate meetings so that that each group can have frank and honest conversations with the ER, but the schedule wasn't clear nor did the ER report clarify. The ER stated that they were disappointed that undergraduate and graduate students weren't present, most likely due to the pandemic, to provide their feedback about their program.

The ER's overall observations were astute and should help Biology develop a rational and a workable approach to meeting structural, internal, and external challenges that affect the health and ability of the Department to successfully deliver its degree programs.

The Department listed the University, College, and departmental mission statements. Additionally, it mentioned its service to other departments, degree programs, and in general education, an external educational partnership with UC Davis (MA Biological Science), and the suspension of their BS Biological Science concentration in Forensic Biology.

II. Recommendations:

A. To Maintain Success

The Department is very large with 31 faculty and approximately 1,600 students, besides furnishing valuable service courses to other departments and general education.

The ER quite succinctly summarized their findings in their introduction for both the BA and BS reports and expressed a greater need for more information to evaluate the bachelor programs.

“The document was somewhat out of date as major portions were written two years prior to the review. It was also missing many sections considered pivotal in the analysis of a program’s progress and status. The two-person panel met with various stakeholder groups including faculty, staff, and administrators. Based on the virtual interviews and the materials provided to the panel, we could not develop a good sense of the state of the department. However, we did come to understand the difficulties it has overcome and the challenges that remain to be addressed. The faculty and staff are dedicated individuals to the undergraduate student population. We only wish that students would have made themselves available in order to gain their perspective regarding the Department and to learn from their experiences within it. Although the overall tone of our evaluation is very positive, the department faces a number of challenges that it must overcome to continue to excel in their teaching and research missions.”

Recommendation II.A.1: The IR strongly recommends that all tenure track/tenured faculty review an example of a successful self-study (See your Dean or the Office of Academic Excellence) to better understand what is appropriate information to provide with sufficient self-reflection and compare it with the Department’s latest for each bachelor degree program.

Recommendation II.A.2: The Department doesn’t adequately differentiate in the course catalog between its BA and the BS degrees. It should examine how other Universities describe them and provide a more accurate description which differentiates them. See CSU Stanislaus’s description as an example. <https://www.csustan.edu/biology/degrees>

Similarly, the ER concluded that there was insufficient information to adequately evaluate the MA and MS programs. There are 44 enrolled graduate students which makes the program the thirteenth largest CSU program, but the number may be 90 which would make it the largest. The ER suggested that a large portion most likely are not enrolled in supervisory units once they’ve completed their course work in order to save tuition.

“The Biological Sciences Department at Sacramento State provided the external review panel with a self-study document prior to our site visit. The document contained almost no information on the Master’s programs in the department. It contained learning outcomes and links to dashboards that the panel could mine through. More importantly, there was no reflection on the state of the graduate programs. The two-person panel met with faculty members in general and with the Graduate Committee. Based on the virtual interviews and the materials provided to the panel, we could not develop a good sense of the state of the program. However, we did come to understand the difficulties it has overcome and the challenges that remain to be addressed. The faculty and staff are dedicated individuals to the graduate student population.”

Recommendation II.A.3: The IR strongly recommends that all tenure track/tenured faculty review an example of a successful self-study (See your Dean or the Office of Academic Excellence) to better understand what is appropriate information to provide with sufficient self-reflection and compare it with the Department’s latest for its master’s degree programs.

Recommendation II.A.4: The Department should have accurate counts of enrolled graduate students for planning/reporting.

The Department offers 4-degree programs with many concentrations. Neither the self-study nor the ER asked if the Department has adequate resources to support them. The Department should consult CSU and CSUS dashboards for current data: [Graduation Initiative 2025 Dashboard \(calstate.edu\)](https://calstate.edu/graduation-initiative-2025-dashboard) and [Enrollment Dashboard | Sacramento State \(csus.edu\)](https://csus.edu/enrollment-dashboard); it should analyze and provide self-reflection on the data rather than just linking to them. This is quite relevant since both the self-study and ER addressed workload and the need for more faculty and staff. The Department is considering or discussing two additional joint programs (strategic plan p 3): a PSM in Biotechnology with the College of Business and an expressed interest in PSM-style program with the Environmental Sciences in SSIS. According to the strategic plan, the Department is considering even more programs: development of Forensic Science degree program (undergraduate), CLS traineeship program, other ideas for certificate/postbaccalaureate programs, a +1 Master's program development, and possible revival of the Honors Thesis program. Also, in the self-study, the Department should have noted their efforts to make the overall program more efficient, e.g. utilizing paired (undergrad and grad) course offerings and curriculum and streamlining the graduate curriculum and learning improvements, e.g. increasing relevance of coursework for students and bioinformatics and computational thinking integration throughout. The ER asked relevant questions that the Department could have proactively addressed in its self-study. They recommended that the Department evaluate the overall curriculum and the number of courses that are offered each year to address potential bottleneck problems (EC BS report p 11) and related issues such as equity in mega courses assignments. Lastly, as a matter of debate, the ER commended the Department for abolishing their pre-major as a significant efficiency gain, while in its self-study, the Department claimed that abolishing their pre-major would *not* result in efficiencies and lessened workload. The IR views these divergent views ripe for further examination and reflection.

Recommendation II.A.5: The IR recommends that the Department should analyze enrollment and current resources for its four-degree programs and submit a report to the dean, and for next program review that justifies it has the adequate resources to sustain them since it is considering potential partnerships and more degree programs.

B. To Improve Student Learning (consider university/college goals on learning, research/scholarship, diversity)

BA Biological Sciences.

In their self-study, the Department lists 2 learning goals. For goal 1, students will demonstrate foundational knowledge in the Biological Sciences in the following core concepts (From V&C Core Concepts for Biological Literacy). This first goal has 5 sub-goals with each having 4 outcomes except sub-goal D which has 3. For goal 2, students will learn functional skills in the Biological Sciences in the following core competencies (Adapted from V&C Core Competencies). This second goal has 3 sub-goals with a varying number of outcomes (sub-goal A has 3, sub-goal B has 2, and sub-goal C has 5) that align with baccalaureate learning goals but include some unique ones. Sub-goal A includes written/oral communication and information literacy; sub-goal B addresses critical thinking and quantitative

reasoning; and sub-goal C focuses on evidence-based personal values, relationship to other Disciplines, social Relevance, collaboration, and life-long learning.

For the prompt, "Provide a summary of data for each learning outcome," The Department furnished a link for their report titled: 2017-2018 ASSESSMENT REPORT FOR BIOLOGICAL SCIENCES (EXCERPTS FROM FULL SUBMISSION). The IR couldn't access the report, so APRC chair Brodd supplied a copy. They assessed overall disciplinary knowledge using the Bio-MAPS Assessment tool developed by biology education researchers as part of a national effort to reform undergraduate biology education. They assessed student learning through two lenses: core concepts as defined by the Vision and Change movement for specific content areas: (1) Evolution, (2) Structure and Function, (3) Information Flow, (4) Energy and Matter, and (5) Systems. They concluded:

"Overall, Sacramento State Biological Sciences majors score between the midpoint and advanced means relative to nationwide scores. This is true for four of the five Vision and Change Core Concepts as well (Evolution, Structure and Function, Information flow and Systems). Our students score lower than the national average in the Energy and Matter core concept area. Based on the three disciplinary areas represented, our students score between the midpoint and advanced levels in Cell and Molecular Biology and Ecology and Evolution but score below the national midpoint in the area of physiology."

For each degree and concentration, the Department explained the student's performance and in most cases an explanation. For example, for the BA they wrote:

"Overall, students in the Bachelor of Arts in Biological Sciences program performed just below the Sacramento State mean and equal to the national midpoint. Students scored higher than the Sacramento State mean in the following Vision and Change Core Concepts: Evolution and Structure and Function, and lower than the Sacramento State mean for Information flow, Energy and Matter, and Systems. For the three disciplinary areas, students performed at the Sacramento State mean in Cell and Molecular Biology and below the Sacramento State mean in physiology and Ecology and Evolution. Most of the students included in this assessment were taking Bio 188, a course that is intended to be taken in their final year. However, many students take this class much earlier in their academic career. This may explain the performance at or below the national midpoint means. Students in this concentration complete the same core courses as those in the BS General Biology concentration but do not have the same depth of study because students take a single elective course that is specified as a Structure and Function elective. As a result, it is not surprising that students perform below the campus mean."

"The **BA in Biological Sciences**, BS in General Biology and the BS in Ecology, Evolution and Conservation programs have numerous deficiencies, defined by students performing below the national midpoint means. These may be related to the demographic factors shown below, particularly GPA and number of courses taken."

"The Biological Sciences Department is currently working on several curricular modifications to address the findings noted here. First, the department is in the process of reviewing/revising our Program Learning Outcomes to better align with the Vision and Change Core concepts/competencies. Second, the Department is working on the development of course learning outcomes for all courses in Biological Sciences. Once complete, the Department will work to align the course learning outcomes to program learning outcomes in order to develop a

curriculum map for each concentration. Once complete, the Department can begin to address deficiencies in the curriculum and adjust courses to better meet the defined program learning outcomes.”

While the Department provided some reflection about the results, it didn’t justify if it should accept them from a programmatic perspective nor did it offer any strategies or suggestions for how it could improve performance. This is another illustration of a lack of self-reflection in the report and generally in the self-study. The program has changed significantly since it created the 2017/18 report, program review assessment data showed students performing below the national midpoint. The IR noted that Biological Sciences Department is currently working on several curricular modifications to address the findings. The ER did not mention this assessment report in either of their reports. It is unclear to the IR whether the ER did not know about it, chose not to comment, unable to access it, or did not consider it significant. Therefore, the Department missed a critical opportunity to answer the prompt: “Provide analysis for each learning outcome by degree program, including how to maintain success and improve learning.”

For the prompts “Summarize other relevant data (student surveys, alumni, licensure passage rates, grad school acceptance, internships, etc.) and how the data is used to maintain success and improve learning” and “Provide updated comprehensive assessment plan for each degree program,” The Department wrote *not available* without any explanation.

Program review is a summative assessment including the years since the last program review, and therefore the Department should have reviewed previous year’s assessment efforts and discussed in their self-study. In 2012/13, the Department conducted a pilot assessment, the EDAT (Experimental Data Assessment Test) writing assignment. It concluded that the standard EDAT Scoring Rubric did not fit with their learning outcomes well. To test critical thinking skills in 2013/14, they developed an assignment where students develop and test a hypothesis based on the primary literature. They gave the assignment in BIO 188, a course that serves as a capstone for all students in the BA in Biological Sciences and the BS in Biological Sciences with a General Biology concentration. They intended to alternate 3 core competencies that are evaluated each year using the same capstone assignment (Critical Thinking, Information Literacy, and Written Communication). In 2014/15, the Department instead administered the Critical Thinking Assessment Test to introductory (Bio 1) and intermediate-level (Bio 100) courses within the Biological Sciences major. The Department planned to administer this instrument in an advanced-level class (Bio 188) in Fall 2015. They were to report the results in their 2015/16 annual assessment report. However, for that year, they were unable to grade the CAT exams for their assessment report. The data they presented was from the graduating senior survey students who self-evaluated their competency for five PLOs. They experienced a low response rate (30 responses from a 140 sent out). For 2016/17, they focused on several aspects of student behavior in laboratory courses. Several years’ assessment reports illustrate that the Department has been assessing student learning outcomes and made good faith efforts to comply with University requirements to assess them.

In their strategic plan under Curricular Needs, the Department stated that they would revise their bachelor and master’s goals but didn’t mention in their self-study if they completed that undertaking.

1. Learning outcomes assessment (both undergraduate and graduate programs)

- a. Review, revise and approve program level (i.e., common among all concentrations) learning outcomes, focusing on core skills and competencies rather than knowledge-based outcomes (*Spring-Fall 2020*)

Recommendation II.A.6: The IR recommends that the Department create an assessment committee if one doesn't already exist to meet with an Office of Academic Excellence representative to discuss departmental PLOs and develop a holistic plan to rotate assessment of their goals in conjunction with the University's Baccalaureate Learning Goals. baccalaureate-learning-goals.pdf (csus.edu)

Recommendation II.A.7: The IR recommends that the College Dean or their designee meet with the Department's assessment group to discuss the assessment plan, year's goal, and proposed strategy for assessing at the beginning of the academic year in order to address any potential problems that would derail the year's effort. It is appropriate to ask a representative from Office of Academic Excellence to attend.

Recommendation II.A.8: The IR recommends that the department consider ways to gauge impact of these changes by outcome to consider success to be maintained or additional needed improvements.

Recommendation II.A.9: The IR recommends that the Department provide appropriate self-reflection and analysis in their self-study of program learning outcomes to improve its efforts for future reporting.

Recommendation II.A.10: The IR recommends that the Department examine the graduating senior survey for qualitative data pertaining to the bachelor degree goals. While an indirect measure, it can provide valuable student perceptions of the baccalaureate goals that when compared with direct measures provides a powerful source of data for self-reflection and inclusion in the self-study.

BS Biological Science

In their self-study, the Department lists 2 learning goals. For goal 1, students will demonstrate foundational knowledge in the Biological Sciences in the following core concepts (From V&C Core Concepts for Biological Literacy). This first goal has 5 sub-goals with each having 4 outcomes except sub-goal D which has 3. For goal 2, students will learn functional skills in the Biological Sciences in the following core competencies (Adapted from V&C Core Competencies). This second goal has 3 sub-goals with a varying number of outcomes (sub-goal A has 3, sub-goal B has 2, and sub-goal C has 5) that align with baccalaureate learning goals but include some unique ones. Sub-goal A includes written/oral communication and information literacy; sub-goal B addresses critical thinking and quantitative reasoning; and sub-goal C focuses on evidence-based personal values, relationship to other Disciplines, social Relevance, collaboration, and life-long learning.

For the prompt, "Provide a summary of data for each learning outcome," The Department furnished a link for their report titled: 2017-2018 ASSESSMENT REPORT FOR BIOLOGICAL SCIENCES (EXCERPTS FROM FULL SUBMISSION). The IR couldn't access the report, so APRC chair Brodd supplied a copy. They assessed overall disciplinary knowledge using the Bio-MAPS Assessment tool developed by biology education researchers as part of a national effort to reform undergraduate biology education. They assessed student learning through two lenses: core concepts as defined by the Vision and Change

movement for specific content areas: (1) Evolution, (2) Structure and Function, (3) Information Flow, (4) Energy and Matter, and (5) Systems. They concluded:

“Overall, Sacramento State Biological Sciences majors score between the midpoint and advanced means relative to nationwide scores. This is true for four of the five Vision and Change Core Concepts as well (Evolution, Structure and Function, Information flow and Systems). Our students score lower than the national average in the Energy and Matter core concept area. Based on the three disciplinary areas represented, our students score between the midpoint and advanced levels in Cell and Molecular Biology and Ecology and Evolution but score below the national midpoint in the area of physiology.”

For each degree and concentration, the Department explained the student’s performance and in most cases an explanation. For example, for the BS they wrote:

“The BA in Biological Sciences, **BS in General Biology** and the BS in Ecology, Evolution and Conservation programs have numerous deficiencies, defined by students performing below the national midpoint means. These may be related to the demographic factors shown below, particularly GPA and number of courses taken.”

“The Biological Sciences Department is currently working on several curricular modifications to address the findings noted here. First, the department is in the process of reviewing/revising our Program Learning Outcomes to better align with the Vision and Change Core concepts/competencies. Second, the Department is working on the development of course learning outcomes for all courses in Biological Sciences. Once complete, the Department will work to align the course learning outcomes to program learning outcomes in order to develop a curriculum map for each concentration. Once complete, the Department can begin to address deficiencies in the curriculum and adjust courses to better meet the defined program learning outcomes.”

While the Department provided some reflection about the results, it didn’t justify if it should accept them from a programmatic perspective nor did it offer any strategies or suggestions for how it could improve performance. This is another illustration of a lack of self-reflection in the report and generally in the self-study. The program has changed significantly since it created the 2017/18 report, that program review assessment data showed that student outcomes achievement varied significantly by concentration and outcome. The program review notes that Biological Sciences Department reviewing/revising our Program Learning Outcomes to better align with the Baccalaureate Learning Outcomes. Second, the Department is working on the development of course learning outcomes for all courses to align to the BS Biological Science PLOs. The ER did not mention this assessment report in either of their reports. It is unclear to the IR whether the ER did not know about it, chose not to comment, unable to access it, or did not consider it significant. Therefore, the Department missed a critical opportunity to answer the prompt: “Provide analysis for each learning outcome by degree program, including how to maintain success and improve learning.”

For the prompts “Summarize other relevant data (student surveys, alumni, licensure passage rates, grad school acceptance, internships, etc.) and how the data is used to maintain success and improve learning” and “Provide updated comprehensive assessment plan for each degree program,” The Department wrote *not available* without any explanation.

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In their strategic plan under Curricular Needs, the Department stated that they would revise their bachelor and master's goals but didn't mention in their self-study if they completed that undertaking.

1. Learning outcomes assessment (both undergraduate and graduate programs)
 - a. Review, revise and approve program level (i.e., common among all concentrations) learning outcomes, focusing on core skills and competencies rather than knowledge-based outcomes (*Spring-Fall 2020*)

Recommendation II.A.11: The IR recommends that the Department create an assessment committee if one doesn't already exist to meet with an Office of Academic Excellence representative to discuss departmental PLOs and develop a holistic plan to rotate assessment of their goals in conjunction with the University's Baccalaureate Learning Goals. baccalaureate-learning-goals.pdf (csus.edu)

Recommendation II.A.12: The IR recommends that the College Dean or their designee meet with the Department's assessment group to discuss the assessment plan, year's goal, and proposed strategy for assessing at the beginning of the academic year in order to address any potential problems that would derail the year's effort. It is appropriate to ask a representative from Office of Academic Excellence to attend.

Recommendation II.A.13: The IR recommends that the department disaggregate program outcome assessment data by concentration to insure success across the different degree options and/or target specific courses with needed improvements.

Recommendation II.A.14: The IR recommends that the Department provide appropriate self-reflection and analysis in their self-study of program learning outcomes to improve its efforts for future reporting.

Recommendation II.A.15: The IR recommends that the Department examine the graduating senior survey for qualitative data pertaining to the bachelor degree goals. While an indirect measure, it can provide valuable student perceptions of the baccalaureate goals that when compared with direct measures provides a powerful source of data for self-reflection and inclusion in the self-study.

MA Biological Science

According to the 2016/17 annual Office of Academic Excellence assessment report, the Department stated it would create an MA assessment plan, but there is no evidence that it did. The Faculty Senate created master's level learning goals in 2015. Four of the goals are conceptually similar to the baccalaureate. 1) Disciplinary knowledge: Master, integrate, and apply disciplinary knowledge and skills to current, practical, and important contexts and situations. 2) Communication: Communicate key knowledge with clarity and purpose both within the discipline and in broader contexts. 3) Critical thinking/analysis: Demonstrate the ability to be creative, analytical, and critical thinkers. 4) Information literacy: Demonstrate the ability to obtain, assess, and analyze information from a myriad of sources. For the Department to create programmatic learning goals and determine direct measures doesn't require a totally new and different effort. It can consult with the Office of Academic Excellence and with other science departments and model successful plans, e.g. Geology, and make any changes unique to biology. If the Department reflected on its informal or non-articulated learning goals before 2015, they would have been the same aforementioned goals. In some, cases a master's goal may not be different even in degree from a baccalaureate goal such as oral communication. The two goals unique to graduate programs are professionalism (demonstrate an understanding of professional integrity) and intercultural/global Perspectives (demonstrate relevant knowledge and application of intercultural and/or global perspectives). Again, other science departments may have already developed approaches that the Department can adopt or adapt.

The self-study provided no information on master's degree assessment in its self-study except listing the Department's program learning goals. The ER stated there was insufficient information to comment on the master's programs.

Recommendation II.A.16: The IR recommends that the Department's graduate committee or group work with the Office of Academic Excellence to discuss departmental PLOs and develop a holistic plan to rotate assessment of their goals in conjunction with the University's master's Learning Goals.
[\(Graduate Learning Goals Report | Sacramento State \(csus.edu\)\)](#)

Recommendation II.A.17: The IR recommends the department work with the Office of Academic Excellence to create a degree specific assessment plan using the CSU required template and strategy to launch systematic in the coming academic year's assessment, year's goal, and proposed strategy for assessing at the beginning of the academic year.

MS Biological Science

There is no evidence that the Department has created an MS assessment plan. The Faculty Senate created master's level learning goals in 2015. Four of the goals are conceptually similar to the baccalaureate. 1) Disciplinary knowledge: Master, integrate, and apply disciplinary knowledge and skills to current, practical, and important contexts and situations. 2) Communication: Communicate key knowledge with clarity and purpose both within the discipline and in broader contexts. 3) Critical

thinking/analysis: Demonstrate the ability to be creative, analytical, and critical thinkers. 4) Information literacy: Demonstrate the ability to obtain, assess, and analyze information from a myriad of sources. For the Department to create programmatic learning goals and determine direct measures doesn't require a totally new and different effort. It can consult with Office of Academic Excellence and with other science departments and model successful plans, e.g. Geology, and make any changes unique to biology. If the Department reflected on its informal or non-articulated learning goals before 2015, they would have been the same aforementioned goals. In some, cases a master's goal may not be different even in degree from a baccalaureate goal such as oral communication. The two goals unique to graduate programs are professionalism (demonstrate an understanding of professional integrity) and intercultural/global Perspectives (demonstrate relevant knowledge and application of intercultural and/or global perspectives). Again, other science departments may have already developed approaches that the Department can adopt or adapt.

The self-study provided no information on master's degree assessment in its self-study except listing the Department's program learning goals. The ER stated there was insufficient information to comment on the master's programs.

Recommendation II.A.18: The IR recommends that the Department's graduate committee or group meet with an Office of Academic Excellence representative to discuss departmental PLOs and develop a holistic plan to rotate assessment of their goals in conjunction with the University's master's Learning Goals. ([Graduate Learning Goals Report | Sacramento State \(csus.edu\)](#))

Recommendation II.A.19: The IR recommends that the College Dean or their designee meet with the Department's assessment group to discuss the assessment plan, year's goal, and proposed strategy for assessing at the beginning of the academic year in order to address any potential problems that would derail the year's effort. It is appropriate to ask a representative from Office of Academic Excellence to attend.

C. To Improve Student Success (consider university/college goals on recruitment, retention, graduation, diversity, engagement)

The Template has 4 prompts. Departments are to provide disaggregated data for each of its 4 degrees for admission data by gender and ethnicity, retention data by gender and ethnicity, 4-year and 6-year graduation data by gender and ethnicity, and analysis on admission, retention, and graduation data, including how to maintain success and improve time to degree, and consider concentrations as needed. The self-study furnished no data and self-reflection. Instead, it provided links to the University' dashboard. The purpose of the prompts is to invoke Department engagement to identify strengths and weaknesses and provide strategies for potential improvement.

For the prompt on impactation, the Department noted not available, which appears to indicate the program isn't impacted. In the Strategic Plan under Curricular Needs, a sentence reads: "1. Discuss and make a decision about coming out of impactation and dropping the pre-major in Biological Sciences (by the end of Fall 2019 semester)." This was another missed opportunity by the Department to explain that it had a significant program change.

The Department also furnished no data or self-reflection for the prompt: Summarize current partnerships in success efforts (Advising, Writing Center, Library Student Success Center, internship sites, etc.) and consider ways to better work together to maintain success and improve time to degree.

The Department and the ER addressed the major challenge of advising. The ER made some thoughtful recommendations. The Department noted in its strategic plan (pages 4-5) several ideas that it could have discussed in its self-study. 1) Increase student representation (both graduate and undergraduate) in departmental decision-making processes. 2) Increase dialog with departments that provide service functions for Biological Sciences students, including Chemistry, Physics and Mathematics, to better meet the needs of our students. **(For the Physics Department's 2018 program review's focused inquiry, Chair Taylor contacted the Biology Department for input on physics service courses; the Biology department never responded to the Physics Chair after repeated contact attempts. See the Physics Program Review Report 2019/19 p 18. The dean may need to make sure that departments respond to each other's requests, especially for curricular considerations).** 3) Increase dialog with departments for whom Biological Sciences provides service courses. 4) Address student financial support for both undergraduate and graduate students. 5) Increase community among students, both graduate and undergraduate. 6) Develop workshops and seminars to better train faculty in inclusive pedagogy practices through workshops and evidence-based practice trainings. The Department should have consulted its own strategic plan for discussion items to include in the self-study.

It appears to the IR that the chair or an individual wrote the self-study and possibly circulated within the Department for feedback. While this is typical of how departments approach program review, it doesn't make for excellent self-studies. The Department can achieve greater quality analysis and self-reflection if more faculty engage with the self-study.

Recommendation II.A.20: The IR strongly recommends all faculty are involved in data analysis and discussions on maintaining success and continuous improvement. This will likely allow the Department more adequate time to obtain and provide appropriate data and self-reflection.

D. To Build Partnerships and Resource Development to Enhance the Student Experience (consider university/college goals on university as place, university experience, community engagement)

The Department lists several biotechnology company partnerships that have resulted in faculty obtaining money, supplies, and hiring support staff. It lists in the beginning of the self-study an External educational partnership with UC Davis's Stem Cell MA Program but didn't furnish any information on the benefits. The Department requests as its highest priority to hire a faculty with Terrestrial Vertebrate Biology/Wildlife Management expertise which will better develop partnerships with state and federal agencies involved in wildlife management but didn't explain in any detail the potential benefits, e.g. external grant or contract funding for faculty and students. The IR and ER commend the Department for its research, grants, etc., but the EC has also noted that workload is a significant challenge for the Department and therefore the teaching mission is the priority.

Commendation II.A.21: The IR commends the Department faculty whose partnerships resulted in benefits to the faculty, students, and the Department.

Recommendation II.A.22: The IR recommends that the Department provide more information on the benefits of partnerships such as the existing degree program with UC Davis and potential hiring justifications.

E. To Improve Strategic and Budget Planning and Operational Effectiveness and to Ensure Sustainability (consider university/college goals on innovative teaching, scholarship, research, university as place, university experience)

The IR concurs with the ER which recommended that the strategic plan is out of date and needs revision and when complete the Department should issue it as a final document until it undergoes its next revision.

The ER's report and the strategic plan raised issues about communication and transparency which departments work on and routinely revisit for refinement and addressing new problems.

Once the Department completes its curricular review it will be better situated to create a staffing plan.

Recommendation II.A.23: The IR recommends that the Department create a taskforce rather than relying solely on the chair or an individual faculty to investigate improving communication and transparency issues within and outside the Department.

III. Appendix (All Recommendations)

Recommendation II.A.1: The IR strongly recommends that all tenure track/tenured faculty review an example of a successful self-study (See your Dean or the Office of Academic Excellence) to better understand what is appropriate information to provide with sufficient self-reflection and compare it with the Department's latest for each bachelor degree program.

Recommendation II.A.2: The Department doesn't adequately differentiate in the course catalog between its BA and the BS degrees. It should examine how other Universities describe them and provide a more accurate description which differentiates them. See CSU Stanislaus's description as an example. <https://www.csustan.edu/biology/degrees>

Recommendation II.A.3: The IR strongly recommends that all tenure track/tenured faculty review an example of a successful self-study (See your Dean or the Office of Academic Excellence) to better understand what is appropriate information to provide with sufficient self-reflection and compare it with the Department's latest for its master's degree programs.

Recommendation II.A.4: The Department should have accurate counts of enrolled graduate students for planning/reporting.

Recommendation II.A.5: The IR recommends that the Department should analyze enrollment and current resources for its four-degree programs and submit a report to the dean, and for next program review that justifies it has the adequate resources to sustain them since it is considering potential partnerships and more degree programs.

Recommendation II.A.6: The IR recommends that the Department create an assessment committee if one doesn't already exist to meet with an Office of Academic Excellence representative to discuss departmental PLOs and develop a holistic plan to rotate assessment of their goals in conjunction with the University's Baccalaureate Learning Goals. baccalaureate-learning-goals.pdf (csus.edu)

Recommendation II.A.7: The IR recommends that the College Dean or their designee meet with the Department's assessment group to discuss the assessment plan, year's goal, and proposed strategy for assessing at the beginning of the academic year in order to address any potential problems that would derail the year's effort. It is appropriate to ask a representative from Office of Academic Excellence to attend.

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Recommendation II.A.9: The IR recommends that the Department provide appropriate self-reflection and analysis in their self-study of program learning outcomes to improve its efforts for future reporting.

Recommendation II.A.10: The IR recommends that the Department examine the graduating senior survey for qualitative data pertaining to the bachelor degree goals. While an indirect measure, it can provide valuable student perceptions of the baccalaureate goals that when compared with direct measures provides a powerful source of data for self-reflection and inclusion in the self-study.

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Recommendation II.A.16: The IR recommends that the Department's graduate committee or group work with the Office of Academic Excellence to discuss departmental PLOs and develop a holistic plan to rotate assessment of their goals in conjunction with the University's master's Learning Goals.

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Recommendation II.A.23: The IR recommends that the Department create a taskforce rather than relying solely on the chair or an individual faculty to investigate improving communication and transparency issues within and outside the Department.

MOU/Action Plan

The department will use the self-study, external reviewer report, and internal reviewer report to complete the MOU/Action Plan Template in conjunction with the Dean.

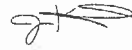
Program: **Biological Sciences MS**
 College: **Natural Sciences & Mathematics**

Date: 2022 Program Review 2YR Update 4YR Update 6YR Update

Program Review Finding	2 YR	4 YR	6 YR
Cite self-study, external review, internal review, and/or accreditation documentation	List goal, success indicator, responsible parties, and resource implications.	List goal, success indicator, responsible parties, and resource implications.	List goal, success indicator, responsible parties, and resource implications.
To Maintain Success			
The Department should have accurate counts of enrolled undergraduate/graduate students for planning/reporting & <i>should analyze enrollment and current resources for its four-degree programs</i> (suggested by external review and internal review [Recommendation II.A.4 &5])	Use University and Systemwide dashboards to gather annual data for students in the MS in Biological Sciences with a focus on student retention and progression.	Identify potential barriers to student progression and opportunity gaps among MS students in Biological Sciences.	If opportunity gaps/barriers to student progression are identified, work as a department to develop strategies to improve student success.
To Improve Student Learning (consider university/college goals on learning, research/scholarship, diversity)			
Create an assessment plan to improve ability to track student learning and implement curricular changes (suggested by external review and internal review [Recommendation II.A.6])	Develop rubrics or strategies for data collection for MS in Biological Sciences PLOs	Identify courses in which assessment data will be collected for each PLO	Develop an annual strategy to collect, analyze and present assessment data to faculty and identify strategies to improve student learning based on assessment data.
Update and streamline the graduate program (suggested by self study)	We are currently undergoing a restructuring of our MA/MS Programs. This should be submitted and complete during the 2022-3 academic year.	Develop mechanisms to track student progression through the MS program.	

To Improve Student Success (consider university/college goals on recruitment, retention, graduation, diversity, engagement)			
<i>The IR recommends that the Department provide appropriate self-reflection and analysis in their self-study of program learning outcomes to improve its efforts for future reporting. (suggested by external and internal review [Recommendation II.A.9])</i>	Develop distinct PLOs for the MS in Biological Sciences that are distinct from the MA degree program	Ensure completion of a curriculum map for the MS in Biological Sciences.	
To Build Partnerships and Resource Development to Enhance the Student Experience (consider university/college goals on university as place, university experience, community engagement)			
<i>The IR recommends that the Department provide more information on the benefits of partnerships such as the existing degree program with UC Davis and potential hiring justifications. (suggested by external review and internal review [Recommendation II.A.22])</i>	Develop evidence-based partnerships with Governmental and private agencies that will enhance the student experience/ success for graduate programs and strengthen community connections with local agencies.		Maintain an informational webpage and list of internships available to students
To Improve Strategic & Budget and Operational Effectiveness and to Insure Sustainability (consider university/college goals on innovative teaching, scholarship, research, university as place, university experience)			
RTP document needs to clarify expectations and include advising expectations (Self study, ER)		Update RTP document to better reflect faculty workload and service expectations and to ensure equitable workloads among faculty in order to ensure faculty workload reflects the needs of the graduate curriculum.	
Update, approve, and submit Strategic Plan (internal and external review)	Review and finalize the Departmental strategic plan based on current College and University initiatives, with a focus on meeting the needs of the graduate curriculum.		Review progress on strategic plan initiatives and revise for the next five-year period.
Develop a strategy for sustainability of research (self study, external review)	Develop a budgetary strategy to ensure sustainability of student research needs	Develop a budgetary strategy to ensure faculty release time in support of graduate student research.	

Department Chair Name/Signature Jamie Kneitel



College Dean Name/Signature Lisa Hammersley

