2017 - 2018
Annual Program Assessment Report

The Office of Academic Program Assessment
California State University, Sacramento

For more information visit our **website**
or **contact us** for more help.

Please begin by selecting your program name in the drop down.
If the program name is not listed, please enter it below:

BS/BA Biology

OR enter program name:

Section 1: Report All of the Program Learning Outcomes Assessed

Question 1: Program Learning Outcomes

Q1.1.
Which of the following Program Learning Outcomes (PLOs), Sac State Baccalaureate Learning Goals (BLGs), and emboldened Graduate Learning Goals (GLGs) **did you assess?** [**Check all that apply**]

- [ ] 1. **Critical Thinking**
- [ ] 2. **Information Literacy**
- [ ] 3. **Written Communication**
- [ ] 4. **Oral Communication**
- [ ] 5. Quantitative Literacy
- [ ] 6. **Inquiry and Analysis**
- [ ] 7. Creative Thinking
- [ ] 8. Reading
- [ ] 9. Team Work
- [ ] 10. Problem Solving
- [ ] 11. Civic Knowledge and Engagement
- [ ] 12. **Intercultural Knowledge, Competency, and Perspectives**
- [ ] 13. Ethical Reasoning
- [ ] 14. Foundations and Skills for Lifelong Learning
- [ ] 15. **Global Learning and Perspectives**
- [ ] 16. Integrative and Applied Learning
- [ ] 17. Overall Competencies for GE Knowledge
- [x] 18. **Overall Disciplinary Knowledge**
- [ ] 19. **Professionalism**
- [ ] 20A. Other, specify any assessed PLOs not included above:

a.
b.
c.

- [ ] 20B. **Check here if your program has not collected any data for any PLOs**. Please go directly to Q6 (skip Q1.2 to Q5.3.1.)

Q1.2.
Please provide more detailed background information about **EACH PLO** you checked above and other information including how your specific PLOs are **explicitly** linked to the Sac State **BLGs**/**GLGs**:

During the 17-18 Academic year, we used the Bio-MAPS assessment (Biology-Measuring Achievement and Progression in Science) to measure student learning in all concentrations in Biological Sciences. This assessment includes 61 multiple True/False questions that are explicitly aligned with the nationally-developed learning outcomes in Biological Sciences published in the American Academy for Advancement of Sciences work Vision and Change in Biological Sciences: A Call to Action.

Q1.2.1.
Do you have rubrics for your PLOs?

- 1. Yes, for all PLOs
- 2. Yes, but for some PLOs
- 3. No rubrics for PLOs
- 4. N/A
- 5. Other, specify:

Q1.3.
Are your PLOs closely aligned with the mission of the university?

- 1. Yes
- 2. No
- 3. Don't know

Q1.4.
Is your program externally accredited (other than through WASC Senior College and University Commission (WSCUC))?

- 1. Yes
- 2. No (skip to **Q1.5**)
- 3. Don't know (skip to **Q1.5**)

Q1.4.1.
If the answer to Q1.4 is **yes**, are your PLOs closely aligned with the mission/goals/outcomes of the accreditation agency?

- 1. Yes
- 2. No
- 3. Don't know

Q1.5.
Did your program use the ***Degree Qualification Profile*** ("DQP", see http://degreeprofile.org) to develop your PLO(s)?

- 1. Yes
- 2. No, but I know what the DQP is
- 3. No, I don't know what the DQP is
- 4. Don't know

Q1.6.
Did you use action verbs to make each PLO measurable?

- 1. Yes
- 2. No
- 3. Don't know

(Remember: Save your progress)

Section 2: Report One Learning Outcome in Detail

Question 2: Standard of Performance for the Selected PLO

Q2.1.
Select **OR** type in **ONE(1)** PLO here as an example to illustrate how you conducted assessment (be sure you *checked the **correct box*** for this PLO in Q1.1):

Overall Disciplinary Knowledge

If your PLO is **not listed, please enter it here**:

Q2.1.1.
Please provide more background information about the **specific PLO** you've chosen in Q2.1.

We have assessed overall disciplinary knowledge in Biological Sciences during the 2017-18 assessment cycle. We are using the Bio-MAPS assessment tool that has recently been developed by Biology Education researchers as part of a national effort to reform undergraduate biology education. We are assessing student learning through two lenses: core concepts as defined by the Vision and Change movement. The specific content areas that were assessed include: (1) Evolution, (2) Structure and Function, (3) Information Flow, (4) Energy and Matter, and (5) Systems.

The assessment allows us to also consider student learning through the lens of subdisciplinary emphasis, with the following subdisciplines: (1) Cell and Molecular Biology, (2) Physiology and (3) Ecology and Evolution.

Q2.2.
Has the program developed or adopted ***explicit program standards of performance/expectations*** for this PLO? (e.g. "We expect 70% of our students to achieve at least a score of 3 or higher in all dimensions of the Written Communication VALUE rubric.")

- 1. Yes
- 2. No
- 3. Don't know
- 4. N/A

Q2.3.
Please **1) provide and/or attach the rubric(s) AND 2) the standards of performance/expectations** that you have developed for *the selected PLO* here:

No file attached | No file attached

Q2.4. PLO	Q2.5. Stdrd	Q2.6. Rubric	Please indicate where you have published the **PLO**, the **standard (stdrd)** of performance, and the **rubric** that was used to measure the PLO:
☑	☐	☐	1. In **SOME** course syllabi/assignments in the program that address the PLO
☐	☐	☐	2. In **ALL** course syllabi/assignments in the program that address the PLO
☐	☐	☐	3. In the student handbook/advising handbook
☐	☐	☐	4. In the university catalogue
☑	☐	☐	5. On the academic unit website or in newsletters
☑	☐	☐	6. In the assessment or program review reports, plans, resources, or activities
☐	☐	☐	7. In new course proposal forms in the department/college/university
☐	☐	☐	8. In the department/college/university's strategic plans and other planning documents
☐	☐	☐	9. In the department/college/university's budget plans and other resource allocation documents
☑	☐	☐	10. Other, specify: Internal documents

Question 3: Data Collection Methods and Evaluation of Data Quality for the Selected PLO

Q3.1.
Was assessment data/evidence **collected** for the selected PLO?

- (•) 1. Yes
- ( ) 2. No (skip to **Q6**)
- ( ) 3. Don't know (skip to **Q6**)
- ( ) 4. N/A (skip to **Q6**)

Q3.1.1.
How many assessment tools/methods/measures **in total** did you use to assess this PLO?

1

Q3.2.
Was the data **scored/evaluated** for this PLO?

- (•) 1. Yes
- ( ) 2. No (skip to **Q6**)
- ( ) 3. Don't know (skip to **Q6**)
- ( ) 4. N/A (skip to **Q6**)

Q3.2.1.
Please describe how you collected the assessment data for the selected PLO. For example, in what course(s) or by what means were data collected:

The Bio-MAPS assessment includes 61 questions with multiple True/False responses based on a prompt for each corresponding question. Of these 61 questions, each student completes 15 questions chosen at random. This instrument is delivered through Qualtrics. Instructors are given a script to read to students and provided with a URL to provide to students. Instructors are also asked to give points in the class or extra credit for completion of the survey (no more than 2% of the final course grade). The assessment is estimated to take 20-40 minutes to complete and is to be completed outside of class time.

We delivered the Bio-MAPS assessment as an assignment in the following courses during Fall 2017: Bio 144 (Pathogenic Bacteriology; approx. 40 students) and Bio 188 (Evolution; approx. 80 students) . We delivered the Bio-MAPS assessment in the following courses during Spring 2018: Bio 133 (Cardio-Respiratory-Renal physiology; approx. 40 students), Bio 187 (Advanced Cell Biology; approx. 18 students), and Bio 188 (approx. 80 students). Data were consolidated for both semesters and cleaned to remove students who had completed the survey more than one time and also to remove students who were not Biological Sciences majors. Students who spent less than 10 minutes completing the survey were also removed from the dataset.

(Remember: Save your progress)

Question 3A: Direct Measures (key assignments, projects, portfolios, etc.)

Q3.3.
Were direct measures (key assignments, projects, portfolios, course work, student tests, etc.) used to assess this PLO?

- (•) 1. Yes
- ( ) 2. No (skip to **Q3.7**)
- ( ) 3. Don't know (skip to **Q3.7**)

Q3.3.1.
Which of the following direct measures (key assignments, projects, portfolios, course work, student tests, etc.) were used? [**Check all that apply**]

- [ ] 1. Capstone project (e.g. theses, senior theses), courses, or experiences
- [ ] 2. Key assignments from required classes in the program
- [ ] 3. Key assignments from elective classes
- [ ] 4. Classroom based performance assessment such as simulations, comprehensive exams, or critiques
- [ ] 5. External performance assessments such as internships or other community-based projects
- [ ] 6. E-Portfolios
- [ ] 7. Other Portfolios
- [x] 8. Other, specify:

Bio-MAPS survey

Q3.3.2.
Please **1) provide and/or attach the direct measure** (key assignments, projects, portfolios, course work, student tests, etc.) you used to collect data, **THEN 2) explain here** how it assesses the PLO:

1) Two sample questions are included as an attachment.

2) Each of the questions was aligned to the Vision and Change Core Concepts by the authors of the survey, as well as to the three different subdisciplines defined in Q2.1.1 above. The alignment matrix is available upon request.

BioMAPS_SampleQuestions.pdf
3.06 MB

No file attached

Q3.4.
What tool was used to evaluate the data?

- 1. **No** rubric is used to interpret the evidence (skip to **Q3.4.4.**)
- 2. Used rubric developed/modified by the faculty who teaches the class (skip to **Q3.4.2.**)
- 3. Used rubric developed/modified by a group of faculty (skip to **Q3.4.2.**)
- 4. Used rubric pilot-tested and refined by a group of faculty (skip to **Q3.4.2.**)
- 5. The VALUE rubric(s) (skip to **Q3.4.2.**)
- 6. Modified VALUE rubric(s) (skip to **Q3.4.2.**)
- (●) 7. Used other means (Answer **Q3.4.1.**)

Q3.4.1.
If you used other means, which of the following measures was used? [**Check all that apply**]

- [ ] 1. National disciplinary exams or state/professional licensure exams (skip to **Q3.4.4.**)
- [ ] 2. General knowledge and skills measures (e.g. CLA, ETS PP, etc.) (skip to **Q3.4.4.**)
- [ ] 3. Other standardized knowledge and skill exams (e.g. ETC, GRE, etc.) (skip to **Q3.4.4.**)
- [x] 4. Other, specify:

Comparisons to national data from 20 universities in the US.

(skip to **Q3.4.4.**)

Q3.4.2.
Was the **rubric** aligned directly and explicitly **with the PLO**?

- 1. Yes
- 2. No
- 3. Don't know
- 4. N/A

Q3.4.3.
Was the **direct measure** (e.g. assignment, thesis, etc.) aligned directly and explicitly **with the rubric**?

- 1. Yes
- 2. No
- 3. Don't know
- 4. N/A

Q3.4.4.
Was the **direct measure** (e.g. assignment, thesis, etc.) aligned directly and explicitly **with the PLO**?

- (●) 1. Yes
- 2. No
- 3. Don't know

- 4. N/A

Q3.5.
Please enter the number (#) of faculty members who participated in planning the assessment data **collection** of the selected PLO?

5

Q3.5.1.
Please enter the number (#) of faculty members who participated in the **evaluation** of the assessment data for the selected PLO?

7

Q3.5.2.
If the data was evaluated by multiple scorers, was there a norming process (a procedure to make sure everyone was scoring similarly)?

- 1. Yes
- 2. No
- 3. Don't know
- 4. N/A

Q3.6.
How did you **select** the sample of student work (papers, projects, portfolios, etc.)?

We chose the five classes used for the Bio-MAPS survey based on when students most often take these classes in the curriculum. All of the chosen courses are upper division and have multiple prerequisites. Our intent was to target students who are close to graduation to ensure that we have meaningful data on student disciplinary knowledge at or near the time of graduation.

Q3.6.1.
How did you **decide** how many samples of student work to review?

We filtered the dataset to remove students who did not meet the following criteria:

1) Biological Sciences majors

2) Spent 10+ minutes completing the assessment

3) Each student was included only one time. If a student had completed the assessment more than one time, only the most recent attempt was considered.

Q3.6.2.
Please enter the number (#) of students that were in the class or program?

1,380 total in Biological Sciences program

Q3.6.3.
Please enter the number (#) of samples of student work that you evaluated?

161

Q3.6.4.
Was the sample size of student work for the direct measure adequate?
- (●) 1. Yes
- ( ) 2. No
- ( ) 3. Don't know

(Remember: Save your progress)

Question 3B: Indirect Measures (surveys, focus groups, interviews, etc.)

Q3.7.
Were indirect measures used to assess the PLO?
- ( ) 1. Yes
- (●) 2. No (skip to **Q3.8**)
- ( ) 3. Don't Know (skip to **Q3.8**)

Q3.7.1.
Which of the following indirect measures were used? [**Check all that apply**]
- [ ] 1. National student surveys (e.g. NSSE)
- [ ] 2. University conducted student surveys (e.g. OIR)
- [ ] 3. College/department/program student surveys or focus groups
- [ ] 4. Alumni surveys, focus groups, or interviews
- [ ] 5. Employer surveys, focus groups, or interviews
- [ ] 6. Advisory board surveys, focus groups, or interviews
- [ ] 7. Other, specify:

Q3.7.1.1.
Please explain and attach the indirect measure you used to collect data:

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Q3.7.2.
If surveys were used, how was the sample size **decided**?

Q3.7.3.
If surveys were used, how did you **select** your sample:

Q3.7.4.
If surveys were used, please enter the response rate:

Question 3C: Other Measures (external benchmarking, licensing exams, standardized tests, etc.)

Q3.8.
Were external benchmarking data, such as licensing exams or standardized tests, used to assess the PLO?

- (●) 1. Yes
- ( ) 2. No (skip to **Q3.8.2**)
- ( ) 3. Don't Know (skip to **Q3.8.2**)

Q3.8.1.
Which of the following measures was used? [**Check all that apply**]

- [ ] 1. National disciplinary exams or state/professional licensure exams
- [ ] 2. General knowledge and skills measures (e.g. CLA, ETS PP, etc.)
- [ ] 3. Other standardized knowledge and skill exams (e.g. ETC, GRE, etc.)
- [x] 4. Other, specify:

Unpublished data from 20 Universities throughout the United States. Data were collected from introductory biology students (n=2425), intermediate level (i.e., after completing an introductory biology sequence; n=1,832) and advanced level (n=918)

Q3.8.2.
Were other measures used to assess the PLO?

- ( ) 1. Yes
- (●) 2. No (skip to **Q4.1**)
- ( ) 3. Don't know (skip to **Q4.1**)

Q3.8.3.
If other measures were used, please specify:

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(Remember: Save your progress)

Question 4: Data, Findings, and Conclusions

Q4.1.
Please provide tables and/or graphs to summarize the assessment data, findings, and conclusions for the selected PLO in **Q2.1** (see Appendix 12 in our Feedback Packet Example):

Data for all programs in Biological Sciences are embedded in the attached file, each concentration/program in a separate figure. For all figures, the first three bars in each category represent benchmark data and are identical in all figures. The first two bars (gray) represent benchmark data collected from 20 Colleges and Universities nationwide. The light gray bar show average scores for students who are at an intermediate level in their major program (i.e., have completed a lower division introductory Biololgy sequence of 2-4 courses). The second (dark gray) bar represents data collected from advanced students in the Biological Sciences major (i.e., at the point of graduation. The blue bar represents the mean scores for all students who completed the assessment at Sacramento State in the 2017-18 academic year. Based on the courses that were sampled, these students are generally somewhere between the two benchmark levels indicated by national data, with the hope that most students are closer to the advanced level.

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 stduents 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.

Notes on each concentration/program performance relative to the campus/national performance are indicated below. These data are represented by the yellow bar in each respective figure.

BA in Biological Sciences (Figure 1): 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.

BS in Biological Sciences, concentration in General Biology (Figure 2): Students in the BS General Biology Concentration performed below the campus mean and the national midpoint overall and in all five of the Vision and Change core competencies. Students also performed below the campus mean and national midpoint means in the three defined disciplinary areas. The results for this degree program are somewhat unexpected because students complete the same set of core courses as the BA in Biological Sciences. One possible explanation is that students are choosing to complete elective courses rather than core courses early in their major requirements and as a result have not gotten the core content at the time the assessment was completed.

BS in Biological Sciences, concentration in Biomedical Sciences (Figure 3): Students in the BS Biomedical Sciences Concentration overall performed slightly above the campus mean. Students also performed above the campus mean in the following Vision and Change Core Concepts: Evolution, Structure and Function, Information flow and Energy and Matter. Sudents performed below just below the campus mean in the following Vision and Change Core Concept: Systems. In the three disciplinary areas, students performed above the campus average in both Cell and Molecular Biology and Physiology, but slightly below the campus mean in Ecology and Evolution. Students in the Biomedical Sciences concentration perfmrm close ot the national Advanced mean in Structure and Function core concept area in Vision and Change, and in the physiology disciplinary area. This isn't surprising as many of the required/elective courses in this concentration are in the areas of physiology and structure and function.

BS in Biological Sciences, concentration in Cell and Molecular Biology (Figure 4): Students in the BS Cell and Molecular Biology concentration performed above the campus mean overall, in all Vision and Change Core Concept areas and in all three disciplinary areas. In most areas, students in this concentration performed very close or at/above the national advanced mean. In the Vision and Change core concept area Systems, students performed above the level of the national mean. The weakest performance for students in this area was in the Vision and Change core concept, Energy and Matter, where students performed at a level equal to the national midpoint mean. The high performance of students in this concentration is likely the result of this assessment

No file attached

Bio-MAPS_17-18_AssessmentResults.docx
301.18 KB

Q4.2.
Are students doing well and meeting the program standard? **If not**, how will the program work to improve student performance of the selected PLO?

Table 1 (attached) includes a summary of student performance by concentration and concept area. When considering the campus mean scores compared to the national midpoint and advanced means, Biological Sciences majors at Sacramento State performed between the national midpoint and advanced means in all Vision and Change Core Concept areas except Energy and Matter. Students also perform between the national midpoint and advanced levels for all three disciplinary areas. The following concentrations performed very well overall and within the Vision and Change core competencies/disciplinary areas: Cell and Molecular Biology and Microbiology. Biomedical Sciences and Clinical Laboratory Sciences students also performed well, with deficiencies noted in one to three core concept/disciplinary areas. 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.

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.

Bio_17-18_AssessmentSummary.docx
12.59 KB

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Q4.3.
For the selected PLO, the student performance:
- 1. **Exceeded** expectation/standard
- 2. **Met** expectation/standard
- (●) 3. **Partially** met expectation/standard
- 4. Did not meet expectation/standard
- 5. No expectation/standard has been specified
- 6. Don't know

Question 4A: Alignment and Quality

Q4.4.
Did the data, including the direct measures, from all the different assessment tools/measures/methods directly align with the PLO?
- (●) 1. Yes
- 2. No
- 3. Don't know

Q4.5.
Were **all** the assessment tools/measures/methods that were used good measures of the PLO?
- (●) 1. Yes
- 2. No
- 3. Don't know

Question 5: Use of Assessment Data (Closing the Loop)

Q5.1.
As a result of the assessment effort and based on prior feedback from OAPA, do you anticipate ***making any changes*** for your program (e.g. course structure, course content, or modification of PLOs)?

- (●) 1. Yes
- ( ) 2. No (skip to **Q5.2**)
- ( ) 3. Don't know (skip to **Q5.2**)

Q5.1.1.
Please describe ***what changes*** you plan to make in your program as a result of your assessment of this PLO.

We are currently working on a department-wide project to develop/update learning outcomes for all courses and to develop curriculum maps for each concentration.

Q5.1.2.
Do you have a plan to assess the ***impact of the changes*** that you anticipate making?

- (●) 1. Yes, describe your plan:

We will repeat the Bio-MAPS assessment in two years to address the impact of revised learning outcomes and the newly developed curriculum map.

- ( ) 2. No
- ( ) 3. Don't know

Q5.2.

To what extent did you apply **previous assessment results** collected through your program in the following areas?	1. Very Much	2. Quite a Bit	3. Some	4. Not at All	5. N/A
1. Improving specific courses	( )	( )	( )	(●)	( )
2. Modifying curriculum	( )	( )	( )	(●)	( )
3. Improving advising and mentoring	( )	( )	( )	(●)	( )
4. Revising learning outcomes/goals	( )	(●)	( )	( )	( )
5. Revising rubrics and/or expectations	( )	( )	(●)	( )	( )

6. Developing/updating assessment plan	○	○	○	◉	○
7. Annual assessment reports	○	◉	○	○	○
8. Program review	○	○	○	◉	○
9. Prospective student and family information	○	○	○	◉	○
10. Alumni communication	○	○	○	◉	○
11. WSCUC accreditation (regional accreditation)	○	○	○	◉	○
12. Program accreditation	○	○	○	◉	○
13. External accountability reporting requirement	○	○	○	◉	○
14. Trustee/Governing Board deliberations	○	○	○	◉	○
15. Strategic planning	○	○	◉	○	○
16. Institutional benchmarking	○	○	○	◉	○
17. Academic policy development or modifications	○	○	◉	○	○
18. Institutional improvement	○	○	◉	○	○
19. Resource allocation and budgeting	○	○	◉	○	○
20. New faculty hiring	○	○	◉	○	○
21. Professional development for faculty and staff	○	○	◉	○	○
22. Recruitment of new students	○	○	○	◉	○
23. Other, specify:	○	○	○	○	◉

Q5.2.1.
Please provide a detailed example of how you used the assessment data above:

Q5.3. To what extent did you apply **previous assessment feedback** from the Office of Academic Program Assessment in the following areas?	1. Very Much	2. Quite a bit	3. Some	4. Not at All	5. N/A
1. Program Learning Outcomes	○	○	○	◉	○
2. Standards of Performance	○	○	◉	○	○
3. Measures	○	○	○	◉	○
4. Rubrics	○	○	◉	○	○
5. Alignment	○	○	◉	○	○
6. Data Collection	○	○	◉	○	○
7. Data Analysis and Presentation	○	○	○	◉	○
8. Use of Assessment Data	○	○	◉	○	○

9. Other, please specify:					
	○	○	○	○	○

Q5.3.1.
Please share with us an example of how you applied **previous feedback** from the Office of Academic Program Assessment in any of the areas above:

(Remember: Save your progress)

Section 3: Report Other Assessment Activities

Other Assessment Activities

Q6.
If your program/academic unit conducted assessment activities that are **not directly related to the PLOs** for this year (i.e. impacts of an advising center, etc.), please provide those activities and results here:

No file attached No file attached

Q6.1.
Please explain how the assessment activities reported in **Q6** will be linked to any of your PLOs and/or PLO assessment in the future and to the mission, vision, and the strategic planning for the program and the university:

Q7.
What PLO(s) do you plan to assess next year? [**Check all that apply**]

- [x] 1. **Critical Thinking**
- [ ] 2. **Information Literacy**
- [ ] 3. **Written Communication**
- [ ] 4. **Oral Communication**
- [ ] 5. Quantitative Literacy
- [ ] 6. **Inquiry and Analysis**
- [ ] 7. Creative Thinking
- [ ] 8. Reading
- [ ] 9. Team Work
- [ ] 10. Problem Solving
- [ ] 11. Civic Knowledge and Engagement
- [ ] 12. **Intercultural Knowledge, Competency, and Perspectives**
- [ ] 13. Ethical Reasoning
- [ ] 14. Foundations and Skills for Lifelong Learning
- [ ] 15. **Global Learning and Perspectives**
- [ ] 16. Integrative and Applied Learning
- [ ] 17. Overall Competencies for GE Knowledge
- [ ] 18. **Overall Disciplinary Knowledge**
- [ ] 19. **Professionalism**
- [ ] 20. Other, specify any PLOs not included above:

a.
b.
c.

Q8.
Please explain how this year's assessment activities help you address recommendations from your department's last program review?

N/A. Our last program review focused on student progression in the Biological Sciences major.

Q9. Please attach any additional files here:

No file attached | No file attached
No file attached | No file attached

Q9.1.
If you have attached **any** files to this form, please list **every** attached file here:

BioMAPS_SampleQuestions.pdf

Bio-MAPS_17-18_AssessmentResults.docx

Bio_17-18_AssessmentSummary.docx

Section 4: Background Information about the Program

Program Information (**Required**)

Program:

(If you typed in your program name at the beginning, please skip to **Q11**)

Q10.
Program/Concentration Name: [skip if program name is already selected or appears above]
BS/BA Biology

Q11.
Report Author(s):
Shannon Datwyler

Q11.1.
Department Chair/Program Director:
Shannon Datwyler

Q11.2.
Assessment Coordinator:
Kelly McDonald

Q12.
Department/Division/Program of Academic Unit (select):
Biological Sciences

Q13.
College:
College of Natural Science & Mathematics

Q14.
What is the total enrollment (#) for Academic Unit during assessment (see Departmental Fact Book):
1385

Q15.
Program Type:
- (●) 1. Undergraduate baccalaureate major
- ( ) 2. Credential
- ( ) 3. Master's Degree
- ( ) 4. Doctorate (Ph.D./Ed.D./Ed.S./D.P.T./etc.)
- ( ) 5. Other, specify:

Q16. Number of **undergraduate degree programs** the academic unit has?

8

Q16.1. List all the names:

BA in Biological Sciences

BS in Biological Sciences, General Biology Concentration

BS in Biological Sciences, Biomedical Sciences Concentration

BS in Biological Sciences, Cell and Molecular Biology Concentration

BS in Biological Sciences, Clinical Laboratory Sciences Concentration

BS in Biological Sciences, Ecology, Evolution and Conservation Concentration

BS in Biological Sciences, Forensic Biology Concentration

BS in Biological Sciences, Microbiology Concentration

Q16.2. How many concentrations appear on the diploma for this undergraduate program?

7

Q17. Number of **master's degree programs** the academic unit has?

5

Q17.1. List all the names:

MA in Biological Sciences, No concentration

MA in Biological Sciences, Stem Cell Concentration

MS in Biological Sciences, No concentration

MS in Biological Sciences, Cell and Molecular Biology Concentration

MS in Biological Sciences, Ecology, Evolution and Conservation Concentration

Q17.2. How many concentrations appear on the diploma for this master's program?

5

Q18. Number of **credential programs** the academic unit has?

0

Q18.1. List all the names:

Q19. Number of **doctorate degree programs** the academic unit has?
0

Q19.1. List all the names:

When was your **Assessment Plan**...	1. Before 2012-13	2. 2013-14	3. 2014-15	4. 2015-16	5. 2016-17	6. 2017-18	7. No Plan	8. Don't know
Q20. Developed?	○	○	○	○	○	○	◉	○
Q20.1. Last updated?	○	○	○	○	○	○	◉	○

Q20.2. (Required)
Please **obtain** and **attach** your latest **assessment plan**:
No file attached

Q21.
Has your program developed a **curriculum map?**
- ○ 1. Yes
- ◉ 2. No
- ○ 3. Don't know

Q21.1.
Please **obtain** and **attach** your latest **curriculum map**:
No file attached

Q22.
Has your program indicated explicitly in the curriculum map where assessment **of student learning** occurs?
- ○ 1. Yes
- ◉ 2. No
- ○ 3. Don't know

Q23.
Does your program have a capstone class?
- ○ 1. Yes, specify:
- ◉ 2. No
- ○ 3. Don't know

Q23.1.
Does your program have a capstone project(s)?

- 1. Yes
- 2. No
- 3. Don't know

(**Remember**: **Save your progress**)
Save When Completed!

ver. 10.**31**.17

Data for all programs in Biological Sciences are embedded in the attached file, each concentration/program in a separate figure. For all figures, the first three bars in each category represent benchmark data and are identical in all figures. The first two bars (gray) represent benchmark data collected from 20 Colleges and Universities nationwide. The light gray bar show average scores for students who are at an intermediate level in their major program (i.e., have completed a lower division introductory Biololgy sequence of 2-4 courses). The second (dark gray) bar represents data collected from advanced students in the Biological Sciences major (i.e., at the point of graduation. The blue bar represents the mean scores for all students who completed the assessment at Sacramento State in the 2017-18 academic year. Based on the courses that were sampled, these students are generally somewhere between the two benchmark levels indicated by national data, with the hope that most students are closer to the advanced level.

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 stduents 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.

Notes on each concentration/program performance relative to the campus/national performance are indicated below. These data are represented by the yellow bar in each respective figure.

BA in Biological Sciences (Figure 1): 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.

BS in Biological Sciences, concentration in General Biology (Figure 2): Students in the BS General Biology Concentration performed below the campus mean and the national midpoint overall and in all five of the Vision and Change core competencies. Students also performed below the campus mean and national midpoint means in the three defined disciplinary areas. The results for this degree program are somewhat unexpected because students complete the same set of core courses as the BA in Biological Sciences. One possible explanation is that students are choosing to complete elective courses rather than core courses early in their major requirements and as a result have not gotten the core content at the time the assessment was completed.

BS in Biological Sciences, concentration in Biomedical Sciences (Figure 3): Students in the BS Biomedical Sciences Concentration overall performed slightly above the campus mean. Students also performed above the campus mean in the following Vision and Change Core Concepts: Evolution, Structure and Function, Information flow and Energy and Matter. Sudents performed below just below the campus mean in the following Vision and Change Core Concept: Systems. In the three disciplinary areas, students performed above the campus average in both Cell and Molecular Biology and Physiology, but slightly below the campus mean in Ecology and Evolution. Students in the Biomedical Sciences concentration perfmrm close ot the national Advanced mean in Structure and Function core concept area in Vision and Change, and in the physiology disciplinary area. This isn't surprising as many of the required/elective courses in this concentration are in the areas of physiology and structure and function.

BS in Biological Sciences, concentration in Cell and Molecular Biology (Figure 4): Students in the BS Cell and Molecular Biology concentration performed above the campus mean overall, in all Vision and Change Core Concept areas and in all three disciplinary areas. In most areas, students in this concentration performed very close or at/above the national advanced mean. In the Vision and Change core concept area Systems, students performed above the level of the national mean. The weakest performance for students in this area was in the Vision and Change core concept, Energy and Matter, where students performed at a level equal to the national midpoint mean. The high performance of students in this concentration is likely the result of this assessment being delivered in a course taken during their final semester, typically (Bio 187). It is important to note also that the faculty in the Cell and Molecular Biology concentration have also taken great care to ensure alignment of program learning outcomes to course learning outcomes. Therefore, this high performance may be the result of curriculum design and alignment.

BS in Biological Sciences, concentration in Clinical Laboratory Sciences (Figure 5): Students in the BS Clinical Laboratory Sciences concentration performed slightly above the campus mean overall. Students performed above the campus mean in the following Vision and Change core concept areas: Structure and Function, Information flow, and Systems. In Systems, students performed above the national advanced mean and were at the national advanced mean in Structure and Function. Students in this concentration performed below the campus average and national midpoint mean in the following Vision and Change Core Concepts: Evolution and Energy and Matter. Students performed above the campus mean in the following disciplinary areas: Cell and Molecular Biology and Ecology and Evolution. Students performed slightly below the campus and national midpoint mean in the Physiology area.

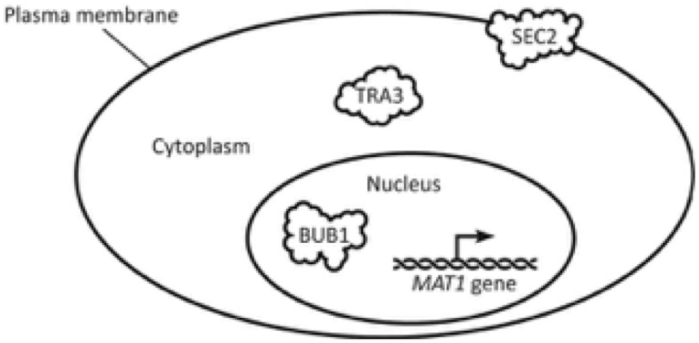
BS in Biological Sciences, concentration in Ecology, Evolution and Conservation (Figure 6): Students in the BS Ecology, Evolution and Conservation Concentration performed slightly below the campus mean and national midpoint mean overall. Students performed above the campus average in the following Vision and Change Core Concept Areas: Energy and Matter and Systems. Students performed below the campus mean and at the national midpoint mean in Structure and Function, and below the campus and national midpoint means in the following concept areas: Evolution and Information Flow. Students performed above the campus mean in the Ecology and Evolution disciplinary areas, slightly below the campus average in Physiology and well below the campus mean and national midpoint mean in Cell and Molecular Biology. These results may be partly explained by the following factors: students in this concentration take limited coursework in the area of cell and molecular biology, students are likely completing the assessment early in their academic career because evolution (Bio 188) is often completed in their first year in the upper division majors courses, and by the small sample size.

BS in Biological Sciences, concentration in Forensic Biology (No data included): For this concentration, we only collected data from two students. We cannot draw any conclusions from such a small sample size. We will focus on completing this assessment for the Forensic Biololgy concentration this fall.

BS in Biological Sciences, concentration in Microbiology (Figure 7): Students in the BS Microbiology concentration peformed above the campus mean and the national advanced mean overall. Students also performed above the campus mean in all of the Vision and Change Core Concept areas, and above the national advanced mean in the following Vision and Change Core Concept areas: Evolution, Structure and Function, Information flow, Energy and matter. Students performed above the campus mean in all three disciplinary areas, and above the national advanced means in Cell and Molecular Biology.

Example Question

A signal transduction pathway in yeast activates expression of the *MAT1* gene. This pathway is activated when a neighboring cell secretes a large, hydrophilic growth factor called Alpha. Three cellular proteins, SEC2, TRA3, and BUB1, are essential components of the *MAT1* signaling pathway activated by Alpha. The subcellular locations of these proteins in the absence of Alpha are shown below. The bent arrow indicates the start site of transcription.



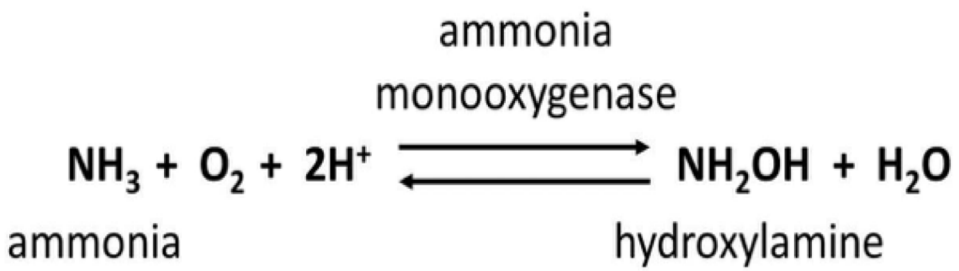
Based on this information and your knowledge about biology, select true or false for each of the following statements.

a) T/F The TRA3 protein could function as a receptor for Alpha.
b) T/F In a cell treated with Alpha, the TRA3 protein could move into the nucleus.
c) T/F In a cell treated with Alpha, the entire SEC2 protein could move into the nucleus to activate the *MAT1* gene.
d) T/F In the absence of Alpha, the gene that codes for the TRA3 protein is located in the nucleus.
e) T/F A mutation in the *SEC2* gene could disrupt expression of the *MAT1* gene.

Knowledge statements:

a) Large, hydrophilic proteins do not readily cross through the plasma membrane.
b) Cytosolic proteins can translocate into the nucleus in response to external signals.
c) Intact transmembrane proteins are not readily released from the membrane.
d) The genes for nearly all cellular factors are located in the nucleus, even for proteins not located in the nucleus.
e) A mutation in one gene can affect the expression of another gene.

A bacterium uses ammonia, NH_3, as its only food source. This bacterium has an enzyme called ammonia monooxygenase that catalyzes the reaction shown below, which is energetically favorable under the conditions found in this bacterium.



#	Question	True		False		Total
1	Energy released during the conversion of ammonia to hydroxylamine could be used by the bacterium to drive ATP synthesis.	81.58%	31	18.42%	7	38
2	Enzymes, such as ammonia monooxygenase, are often inhibited by the products of the reactions that they catalyze.	60.53%	23	39.47%	15	38
3	Ammonia monooxygenase likely raises the activation energy of the reaction.	50.00%	19	50.00%	19	38
4	A mutation in the ammonia monooxygenase gene could increase the fitness of this bacterium.	50.00%	19	50.00%	19	38

Student Data

a) Energy released during energetically favorable reactions can be coupled to drive energetically unfavorable reactions.
b) The enzymes that catalyze catabolic pathways are often inhibited by the end products of the pathway.
c) Enzymes catalyze chemical reactions by lowering the activation energy of the reaction.
d) Mutations that alter the function of an enzyme can increase the fitness of an organism.

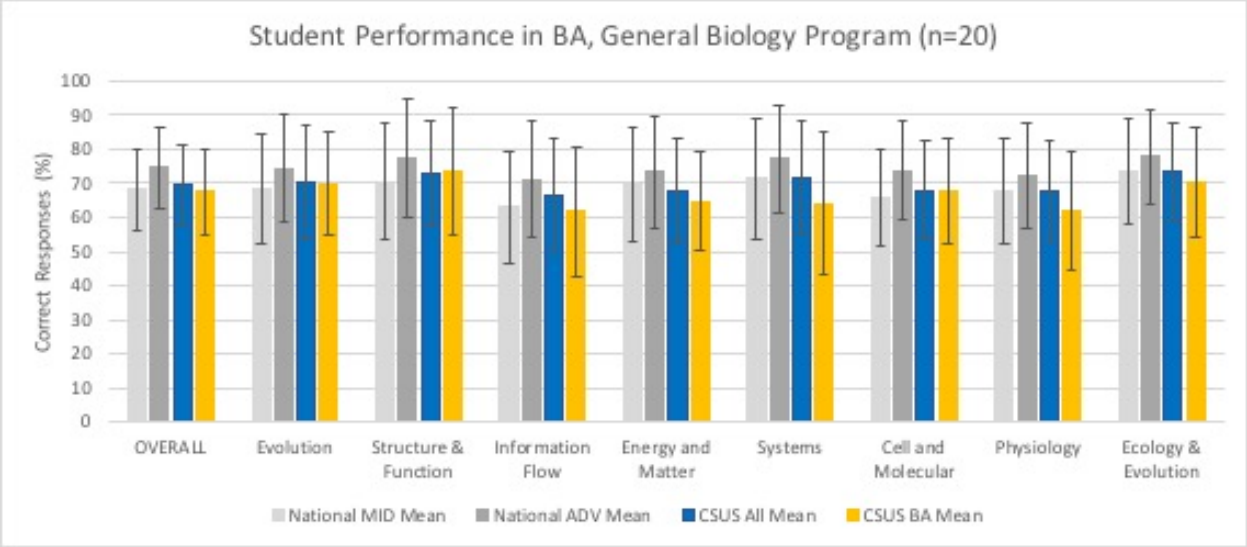


Figure 1. Performance of students in the Bachelor of Arts in Biology program. Error bars represent 1 SD. Spring 18 number of students in program=63.

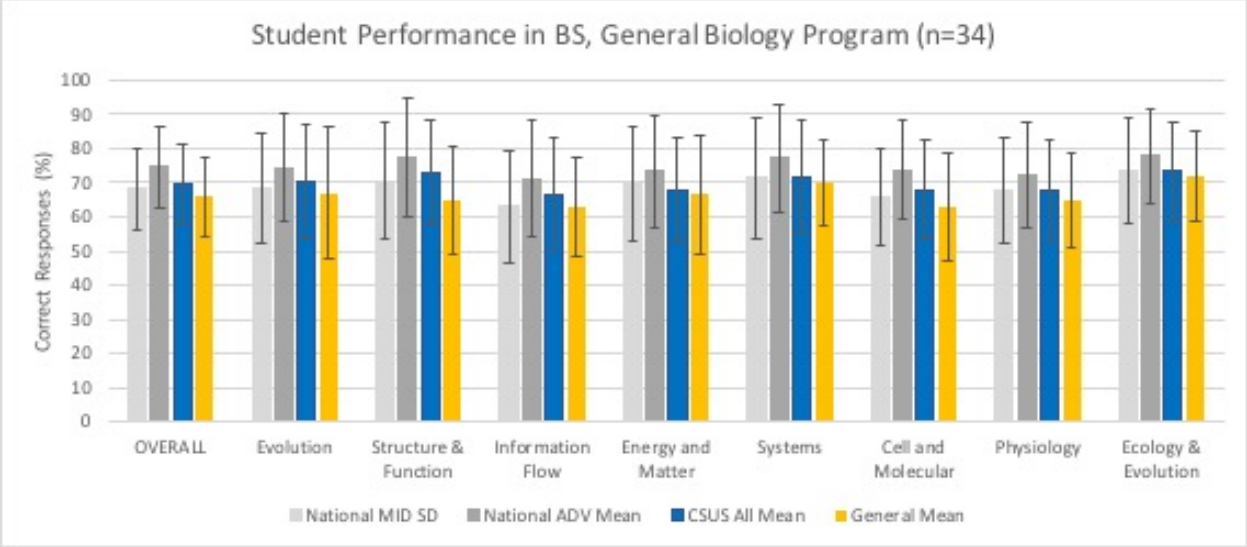


Figure 2. Performance of students in the Bachelor of Science, General Biology Concentration. Error bars represent 1 SD. Spring 18 number of students in program=140.

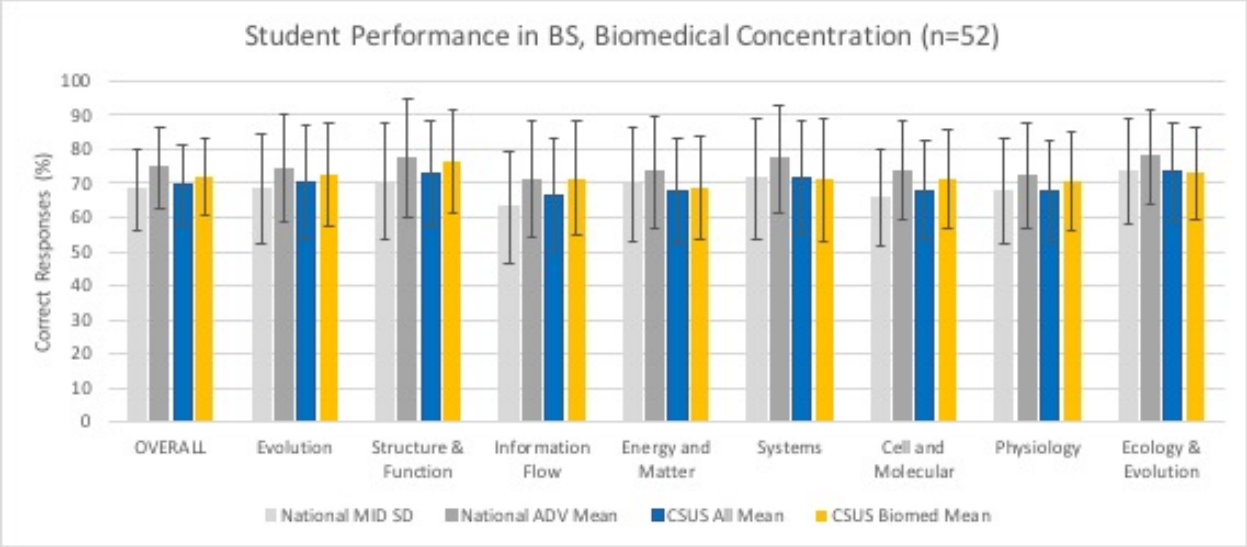


Figure 3. Performance of students in the Bachelor of Science, Biomedical Sciences Concentration. Error bars represent 1 SD. Spring 18 number of students in program=275.

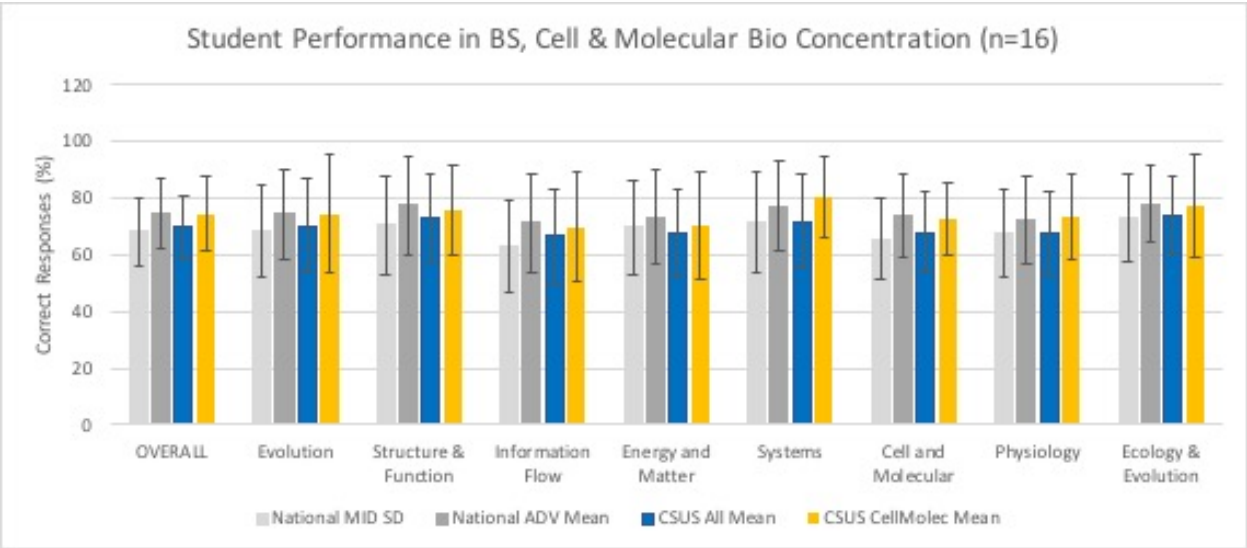


Figure 4. Performance of students in the Bachelor of Science, Cell and Molecular Biology Concentration. Error bars represent 1 SD. Spring 18 number of students in program=38.

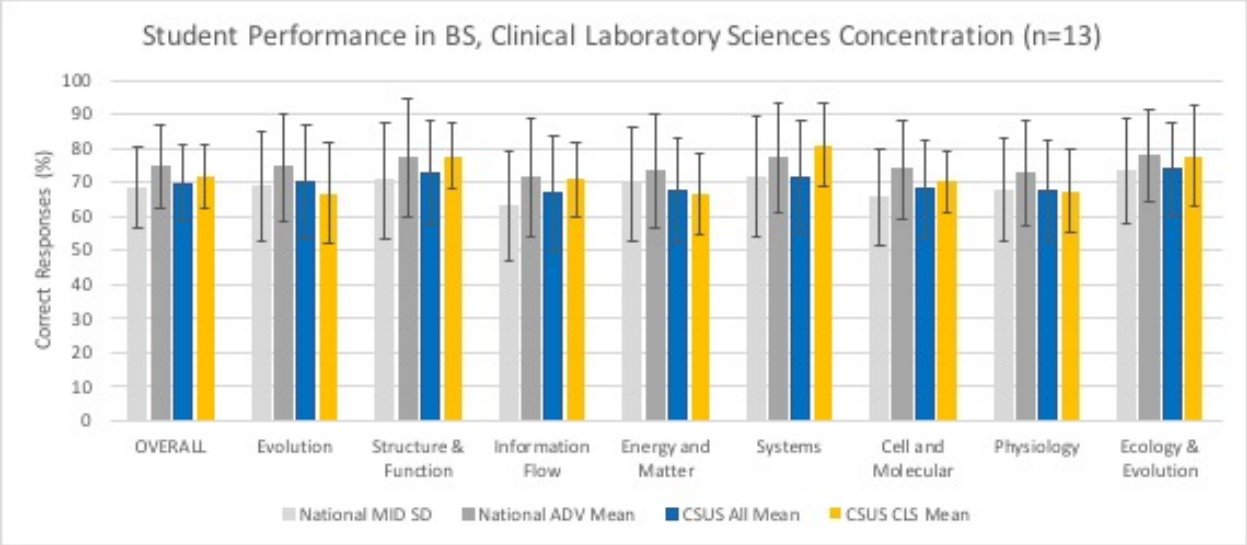


Figure 5. Performance of students in the Bachelor of Science, Clinical Laboratory Sciences Concentration. Error bars represent 1 SD. Spring 18 number of students in program=62.

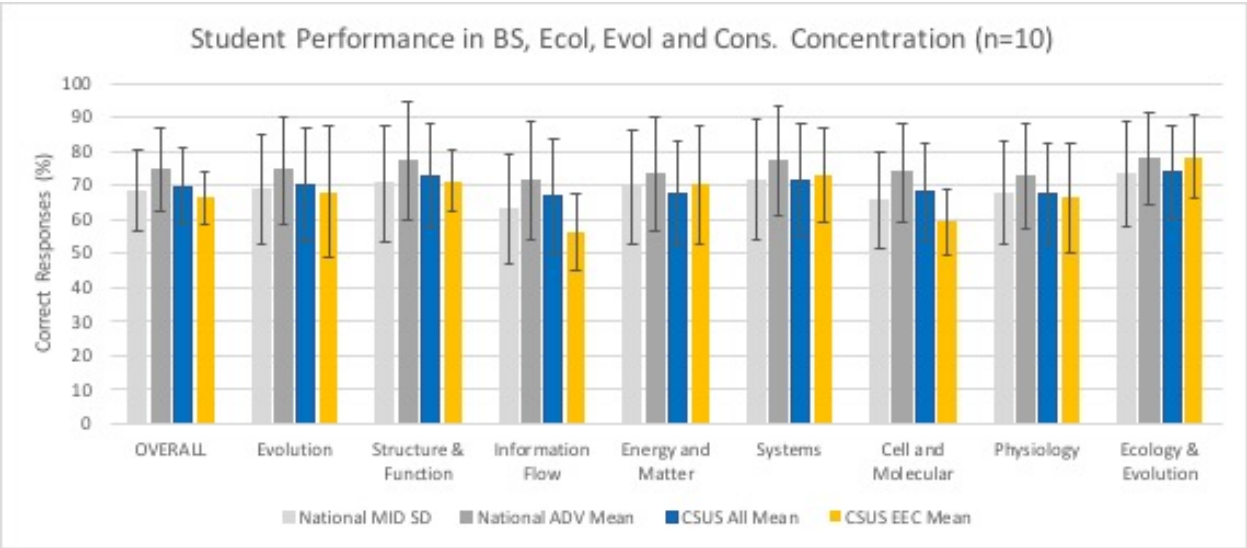


Figure 6. Performance of students in the Bachelor of Science, Ecology, Evolution and Conservation Concentration. Error bars represent 1 SD. Spring 18 number of students in program=32.

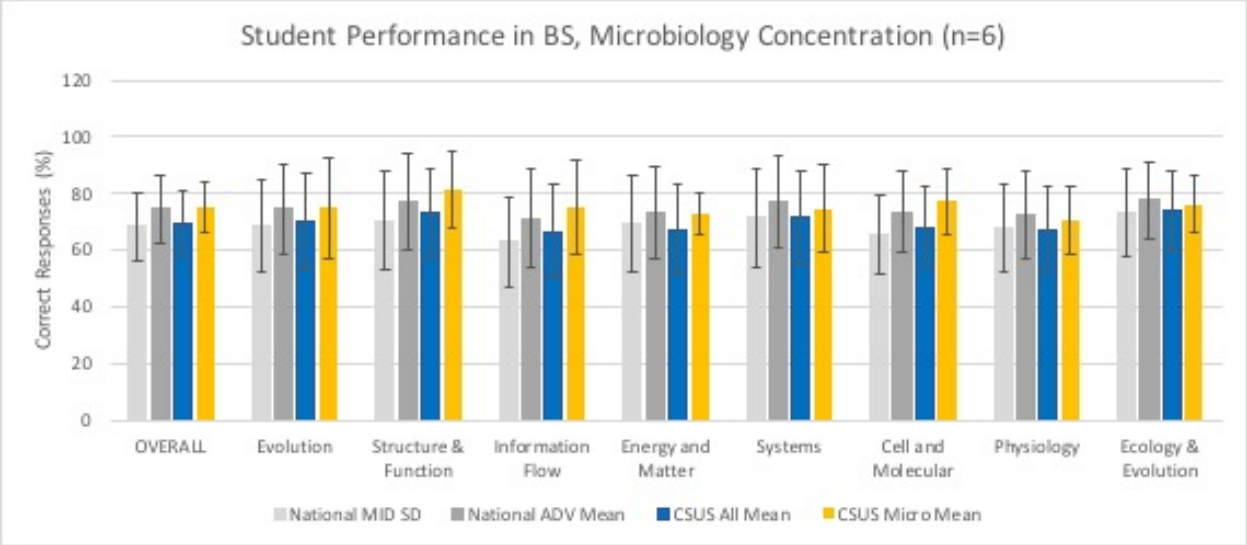


Figure 7. Performance of students in the Bachelor of Science, Microbiology Concentration. Error bars represent 1 SD. Spring 18 number of students in program=50.

Table 1. Summary of student performance by concentration. - = below national midpoint mean; + = at/above national midpoint mean; ++ = at/above national advanced mean.

	Campus mean	BA	BS General	BS Biomed	BS C/M	BS CLS	BS EEC	BS Forens	BS Micro
Overall	+	-	-	+	++	+	-	N/A	++
Evolution	+	+	-	+	+	-	-	N/A	++
Struct/ Funct.	+	+	-	+	+	++	+	N/A	++
Inform. Flow	+	-	+	++	+	+	-	N/A	++
Energy/ Matter	-	-	-	-	+	-	+	N/A	+
Systems	+	-	-	-	++	+	-	N/A	+
Cell/ Molec	+	+	-	+	+	+	-	N/A	++
Physio	+	-	-	+	++	+	-	N/A	+
Ecol/ Evol	+	-	-	-	++	+	++	N/A	+