

Program Review Summary Page
For Instructional Programs

Program or Area(s) of Study under Review: Biology

Term/Year of Review: Spring 2020

Summary of Program Review:

A. Major Findings

1. Strengths:

1. Demand for Biology courses is strong. Fill rates are among the highest in the institution.
2. Biology has developed two new Associates degrees, the AS in Natural Science-Life Science and the AS in Pre-Health Science, which were activated in the 2018-2019 academic year.
3. Biology has been involved in many outreach programs to stimulate interest in the biological sciences and other STEM fields.

2. Areas for Improvement:

1. Equity analysis shows that the retention rate for African Americans and the completion rate for African Americans, Hispanics, and first generation students are lower than the institutional average.

3. Projected Program Growth, Stability, or Viability:

Biotechnology, molecular biology research, medical advances, vaccine development, and increasing demand for health care professionals are driving growth in biology. As a consequence, biology is in high demand. The biology program is currently in a relatively stable phase and this trend is likely to continue into the foreseeable future.

B. New Objectives/Goals:

1. Evaluate new AS degrees as more data on degree completion and program SLOs become available.
2. Coordinate within the department and division on best practices for online instruction and build a virtual library of biology department online resources.

This report covers the following program, degrees, certificates, area(s) of study, and courses (based on the Taxonomy of Programs on file with the Office of Academic Affairs):

Program	Biology
Area of Study	Biology
Degrees / Certificates	Natural Science, Life Science: AS
	Pre-Health Science: AS
Courses	BIOL 103
	BIOL 105
	BIOL 110
	BIOL 112
	BIOL 117
	BIOL 120
	BIOL 199
	BIOL 218
	BIOL 219
	BIOL 220
	BIOL 240
	BIOL 241

Taxonomy of Programs, August 2019

I. PROGRAM DATA

A. Demand

1. Headcount and Enrollment

	2016-2017	2017-2018	2018-2019	Change over 3-Year Period
Headcount				
Within the Program	1,358	1,396	1,206	-11.2%
Across the Institution	8,930	8,843	8,176	-8.4%
Enrollments				
BIOL-103	192	249	292	52.1%
BIOL-105	585	533	234	-60.0%
BIOL-110	219	212	209	-4.6%
BIOL-112	156	197	183	17.3%
BIOL-117	68	35	64	-5.9%
BIOL-120	78	83	87	11.5%
BIOL-218	120	121	122	1.7%
BIOL-219	128	125	128	0.0%
BIOL-220	78	83	73	-6.4%
BIOL-240	28	24	33	17.9%
BIOL-241	29	26	28	-3.4%
Within the Program	1,681	1,688	1,453	-13.6%
Across the Institution	36,525	36,115	32,545	-10.9%
<i>Source: SQL Enrollment Files</i>				

***RPIE Analysis:** The number of students enrolled (headcount) in the Biology Program decreased by 11.2% over the past three years, while headcount across the institution decreased by 8.4%. Similarly, enrollment within the Biology Program decreased by 13.6%, while enrollment across the institution decreased by 10.9%.*

Enrollment in the following courses changed by more than 10% ($\pm 10\%$) between 2016-2017 and 2018-2019.

Courses with enrollment increases:

- *BIOL-103 (52.1%)*
- *BIOL-240 (17.9%)*
- *BIOL-112 (17.3%)*
- *BIOL-120 (11.5%)*

Course with enrollment decrease:

- *BIOL-105 (-60%)*

Program Reflection:

Programs in the STEM fields have seen a surge in enrollment in recent years. Jobs are plentiful and well-paying. The values in this table are artificially skewed because of a change in prerequisite for Biology 105 which occurred in 2018. Prior to 2018-2019 there was no prerequisite for BIOL 105. In 2018, a CHEM 110 prerequisite/corequisite was added. As a result, fewer BIOL 105 sections were offered in 2018-19 and this substantially lowered the enrollment for that year. Since 2018-2019, BIOL 105 enrollment has risen slightly but has not yet returned to pre-2018 levels. Given time, it is expected that the enrollments in BIOL 105 will return closer to pre-2018 levels.

With the exception of BIOL 105, the overall trend for all other Biology courses has been one of modest growth, averaging 11% increase in enrollment. All other classes have either increased in enrollment by more than 10% (one by more than 50%) or have decreased by 5% or less.

Overall, with the exception of BIOL 105, Biology has seen an increase in enrollment during a period of lower enrollment at the college. This is attributed to the strong interest in STEM and Health Care fields, and it is anticipated that enrollment trends will continue to remain stable or rise for Biology.

2. Average Class Size

	2016-2017		2017-2018		2018-2019		Three-Year	
	Sections	Average Size	Sections	Average Size	Sections	Average Size	Average Section Size	Trend
BIOL-103	5	38.4	7	35.6	8	36.5	36.7	-4.9%
BIOL-105	21	27.9	18	29.6	11	21.3	27.0	-23.6%
BIOL-110	7	31.3	7	30.3	7	29.9	30.5	-4.6%
BIOL-112	5	31.2	5	39.4	5	36.6	35.7	17.3%
BIOL-117	2	34	1	35	2	32	33.4	-5.9%
BIOL-120	3	26	3	27.7	3	29	27.6	11.5%
BIOL-218	4	30	4	30.3	4	30.5	30.3	1.7%
BIOL-219	4	32	4	31.3	4	32	31.8	0.0%
BIOL-220	4	19.5	4	20.8	4	18.3	19.5	-6.4%
BIOL-240	1	28	1	24	1	33	28.3	17.9%
BIOL-241	1	29	1	26	1	28	27.7	-3.4%
Program Average*	57	29.5	55	30.7	50	29.1	29.8	-1.5%
Institutional Average*	1,474	24.8	1,406	25.7	1,313	24.8	25.1	0.0%

Source: SQL Enrollment and Course Sections Files

Average Section Size across the three-year period for courses, and both within academic years and across the three-year period for the program and institutional levels is calculated as:

$$\frac{\text{Total \# Enrollments.}}{\text{Total \# Sections}}$$

It is not the average of the three annual averages.

RPIE Analysis: Over the past three years, the Biology Program has claimed an average of 29.8 students per section. The average class size in the program has exceeded the average class size of 25.1 students per section across the institution during this period. Average class size in the program decreased slightly (by 1.5%) between 2016-2017 and 2018-2019. Average class size at the institutional level remained stable between 2016-2017 and 2018-2019.

Average class size in the following courses changed by more than 10% ($\pm 10\%$) between 2016-2017 and 2018-2019:

Courses with increases in average class size:

- o BIOL-240 (17.9%)*
- o BIOL-112 (17.3%)*
- o BIOL-120 (11.5%)*

Course with a decrease in average class size:

- o BIOL-105 (-23.6%)*

Program Reflection:

The average class size in most Biology classes is determined by the size of its labs. The labs have space for 30 students per section. It becomes a safety issue to have more than 30 students in a lab at one time so the number of students enrolled per section should not be expected to grow.

When you consider that we have a program average of 29.8 students per section, this means that sections in Biology are at 99.3% of capacity. Perhaps more importantly, and more meaningful, is the fact that the average class size in 2017-2018 was 30.7 students per section in a lab room that only holds 30 students. In more than half our class (6 of 11) we are at more than 100% of capacity.

Not surprisingly, the more advanced classes like BIOL 220 have slightly lower enrollments. The requirements for entering this class are among the most restrictive and the discipline is narrower than other Biology classes.

The decrease in average class size in BIOL 105 was a result of adding the CHEM 110 pre/co-requisite to the course. Once this requirement is in place for a few years, it is expected that BIOL 105 class size will increase and stabilize.

Overall, the Biology program is in high demand and running at capacity. It is not possible to increase the size of the sections without compromising safety and instructional effectiveness. To be safe, there must be limits on the size that these labs are allowed to grow. Labs in the Life Sciences building hold 30 students by design, and this works well for students in the program. Larger labs become unsafe, reduce instructor-student interaction, and are not recommended.

3. Fill Rate and Productivity

Fill Rate*			
	Enrollments*	Capacity	Fill Rate
2016-2017	1,558	1,620	96.2%
2017-2018	1,570	1,645	95.4%
2018-2019	1,316	1,475	89.2%
Three-Year Program Total	4,444	4,740	93.8%
Institutional Level	94,614	117,777	80.3%
Productivity*			
	FTES	FTEF	Productivity
2016-2017	311.3	20.3	15.3
2017-2018	305.6	18.5	16.5
2018-2019	251.5	16.5	15.2
Three-Year Program Total	868.4	55.4	15.7
<i>Source: SQL Enrollment and Course Sections Files</i>			

RPIE Analysis: Fill rates within the Biology Program tend to be higher than the fill rates at the institutional level. [Compare program-level rate of 93.8% to institution-level rate of 80.3% over the past three years.] Between 2016-2017 and 2017-2018, enrollment increased and capacity increased, resulting in a slight decrease in fill rate. Between 2017-2018 and 2018-2019, enrollment and capacity decreased, resulting in a decrease in fill rate.

Productivity was relatively consistent over the three-year period, ranging from 15.2 to 16.5. [Productivity has not been calculated at the institutional level.] The three-year program productivity of 15.7 is lower than the target level of 17.5, which reflects 1 FTEF (full-time equivalent faculty) accounting for 17.5 FTES (full-time equivalent students) across the academic year. (This target reflects 525 weekly student contact hours for one full-time student across the academic year.)

**Note: Fill rates and productivity reported in the table do not include 5 Biology section offerings for summer terms over the past three years. As a result, the enrollment figures reported here might differ from those reported in Section I.A.1.*

Program Reflection:

The Biology program carefully plans the number of sections offered to correspond to the anticipated demand. We err on the side of too few sections when demand is unclear and then add sections as necessary. This keeps our fill rates high – at or near capacity.

A direct consequence of the way we plan our sections is that our productivity has remained relatively constant over the last few years. Productivity is measured as the ratio of the number of FTES to FTEF. It should be noted that productivity calculations are artificially low for laboratory classes, because each three hours of lab count as only one unit in FTES calculations, which decreases the numerator in the productivity ratio.

Productivity in the Biology program is at an appropriate level considering the high fill rates of biology classes and necessary limitations on lab class sizes. It is expected that productivity will remain relatively constant over the next few years.

4. Labor Market Demand

This section does not apply to the Biology Program, as it is not within the Career Technical Education Division.

B. Momentum

1. Retention and Successful Course Completion Rates

Level	Retention Rates (Across Three Years)			Successful Course Completion Rates (Across Three Years)		
	Rate	Course Rate vs. Program Rate		Rate	Course Rate vs. Program Rate	
		Above	Below		Above	Below
BIOL-103	87.2%	X		62.2%		X
BIOL-105	78.9%		X	46.7%		X
BIOL-110	93.9%	X		80.8%	X	
BIOL-112	95.0%	X		87.5%	X	
BIOL-117	97.6%	X		84.4%	X	
BIOL-120	90.7%	X		72.6%	X	
BIOL-218	72.7%		X	59.2%		X
BIOL-219	80.8%		X	64.6%		X
BIOL-220	89.7%	X		81.2%	X	
BIOL-240	83.5%		X	71.8%	X	
BIOL-241	96.4%	X		95.2%	X	
Program Level		85.8%			66.1%	
Institutional Level		89.8%			75.1%	

Source: SQL Enrollment Files

-- Indicates a value that is within 1% of the program level value.

Bold italics denote a statistically significant difference between the course-level rate and the program-level rate.

Bold denotes a statistically significant difference between the program-level rate and the institutional rate.

RPIE Analysis: Over the past three years, the retention rate for the Biology Program was significantly lower than the rate at the institutional level. The retention rates for BIOL-105, BIOL-218, and BIOL-219 were significantly lower than the program-level rate. The retention rates for BIOL-103, BIOL-110, BIOL-112, BIOL-117, BIOL-120, and BIOL-241 were significantly higher than the program-level rate. The retention rate for Biology Program falls in the 13.5th percentile among program-level retention rates (across 59 instructional programs, over the past three years).

Over the past three years, the successful course completion rate for the Biology Program was significantly lower than the rate at the institutional level. The successful course completion rates for BIOL-103, BIOL-105, and BIOL-218 were significantly lower than the program-level rate. The successful course completion rates for BIOL-110, BIOL-112, BIOL-117, BIOL-120, BIOL-220, AND BIOL-241 were significantly higher than the program-level rate. The successful course completion rate for Biology Program falls in the 6.7th percentile among program-level successful course completion rates (across 59 instructional programs, over the past three years).

Over the past three years, the difference between retention and successful course completion at the program level (19.7%) was higher than the difference at the institutional level (14.7%). This figure represents the proportion of non-passing grades assigned to students (i.e., grades of D, F, I, NP).

The following Biology Program courses claimed differences (between retention and successful course completion) that exceeded 10%:

- BIOL-105 (32.2%)
- BIOL-103 (25%)
- BIOL-120 (18.1%)
- BIOL-219 (16.3%)
- BIOL-218 (13.5%)
- BIOL-117 (13.2%)
- BIOL-110 (13.1%)
- BIOL-240 (11.8%)

Program Reflection:

Retention and successful course completion rates continue to be notably low for the introductory and intermediate-level pre-health science courses – BIOL 105, 218 and 219 – and this continues to be a challenge for the Biology department. These courses historically have had lower-than-average success rates when compared across the program and the institution. These low rates are not surprising, considering the necessary rigor of the pre-health science curriculum combined with the open-access admissions of the community college. Biology is a rigorous scientific discipline and many students who take these courses, with the aim of pursuing health science careers, are substantially unprepared to succeed in college-level biology. This is not unique to the Biology program at Napa Valley College.

If student success is defined only as a high successful course completion rate, then Biology program could be seen as falling short of this goal. However, we believe that

what is at least as important is increasing the likelihood that our students will be successful moving forward into ever-more-demanding courses and programs in health science fields. By this measure, we believe our program is very successful, both at serving the longer-term academic needs of our students and the needs of the community to provide qualified candidates for the health science fields.

If one examines the trend within the pre-health science courses in sequence (BIOL 105, 218, 219 and 220), successful course completion improves steadily and significantly as students move through the program, from a low of 46.7% in BIOL 105, increasing to 59.2-64.6% in BIOL 218 and 219, and then up to 81.2% in BIOL 220, the final course in the sequence. So, while it is unfortunate to have low success rates in courses earlier in the sequence, the trend of increasing success shows that we are doing something right. Those students who are able to get over the bar early in the sequence have an ever-increasing chance of success moving forward. While we cannot control the preparation and study habits of students entering our pre-health science program, we are confident that those students who successfully complete the sequence will have the knowledge and ability to succeed moving forward.

That being said, we will continue to consider ways we might improve student success in these courses. We are hopeful that adding the CHEM 110 prerequisite/ corequisite for BIOL 105 will lead to some improvement in success in BIOL 105 over time, but adding additional prerequisites is neither feasible nor desirable. This would only lengthen the already long pre-health science pathway. We will continue to evaluate our assessment results to identify areas that are particularly challenging to students and consider ways to help improve outcomes. We are also continuing to develop and provide online instructional resources for students. Significant progress has been made on that front this year, especially as we shifted to online instruction with the campus closure in response to the COVID-19 pandemic. Many of the online instructional materials and methods being developed this year will be available to our students in the future through their Canvas course sites. We believe these will be valuable resources that can help improve student success in the future.

2. Student Equity

	Retention Rates (Across Three Years)		Successful Course Completion Rates (Across Three Years)	
	Program Level	Institution Level	Program Level	Institution Level
Black/African American	79%	85.8%	49.5%	64.2%
Hispanic			62.7%	72.9%
First Generation			63.0%	73.9%

Source: SQL Enrollment Files

Bold italics denote a statistically significant difference between rates at the program and institutional levels, with the lower of the two rates in **bold italics**.

Shaded cells pertaining to retention rates indicate that statistically significant differences for those groups were not found at the institutional level.

RPIE Analysis: This analysis of student equity focuses on the three demographic groups with significantly lower retention and/or successful course completion rates found at the institutional level (vs. the corresponding rates among all students) over the past three years. Tests of statistical significance were conducted to compare program-level and institution-level rates among the three groups listed above.

Within the Biology Program, the retention rate among Black/African American students was significantly lower than the retention rate at the institutional level.

Within the Biology Program, the successful course completion rates at the program level were significantly lower than the rates at the institutional level for all three groups.

This pattern reflects the findings from the comparison of retention and successful course completion at the program vs. institutional level (with the institution-level rate exceeding the program-level rate for retention and successful course completion). (See Section I.B.1 above).

Program Reflection:

It is difficult to know the cause of low retention and completion rates in these populations but it is suspected that it is because of a lack of sufficiently rigorous preparation for these classes. Unfortunately, the required preparation for Biology is in areas over which biology has no control; like English, math, and chemistry. Lacking this preparation, the Biology program has attempted to promote interest in its program by being involved in several programs that are meant to promote interest in STEM programs. These include participation in the annual MESA STEM Fair, STEM Open Houses, hosting visits from local Middle schools, internships with local hospitals and businesses, bringing speakers to the college to promote areas of biological interest, and hosting science students from local high schools. In addition, biology has attempted to generate interest by participating in a Summer Bridge Program that specifically targets first generation, Hispanic, and African American junior and senior high school students. Unfortunately, these events did not produce the results we were trying to achieve. A few high school students chose NVC based on their experiences in Summer Bridge but those few students did not move the needle very much and success rates did not increase.

In recent discussions, it has been decided that a two-week summer program in STEM is not sufficient intervention to generate interest nor prepare students for a future in the sciences. A different approach is needed. We must reach into the high schools and provide a better education before these students come to our college. To this end, discussions have now switched from a Summer Bridge program to a STEM Summit that brings high school science teachers to the college for a few days of meetings where we discuss the gaps that we find in the knowledge base of incoming students and discover ways that these gaps might be filled at the high school level. This will most certainly mean that new materials and methods will be developed that will align the high school programs more closely to the students college experience. We believe that doing this will improve the success rates of our underserved students by providing them a better foundation for when they enter college.

Generally, there is a lack of diversity in our teaching staff, though recent additions to our adjunct pool include instructors from these equity groups. While biology has done a pretty good job in hiring a diverse staff, other areas of STEM have not so when our students look at their STEM instructors they don't see anyone who looks like them and we believe that this is an impediment to success for these students. Given a range of potential applicants, we have to be mindful of the need for ethnic diversity when we make our decision who to hire.

3. Retention and Successful Course Completion Rates by Delivery Mode (of Courses Taught through Multiple Delivery Modes, i.e., In-Person, Hybrid, and Online)

	Retention Rates		Successful Course Completion Rates	
	In-Person	Online	In-Person	Online
BIOL-103	90.0%	75.0%	60.8%	65.5%
Program Total	90.0%	75.0%	60.8%	65.5%
Institutional Total	89.2%	87.0%	70.2%	69.1%

Source: SQL Course Sections Files

This table compares student performance in courses offered through multiple delivery modes within the same academic year.

Bold italics denote a significantly higher rate within that delivery mode.

*Program total is equivalent to BIOL-103, as one course was offered through multiple delivery modes

RPIE Analysis: Over the past three years, one course within the Biology Program has been offered through at least two delivery modes within the same academic year. Across each year of the three-year period, BIOL-103 was offered through in-person and online formats.

Within the Biology Program:

- The retention rate in the in-person sections of BIOL-103 (and therefore across the program) was significantly higher than the retention rate in online sections of the course.*

This pattern within the program – with retention rates in in-person sections exceeding the corresponding rates in online sections of the same course – reflects the finding at the institutional level.

Within the Biology Program:

- The successful course completion rate in in-person sections of BIOL-103 (and therefore across the program) was slightly lower than the successful course completion rate in online sections of the course (although the difference was not significant).*

This pattern within the program – with successful course completion rates in online sections exceeding the corresponding rates in in-person sections of the same course – deviates from the findings at the institutional level, where the rate in in-person was slightly higher than the corresponding rates in online sections. The differences at both the program level and institutional level were not statistically significant.

Program Reflection:

It is difficult to interpret the differences in retention rate and successful course completion for in-person versus online section of BIOL 103, because the data are from a limited time period and the sections were taught by different instructors. In any event, the comparison is somewhat irrelevant, as we have moved to all online sections for BIOL 103 starting in 2019-2020.

We will continue to evaluate retention trends in BIOL 103. If retention rates remain substantially lower than program averages, we will coordinate with the BIOL103 instructor to explore options to improve retention. This could include surveying students at the beginning and end of the course to get a better idea of their educational goals and their experience taking the course in an online format.

C. Student Achievement

1. Program Completion

	2016-2017	2017-2018	2018-2019
Degrees			
Natural Science-Life Science: AS	--	--	10
Pre-Health Science: AS	--	--	57
Active Biology Degree Total	--	--	67
Natural Science and Mathematics: AS	292	242	189
Institutional: AS Degrees	443	394	386
Average Time to Degree (in Years)⁺			
Natural Science-Life Science: AS	--	--	3
Pre-Health Science: AS	--	--	4
Active Biology Degree Total	--	--	4
Natural Science and Mathematics: AS	4	4	4
Institutional: AS	4	4	4

Source: SQL Award Files

*Time to degree/certificate within the program reported among cohorts with at least 10 graduates within the academic year. Asterisk indicates that data have been suppressed.

+Average time to degree/certificate was calculated among students who completed a degree/certificate within 10 years (between first year of enrollment at NVC and award conferral year). Among 2018-2019 completers, the average time to degree/certificate was calculated among students who enrolled at NVC for the first time in 2009-2010 or later.

RPIE Analysis: The Office of Academic Affairs advised that the Biology program review report should reflect the intent of the department. Therefore, this analysis focuses on the active degrees associated with Biology. Those degrees include Natural Science-Life Science AS and Pre-Health Science AS. The Natural Science and Mathematics AS degree is associated with the Biology department according to the Taxonomy of Programs. However, since the degree is being phased out, the number of degrees conferred is reported in the table above for informational purposes only.

In 2018-2019, the Biology department conferred 67 degrees – 10 within Natural Science-Life Science and 57 within Pre-Health Science. 2018-2019 was the first year that degrees in these two areas were awarded.

The Biology Program accounted for 17.4% of the AS degrees conferred in 2018-2019. The average time to degree among Natural Science-Life Science AS degree recipients was 3 years, while the average time to degree among Pre-Health Science AS degree recipients was 4 years. The time to degree among all 67 degree recipients was 4 years, which reflects the average time to degree for AS degrees conferred across the institution in each of the past three years.

Program Reflection:

The Biology department recently made significant changes to the AS degrees offered through the program. The new AS-Natural Science (AS-NS) degree is more rigorous than the AS-Natural Science and Mathematics (AS-NSM) degree that it replaces, and we created a new AS-Pre-Health Science (AS-PHS) degree. We believe these new degrees are more academically meaningful, and will be more useful to our biology and pre-health science students moving forward.

Because these degrees have only been offered starting in 2018-19, multi-year data are not yet available to evaluate trends in degrees awarded. We anticipate that we will see increase in number of these degrees awarded over the next few years, as the previous AS-NSM degree is phased out and more students become aware of the new degrees. Because of the rigorous nature of both degrees, we do not expect the average time to degree to change significantly, but implementation of Guided Pathways may help to reduce the average time for completion of the AS-Pre-Health Science degree.

2. Program-Set Standards: Job Placement and Licensure Exam Pass Rates

This section does not apply to the Biology Program, as the discipline is not included in the Perkins IV/Career Technical Education data provided by the California Community Colleges Chancellor's Office, and licensure exams are not required for jobs associated with the discipline.

II. CURRICULUM

A. Courses

Subject	Course Number	Approval Date	Has Prerequisite* Yes/No	In Need of Revision <i>Indicate Non-Substantive (NS) or Substantive (S) & Academic Year</i>	To Be Archived <i>(as Obsolete, Outdated, or Irrelevant) & Academic Year</i>	No Change
BIOL	103	1/30/18	No	No	No	X
BIOL	105	8/13/18	Yes	No	No	X
BIOL	110	8/11/08	No	Yes (NS) – in progress	No	X
BIOL	112	8/11/13	No	Yes (S) – in progress	No	X
BIOL	117	8/11/13	No	Yes (NS) – in progress	No	X
BIOL	120	8/11/13	Yes	Yes (S) – in progress	No	X
BIOL	199	8/11/13	Yes	No	No	X
BIOL	218	8/11/13	Yes	Yes (S) – in progress	No	X
BIOL	219	8/11/13	Yes	Yes (S) – in progress	No	X
BIOL	220	8/13/18	Yes	No	No	X
BIOL	240	1/13/17	Yes	No	No	X
BIOL	241	1/13/17	Yes	No	No	X

*As of fall 2018, prerequisites need to be validated (in subsequent process) through Curriculum Committee.

B. Degrees and Certificates[†]

Degree or Certificate & Title	Implementation Date	Has Documentation Yes/No	In Need of Revision+ and/or Missing Documentation & Academic Year	To Be Archived* (as Obsolete, Outdated, or Irrelevant) & Academic Year	No Change
AS - Natural Science, Life Science	Spring 2019	Yes	No	No	X
AS - Pre-Health Science	Fall 2018	Yes	No	No	X

[†]Degrees and Certificates cannot be implemented until the required courses in them are approved and active.

*As of fall 2018, discontinuance or archival of degrees or certificates must go through the Program Discontinuance or Archival Task Force.

Program Reflection:

AB 705 forced changes in the prerequisite/corequisites for several courses in biology. In addition, rule changes forced a change in enrollment strategies for Biology 218/219 that necessitated changes in their course outlines of record. As a consequence, a number of course revisions were submitted through the curriculum process in 2019-2020 but have not yet been approved, so a number of our course revisions are “in progress.” By the end of spring 2020 all courses will have been updated.

In addition, one class, BIOL 112 - Introduction to Ecology, has been submitted for Distance Education. We are excited about this new offering because it will open up this class to a new reservoir of students and the instructor available to teach it is excellent.

Finally, with the move to online education necessitated by Covid-19 in Spring 2020, the Biology faculty have been developing and implementing an abundance of new, online instructional content and teaching methods. We anticipate that many of these online materials and methods will be utilized in the future to supplement our traditional modes of instruction, and will continue to provide students with valuable learning resources.

III. LEARNING OUTCOMES ASSESSMENT

A. Status of Learning Outcomes Assessment

Learning Outcomes Assessment at the Course Level

Number of Courses	Number of Courses with Outcomes Assessed		Proportion of Courses with Outcomes Assessed	
	Over Last 4 Years	Over Last 6 Years	Over Last 4 Years	Over Last 6 Years
12	12	12	100%	100%

Learning Outcomes Assessment at the Program/Degree/Certificate Level

Degree/Certificate	Number of Outcomes*	Number of Outcomes Assessed		Proportion of Outcomes Assessed	
		Over Last 4 Years	Over Last 6 Years	Over Last 4 Years	Over Last 6 Years
AS – Natural Science, Life Science	3	2	2	66%	66%
AS - Pre-Health Science	2	2	2	100%	100%

Program Reflection:

Since the new AS degrees have only been active for one year, there is not sufficient data to assess learning outcomes for them. In addition, the Biology department will need to coordinate learning outcomes assessment with the Chemistry department for the AS-NS degree. This degree has a substantial chemistry component and one of its program-level SLOs is associated with a CHEM 120 SLO. This analysis would need to identify and separately assess the subgroup of students who have taken both CHEM 120 and BIOL 120, in order for the results to be applicable to the AS-NS, Life Science degree. We anticipate this will be done in time for the next program review cycle.

B. Summary of Learning Outcomes Assessment Findings and Actions

The department has been assessing SLOs at the course level since 2009. We have improved a great deal since then in the assessment tools, analysis of the data, assessment results, and in developing meaningful learning outcomes. In the early days of assessment, the data collected was general and therefore not very meaningful. Currently, the data are being analyzed in a detailed way that generates meaningful information and generates program-wide dialogue. For example, in General Biology, there is a SLO assessing the students' knowledge of molecular biology and genetics. When the data was assessed as a general overview of the SLO, no meaningful information was generated. But when the data was broken down to show the assessment results for each topic, then specific topics that the students struggled with were identified and interventions were developed. As a result of these interventions, improvements in assessment data were observed. Targeted interventions were implemented across the program, examples include: developing homework worksheets to improve students' performance in quantitative problem solving; developing practice quizzes including Kahoot mobile phone-based quizzes for histology; streamlining lecture material; and increasing review of difficult material. The need for more visual aids was identified through dialogue on assessment results. More models were purchased, photos were taken of anatomical and cellular models and histology slides, and these photos were labeled and posted online to be shared with the students.

The benefits of assessment go beyond the course level. When all the assessment data are examined, similarities are identified across courses. Students struggle with many of the same complex process in multiple courses. For example, it was identified that vocabulary of specific biological terms, for example in the muscular system, was difficult for many students. Similarly, quantitative problem solving, including working with units in calculations was identified across several courses. Faculty members have been able to share strategies and resources to help students learn this new and challenging language and understand complex processes. The Biology faculty is considering developing a common Biology Canvas website that can be used to share resources.

Currently the full time faculty share their course Canvas sites with adjunct faculty teaching the same course to give the adjuncts access to all the material that has been developed.

Assessment data has also been used to identify areas where, when comparing sections of the same course, differences in results between sections indicated that there were differences in rigor and level of detail of topics. The department strives to maintain consistency in rigor and content across sections, this data can identify courses where more collaboration between instructors is needed to maintain this consistency.

SLO assessment tools have also improved, rubrics have been developed and shared with the students. This has given the students a better understanding of what is expected of them with the assignments and their performances often improved as a result. Another improvement was looking at the benefit of multiple assessment tools. In some of the GE biology courses including Ecology, Nutrition and Wildlife Biology, the same SLO is assessed using both exam questions and projects. This has shown the benefit of multiple measures in getting a more authentic measure of a student's understanding of a concept. An area the department has improved in the assessment of SLOs is including adjunct faculty in the development of the outcomes, assessment tools, and analysis of the data generated. This has led to meaningful dialogue with the adjunct faculty and better assessments. This is an area we will continue to work on to include adjunct faculty in the process.

There are still areas that have been identified that the students still struggle to master. For example, in General Biology, cell communication is an area students struggle to understand. It is a complex process that requires the synthesis of many other complex processes to fully understand, including protein synthesis. The lectures have been streamlined, and more visual tools and review of the topic has been incorporated to the course. As a result, assessment data has improved over the years but this is still an area with lower assessment results. But the assessment data helps the faculty to identify these areas and continue to put interventions into place.

Program Reflection:

The assessment methods and analysis of SLO results has improved over the years, providing meaningful data and dialogue. The analysis of SLO assessment has led to many improvements in instruction and assessment. The assessment results have shown some improvements in many of the courses, but more importantly, it has identified areas that need improvement, the need to share resources across the department, improvements in assessment tools and increased dialogue among the faculty. One area where the department has improved is in including adjunct faculty in the development of assessment tools and the analysis of the data. We are also continuing to develop more materials and methods of instruction to help the students understand the complex content, processes and vocabulary of the sciences.

IV. PROGRAM PLAN

Based on the information included in this document, the program is described as being in a state of:

- Viability
- Stability
- Growth

*Please select ONE of the above.

This evaluation of the state of the program is supported by the following parts of this report:

Section I.A.1. Headcount and enrollment. With the exception of the decline in BIOL 105 enrollments that resulted from the addition of the CHEM 110 prerequisite-corequisite, Biology enrollments have increased over the past three years. There continues to be strong demand for biology classes, especially in the pre-health science courses, and this demand is expected to remain strong.

Section I.A.3. Fill Rate and Productivity. Fill rates in biology classes are at or near capacity and are expected to remain relatively constant.

Section I.B. 1. Retention and Successful Course Completion Rates. With the exception of BIOL 105, 218 and 219, all other biology courses have retention and successful course completion rates near or above institutional averages. In addition, there is a strong trend of increasing retention and successful completion rates as students progress through the pre-health science course sequence (BIOL 105, 218, 219, and 220).

Complete the table below to outline a three-year plan for the program, within the context of the current state of the program.

Program: Biology
 Plan Years: 2020-2023 (3 yr plan – until the next cycle)

Strategic Initiatives Emerging from Program Review	Relevant Section(s) of Report	Implementation Timeline: Activity/Activities & Date(s)	Measure(s) of Progress or Effectiveness
1. Analyze new AS degrees		Fall 2020- Spring 2023	Program SLO assessment
2. Add resources for BIOL 105 to help improve student success		Fall 2020- Spring 2023	Successful course completion data for BIOL 105

Describe the current state of program resources relative to the plan outlined above. (Resources include: personnel, technology, equipment, facilities, operating budget, training, and library/learning materials.) Identify any anticipated resource needs (beyond the current levels) necessary to implement the plan outlined above.

Note: Resources to support program plans are allocated through the annual planning and budget process (not the program review process). The information included in this report will be used as a starting point, to inform the development of plans and resource requests submitted by the program over the next three years.

Description of Current Program Resources Relative to Plan:

No additional resources are needed to implement the three-year plan.

V. PROGRAM HIGHLIGHTS

A. Recent Improvements

The Biology department developed two new AS degrees, the AS in Natural Science-Life Science and the AS in Pre-Health Science, which were activated in Fall 2018 and Spring 2019, respectively.

The department has effectively implemented online instruction using Canvas and Zoom, and has developed extensive online instructional content for biology courses.

Improvements have been made in several biology course laboratories. In particular, the Microbiology laboratory has been substantially updated to improve safety and update laboratory techniques.

B. Effective Practices

The Biology department maintains high academic standards and high quality laboratory programs.

The department's full-time faculty, adjunct faculty, and support staff work cooperatively to maintain continuity and excellence in the biology program.

The department evaluates and updates the biology curriculum regularly.

The department has effectively utilized Supplemental Instruction in several of our courses to the benefit of many students.

Biology faculty actively engage students and maintain a high level of instructor-student interaction in labs and discussions.

Feedback and Follow-up Form

Completed by Supervising Administrator:

Robert Van Der Velde, Senior Dean, Arts & Sciences

Date:

04/30/20

Strengths and successes of the program, as evidenced by analysis of data, outcomes assessment, and curriculum:

Biology is a strong program, academically rigorous, and with careful attention to enrollment management and planning. The new AS Natural Science and AS Pre-Health degrees are valuable contributions to the academic offerings of the college. The program is fortunate to have excellent full-time and part-time faculty, and enjoys good lab facilities.

Areas of concern, if any:

Significant enrollment declines in BIOL 105 (likely due to adding a Chemistry co-/pre-requisite and hopefully short lived) and very low success rates in that class constitute a cloud on an otherwise sunny horizon for Biology; without those declines the program would undoubtedly be classified as “Growth”. BIOL 105 is a gateway into remaining courses in the program, and fewer students passing that course will have a ripple effect in enrollments throughout subsequent courses.

Recommendations for improvement:

The Biology faculty should become engaged in the development of Guided Pathways, as Biology is a very important path into allied health professions as well as transfer to Biology majors. Because of concerns about student success, BIOL 105 is a prime candidate to be an early adopter of the forthcoming Starfish early alert system with strong connections to Counseling. In addition, the faculty should consider participating in equity-minded training programs, as disparities in student success exist among some demographic groups.

Anticipated Resource Needs:

Resource Type	Description of Need (Initial, Including Justification and Direct Linkage to State of the Program)
Personnel: Faculty	Biology continues to need an additional full-time faculty member with expertise in Botany.
Personnel: Classified	
Personnel: Admin/Confidential	
Instructional Equipment	Lab equipment should be updated, with unit plan requests for refurbishing microscopes a high priority.
Instructional Technology	Unit plans have consistently requested addressing classroom screens that are not functional, and these should be funded.
Facilities	
Operating Budget	

Professional Development/ Training	As noted above, participation in equity-minded instruction training should be encouraged.
Library & Learning Materials	