

# Existing Program Review Report

**DEGREE PROGRAM:**

**BIOLOGY BS**

**PROGRAM REVIEW CHAIR:**

**KAYLA BIESER**

**PROGRAM REVIEW MEMBER:**

**SAMANTHA JEWELL**

## I. MISSION STATEMENT

### ***A. Institutional Mission Statement***

At Nevada State College, excellence fosters opportunity. Excellence in teaching leads to innovative, technology-rich learning opportunities that promote the acquisition of interdisciplinary knowledge and skills. Quality, affordable four-year degree programs open the door to career success and an enhanced quality of life for a diverse population of students. Our graduates, in turn, foster the greatest opportunity – the promise of a stronger community and a better future for all of Nevada.

### ***B. Degree Program Mission Statement***

The Biology program identifies as its central role to create scientific literacy in addressing biological issues, enhancing opportunities for a diverse student population to enter graduate, professional and entry-level career positions in biology. The Biology program infrastructure provides ongoing support, guidance and encouragement to our students as they strive to meet personal and professional goals.

### ***C. Mission Statement Alignment***

The Biology program is “central to the educational and research mission of Nevada State University.” This degree focuses on the application of the scientific method and prepares students for entry into the workforce or a multitude of graduate programs. The program also fulfills general education requirements part of NSU’s Core Curriculum for many non-science students, for example, BIOL 101A/L and BIOL 189A/L. The classes in the BIOL major also contribute to NSU’s current Strategic Plan (2020-25), to the Strategic Plan Addendum and to the NSU 2023 Master Plan by: (1) providing experiential learning experiences that involve students from underrepresented groups in campus community outreach, serving the new majority; (2) providing Curriculum in Undergraduate Research (CURE) classes for high-quality research experiences inside the class curriculum; (3) enabling the presentation of class projects at our Undergraduate Research & Creative Works Conference as showcase experiences; and (4) infusing the curriculum and the campus culture with activities that reinforce our commitment to inclusion, equity, diversity and sustainability. These outcomes specifically meet NSU’s Strategic Plan goals to:

- “Earn recognition for our instructors’ use of high-impact teaching practices to enable the success of students who are historically under-represented.”
- “Increase student participation in the Undergraduate Research and Creative Works Conference, as well as the number of students at all levels who collaborate with faculty on research projects.”

## II. INSTITUTIONAL RESEARCH DATA

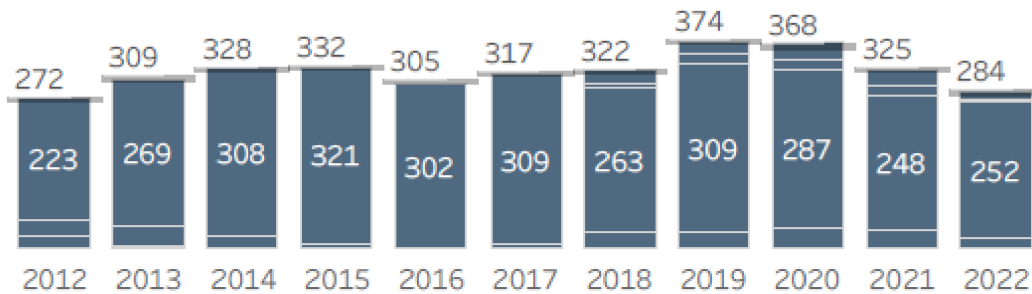
### A. Student Profile and Success Metrics

Data source used for this document:

[https://public.tableau.com/app/profile/nevada.state/viz/ProgramEvaluation\\_2/ProgramEvaluation](https://public.tableau.com/app/profile/nevada.state/viz/ProgramEvaluation_2/ProgramEvaluation)

The many figures in this section show breakdown and trends of students in the Biology program based on many different metrics.

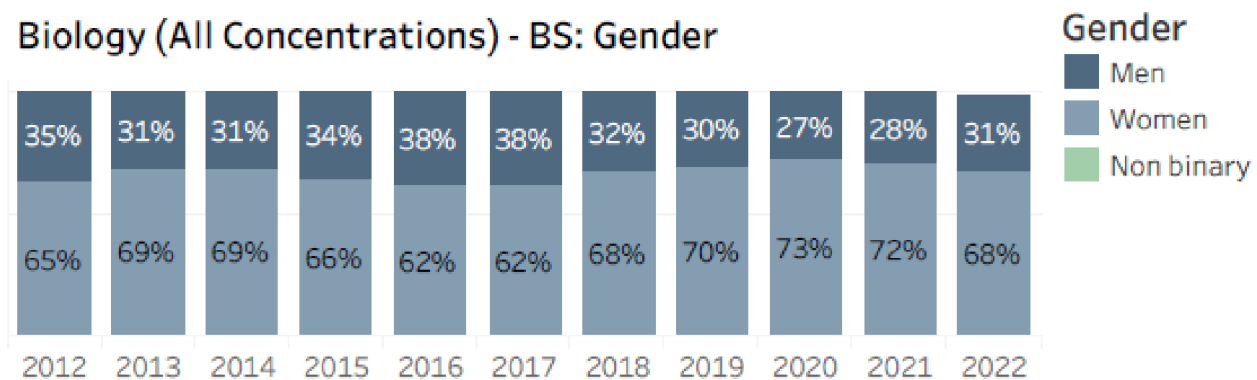
### Biology (All Concentrations) - BS



**Figure 1: Number of students declared as a Biology major each year from 2012 through 2022.**

The program has displayed gradual growth, however it appears that the pandemic likely affected enrollment with a decline since 2020.

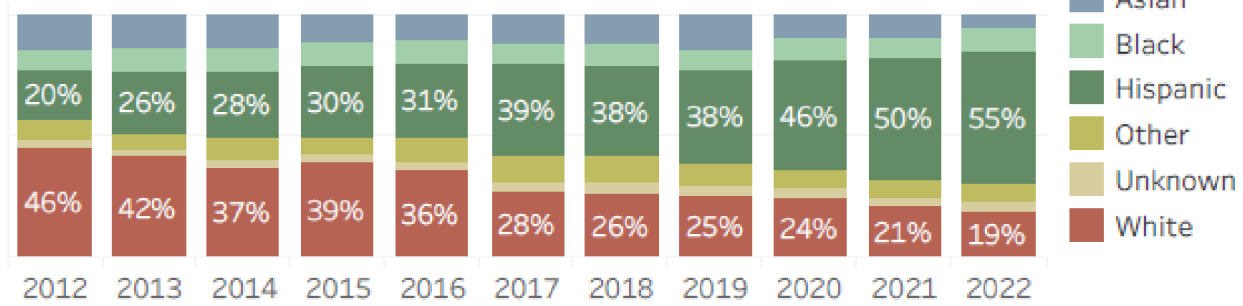
### Biology (All Concentrations) - BS: Gender



**Figure 2: Percentage breakdown of gender of students declared as a Biology major each year from 2012 through 2022.**

A majority of Biology majors have been women which reflects the general population at Nevada State University: ~75%-78% of the 2012-2022 student population were women.

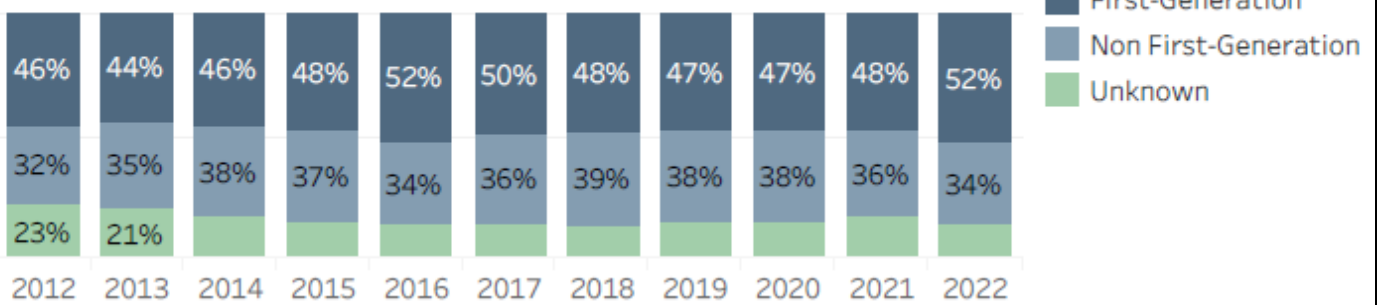
### Biology (All Concentrations) - BS: Ethnicity



**Figure 3: Percentage breakdown of ethnicity of students declared as a Biology major each year from 2012 through 2022.**

Diversity, with respect to ethnicity, has increased over the past decade and is more diverse than the population at Nevada State University. For example, the ethnicity breakdown of all degree seeking students at Nevada State University in 2022 was as follows: 42% Hispanic, 26% White, 10% Asian, 9% Black, 8% Other, and 5% Unknown. While the ethnicity breakdown of Biology majors in 2022 are: 55% Hispanic, 19% White, 6% Asian, 9% Black, 8% Other, and 4% Unknown.

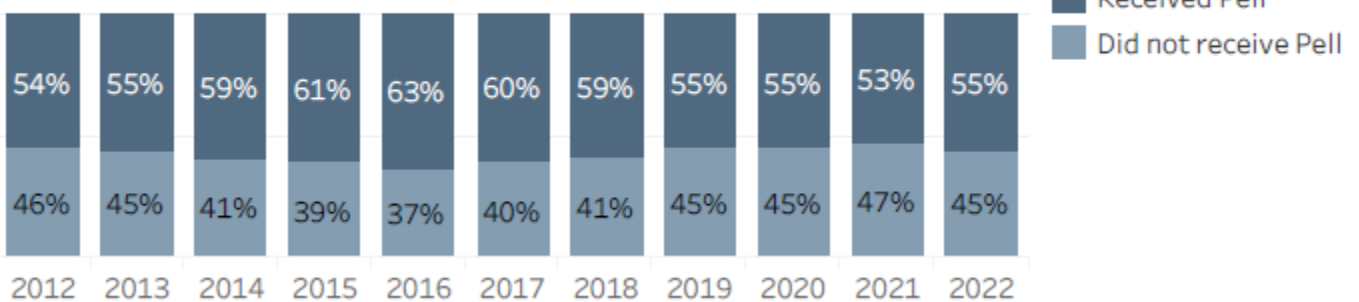
### Biology (All Concentrations) - BS: First Generation



**Figure 4: Percentage breakdown of first generation students declared as a Biology major each year from 2012 through 2022.**

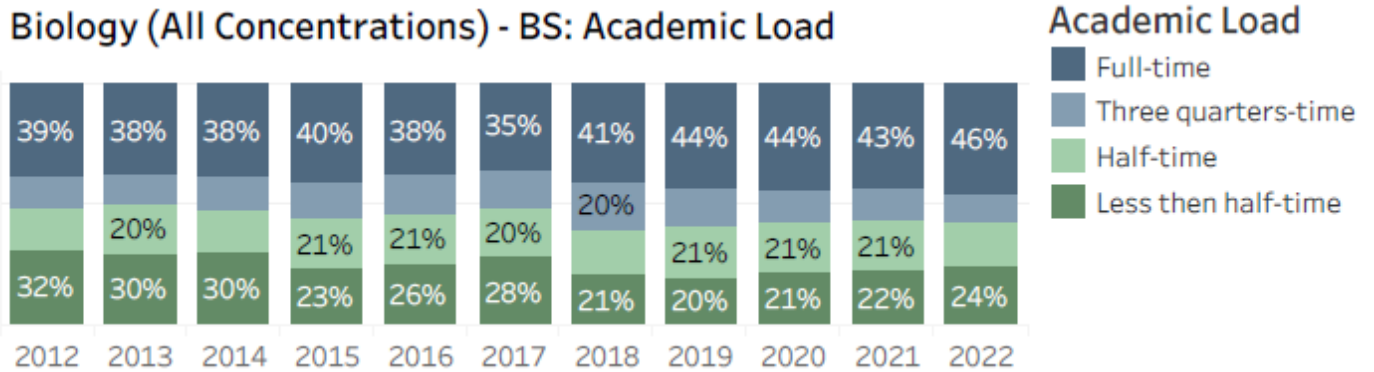
Percentage of first generation college students has been relatively consistent over the past decade, fluctuating from 44% to 52% of all Biology majors. First generation college students made up 46%-51% of the total Nevada State University population, and this program has averaged that percentage between 2012-2022.

### Biology (All Concentrations) - BS: Pell Recipient



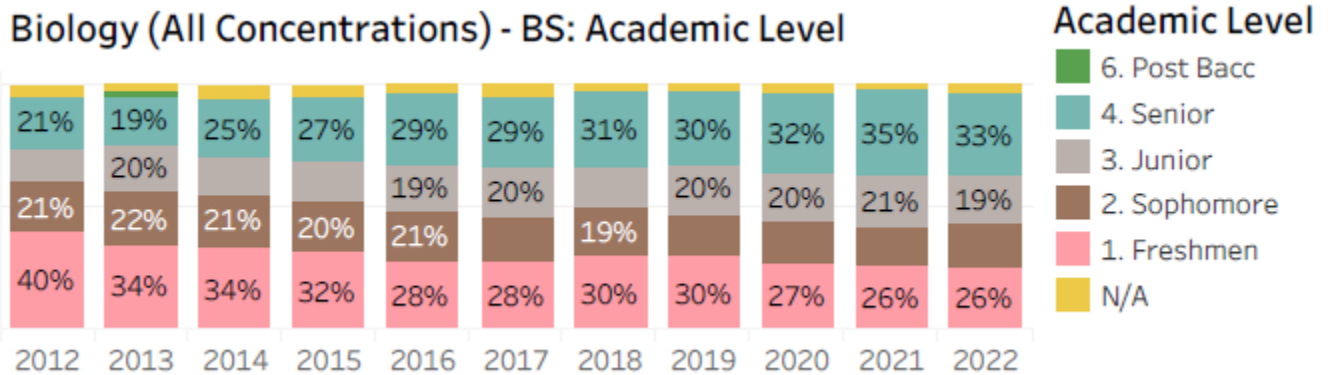
**Figure 5: Percentage breakdown of students declared as a Biology major receiving a Federal Pell Grant each year from 2012 through 2022.**

Percentage of Biology majors receiving a Federal Pell Grant fluctuated from a high in 2016 (63%) to a low in 2021 (53%). Pell grant recipients made up 47%-55% of the total Nevada State University population during the same time period.



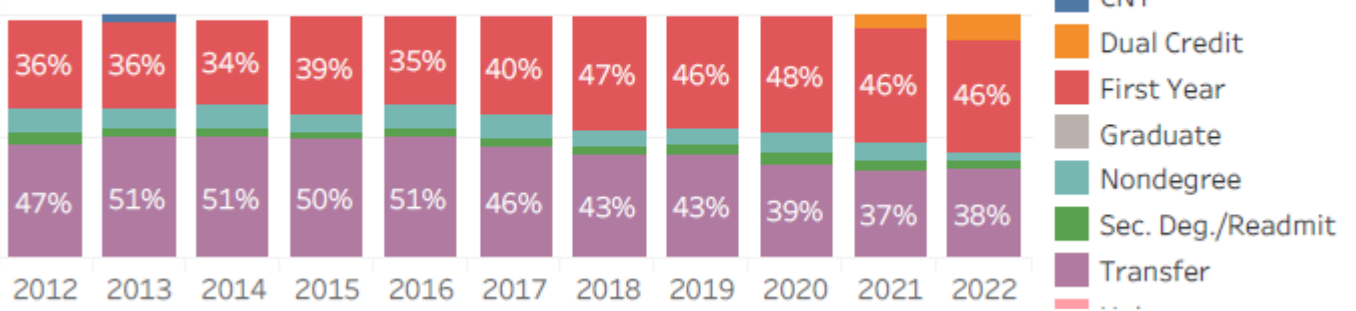
**Figure 6: Percentage breakdown of students declared as Biology majors based on academic load (full time, three quarters time, half time, and less than half time) each year from 2012 through 2022.**

One parameter that Biology majors differ from the total Nevada State College population is academic load. Percentage of Biology majors taking a full academic load has ranged from 35% to 46% between 2012 and 2022, while the percentage of total Nevada State University students taking a full academic load ranged from 29% to 37% during that same time. In 2022, 57% of Biology majors were enrolled three quarters-time to full-time.



**Figure 7: Percentage breakdown of students declared as Biology majors based on academic level (freshmen, sophomore, junior, and senior) each year from 2012 through 2022.**

### Biology (All Concentrations) - BS: First Admissions

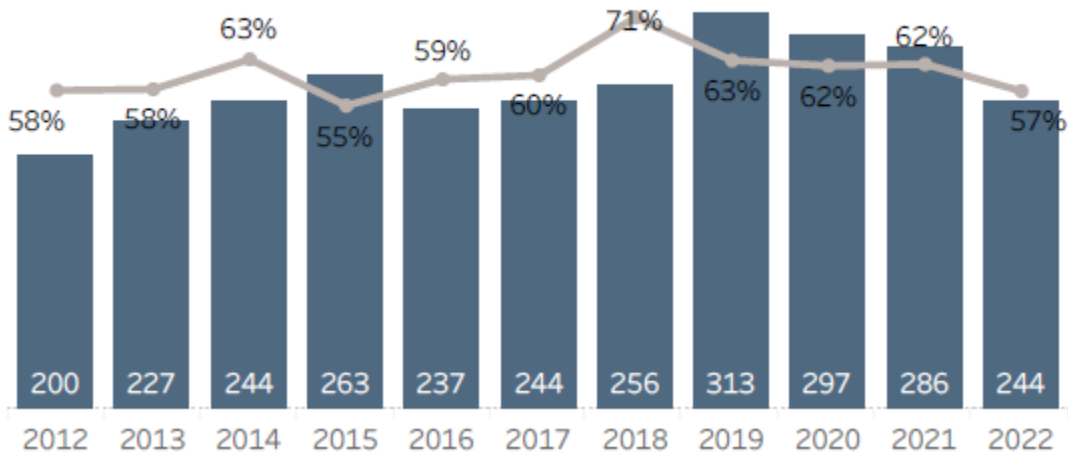


**Figure 8. Percentage breakdown of students declared as Biology majors based on first admission status (first year, transfer, etc.) each year from 2012 through 2022.**

The number of Biology majors that are transfers from another institution has been declining from 51% in 2013-2014 to 38% in 2022. With the start of dual credit programs in the Las Vegas Valley, we are now seeing a percentage of Biology majors enrolled as dual credit students. Nearly half of all biology majors are first time enrollees (or at least not bringing previous college-level credits from another institution).

### One-Year Retention Rates

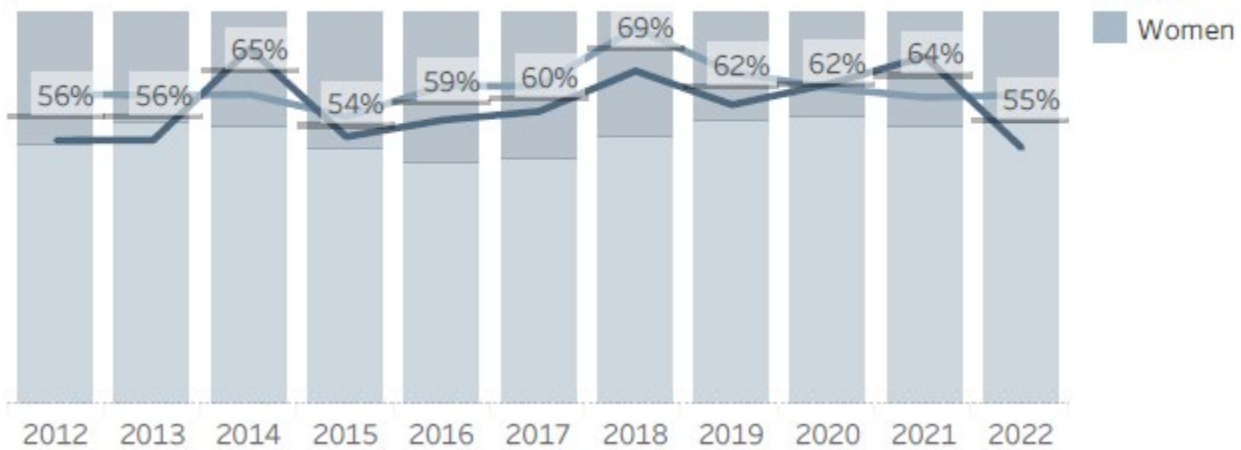
#### Biology (All Concentrations) - BS: All



**Figure 9: One-year retention rates for all Biology students from 2012 through 2022.**

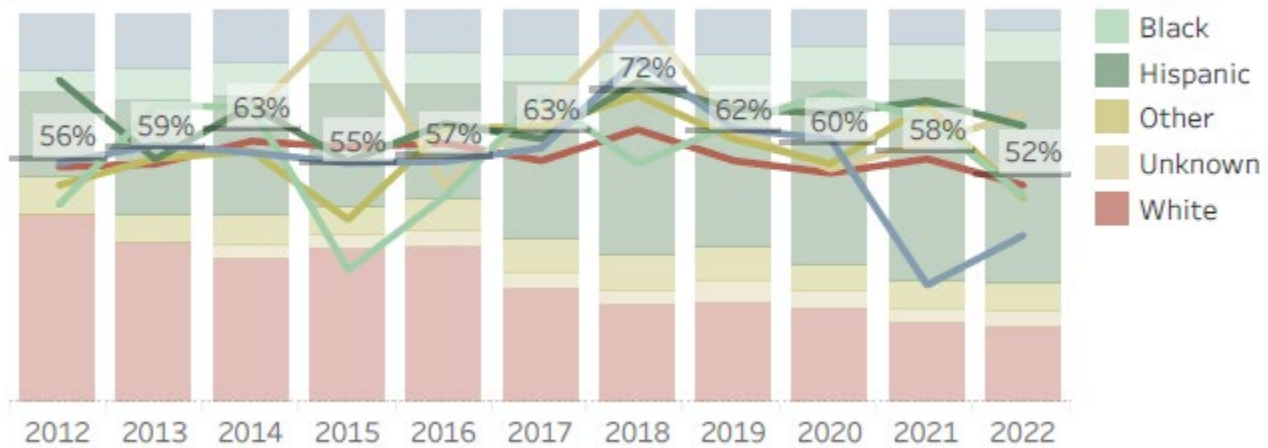
One-year retention rates of Biology students ranged from 55% to 71% from 2011 through 2022. During this same period, one-year retention rates for all students at Nevada State University ranged from 45% to 57%. The Biology retention rates have been within or higher than the average retention rates for Nevada State University since 2012.

### Biology (All Concentrations) - BS: Gender



**Figure 10: One-year retention rates for men and women enrolled as Biology majors from 2012 through 2022. Values show average one-year retention rates across both genders.**

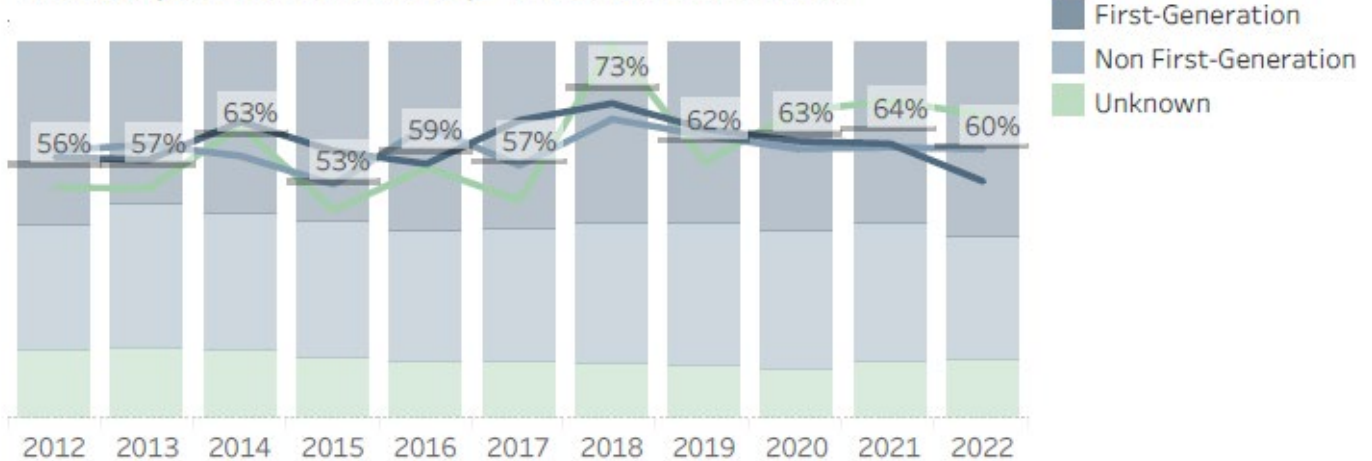
### Biology (All Concentrations) - BS: Ethnicity



**Figure 11: One-year retention rates based on ethnicity for students enrolled as Biology majors from 2012 through 2022. Values show average one-year retention rates across all ethnicities.**

Average one-year retention rates across all ethnicities of students enrolled as biology majors ranged from 52% to 72%. In comparison, university-wide rates ranged from 44% to 57% across the same time period.

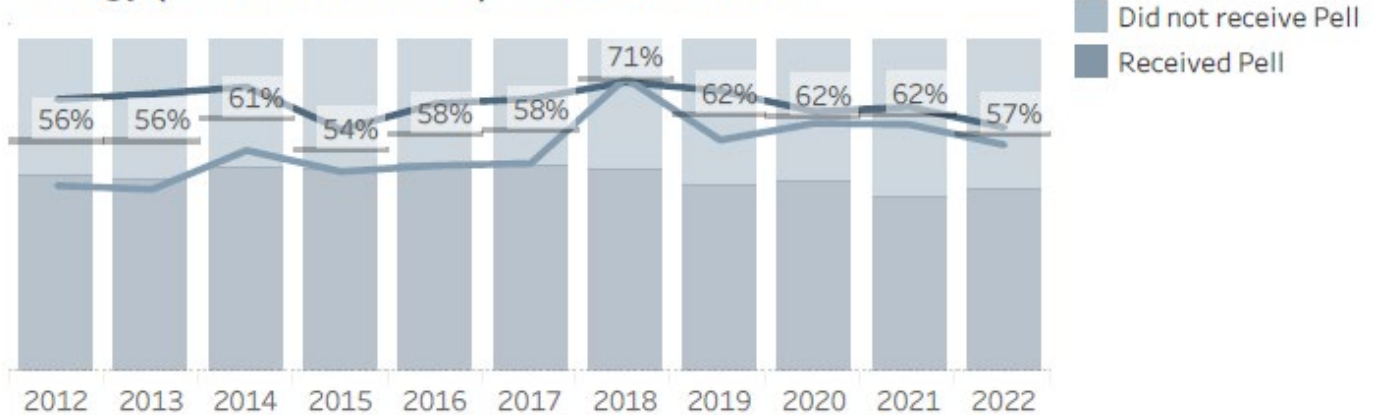
### Biology (All Concentrations) - BS: First Generation



**Figure 12: One-year retention rates based on first-generation status for students enrolled as Biology majors from 2012 through 2022. Values show average one-year retention rates across all groups.**

Average one-year retention rates across three groups: first-generation students, non first-generation students, and unknown. Students enrolled as Biology majors ranged from 53% to 73%. In comparison, university-wide rates ranged from 48% to 56% across the same time period.

### Biology (All Concentrations) - BS: Received Pell



**Figure 13: One-year retention rates based on Pell status for students enrolled as Biology majors from 2012 through 2022. Values show average one-year retention rates based on Pell status.**

**Table 1. Average GPA earned by students at time of graduation.**

Year	Biology Graduates (Number of graduates)	NSU Graduates
2013	3.2 (7)	3.5
2014	3.3 (22)	3.5
2015	3.3 (33)	3.4

2016	3.2 (22)	3.4
2017	3.3 (24)	3.5
2018	3.2 (16)	3.5
2019	3.2 (29)	3.5
2020	3.4 (41)	3.5
2021	3.3 (30)	3.6
2022	3.4 (36)	3.6

Table 1 shows average GPA earned by graduates from 2013 through 2022. Both the NSU and Biology student GPA's are showing a gradual increasing trend.

**Table 2. Average total number of credits earned by students at time of graduation.**

Note: Biology degree requires 120 credits to graduate.

Year	Biology Graduates (Number of graduates)	NSU Graduates
2013	161 (7)	162
2014	166 (22)	162
2015	160 (33)	160
2016	165 (22)	156
2017	165 (24)	156
2018	146 (16)	151
2019	152 (29)	145
2020	156 (41)	142
2021	143 (30)	144
2022	139 (36)	141

Table 2 shows the average total number of credits earned by students at the time of graduation for each year between 2013 and 2022. Credits earned by Biology students have been decreasing over this time span in a similar trend to the institution. Introduced federal regulations limiting financial aid to degree requirements has likely had an influence.

**Table 3. Six-year graduation rate of students enrolled as Biology majors by various metrics from 2010 through 2020.**



Note: Years 2021 and 2022 are not included as six-year graduation rates seem to be calculated in such a way that they include future years and, therefore, the three most recent years are not included in these calculations.

Year	Overall	Gender		Ethnicity				
		Men	Women	Asian	Black	Hispanic	White	Other or Unknown
2010	35%	32%	68%	11%	10%	26%	38%	13%
2011	36%	34%	66%	16%	9%	21%	41%	11%
2012	33%	34%	66%	15%	6%	22%	47%	10%
2013	37%	29%	71%	14%	8%	29%	40%	7%
2014	43%	30%	70%	14%	9%	30%	36%	12%
2015	40%	35%	65%	11%	9%	31%	38%	11%
2016	45%	39%	61%	11%	8%	30%	39%	12%
2017	47%	37%	63%	12%	7%	40%	29%	13%
2018	51%	32%	68%	11%	8%	43%	24%	13%
2019	44%	28%	72%	12%	9%	40%	25%	14%
2020	44%	27%	73%	9%	9%	46%	24%	11%

Table 3 shows six-year graduation rates of students enrolled as Biology majors by metrics including gender and ethnicity. Some important take-aways:

- Overall six-year graduation rates ranged from 35% to 51% between 2010 and 2020.
- Based on the higher enrollment of women to men (Fig. 2), this trend holds with far more women graduating than men.
- For ethnicity, there has been an increase in Hispanics graduating. This trend follows enrollment (Fig. 3).

**B. Programmatic Comparisons**

- Discuss the unique elements of the program. Discuss the special advantages and/or challenges this program experiences. Compare, if possible, with other programs in the institution or with other institutions.

Special Advantages of the NSU Bachelor of Sciences in Biology

The special advantages of the BIOL program at NSU results from: a) the small size of the institution, b) the non-prescriptive nature of the major with diverse class options, c) emphasis on data-driven curriculum, d) the majority of courses are taught by full-time faculty, d) the emphasis of its learning outcomes in inclusivity, diversity and equity.

The small size of NSU allows the interaction between students and faculty from different majors. Some examples of these interactions include: collaborations between Biology, Data Sciences, Chemistry, Human Health Sciences, and Environmental & Resource Science faculty during research projects or the creation of linked-classes. The Human & Health Science program is the largest by number of students at NSU because it includes students pursuing the Nursing Program. Many biology faculty teach in both the Biology and HHS degrees.

Students enrolling in Biology have the choice of 5 distinct options. The standard Biology B.S. offers the greatest flexibility for students in choosing electives to meet the requirements for degree completion. Students with intentions of a particular post-graduate degree path have the choice of 3 concentrations which are: Cell and Molecular Biology, Evolution and Ecology, and Physiology. These concentrations were specifically designed to help students pursuing careers and/or graduate/professional schools. The electives are pre-selected to help students obtain the skills and courses required of these programs. Lastly, in collaboration with Roseman University, students can choose a Roseman Fast Track PharmD concentration. The first 3 years of courses are taken at NSU, while courses are taken at Roseman in their 4th year. Students completing this program graduate with a BS in Biology and will have completed their first year of a PharmD degree from Roseman University.

**Table 4. Overall Estimated Comparison**

<b>Credit Load</b>	<b>NSC</b>	<b>UNLV</b>	<b>UNR</b>
<i>12 credits</i>	\$2,520	\$3,890	\$3,605
<i>15 credits</i>	\$3,112	\$4,726	\$4,418
<i>30 credits</i>	\$6,225	\$9,452	\$8,837
<i>Estimated cost to complete 120 credits</i>	\$24,900	\$37,808	\$35,348

### **Articulation Agreements**

The Nevada State Transfer Team oversees the update of our articulation agreements with the College of Southern Nevada every spring. The Transfer Team works in tandem with CSN’s Assistant Director of Academic Articulation to maintain and update these agreements for all of the Bachelor of Arts and Bachelor of Science degrees that Nevada State offers. The finalized agreements are posted each summer on the dedicated CSN transfer page of the Nevada State website for ease of student and CSN Academic Advising access. The agreements are produced in the format of a four-year degree map to simplify understanding of the pathway from the student’s first semester at CSN to their final semester at Nevada State. This process is carried out in coordination with David Singleton, NSHE Academic and Transfer Policy Analyst. The Biology major has a 3+1 program with Roseman University as a Fast Track PharmD concentration.

### III. FACULTY INFORMATION

#### A. Faculty Profiles

Courses with five different prefixes (BIOL, ENV, CHEM, PHYS, and NRES) are included in the Biology degree. Here is a list of statistics for the faculty who taught courses starting with the BIOL prefix as of Fall 2022:

- 21 different faculty taught classes: 16 were full-time (FT) and 6 were part-time (PT).
- FT faculty taught 74% of class selections while PT faculty taught 26% of class selections. All part-time faculty taught BIOL courses for the HHS degree, not the Biology major.
- Gender breakdown of FT faculty is as follows: 33% female, 67% male. Gender breakdown of PT faculty is as follows: 50% female, 50% male.
- 73% of FT faculty and 50% of PT faculty were white. The remaining percentages did not contain enough data to report in order to maintain anonymity.

Currently there are sixteen FT faculty that teach courses with a Biology prefix:

- Dr. Bryan Sigel - Associate Professor of Biology
- Dr. Kayla Bieser - Associate Professor of Biology and Chair of Physical and Life Sciences
- Dr. Joseph Dertien - Assistant Professor of Biology
- Dr. Jennifer Edmonds - Associate Professor of Biology
- Dr. Samantha Jewell - Associate Professor of Biology
- Dr. HonVu Duong - Senior Lecturer of Biology
- Dr. Kebret Kebede - Professor of Human Health Sciences
- Erica Tietjen, MS - Lecturer of Environmental Sciences and Biology
- Dr. Clark Pearson - Lecturer of College Success and Biology
- Dr. Amber Howerton - Associate Professor of Chemistry
- Dr. Nate Silva - Lecturer of Biology
- Dr. Lance Hellman - Assistant Professor of Human Health Sciences
- Chrisabelle Mefferd – Lecturer of Biology
- Vikash Patel – Lecturer of Biology
- Dr. El Hachemi Bouali – Assistant Professor of Environmental Sciences
- Dr. Laura Rosales Lagarde – Associate Professor of Environmental Sciences

[Link to faculty CV's.](#)

#### B. Teaching Quality

**Advising** is centralized at Nevada State, but certain Biology faculty provide more substantive career advising to students, which includes developing post graduate plans, identifying job placement, providing letters of recommendation and giving feedback on application materials. The following faculty spend a substantive amount of time performing these tasks.

1. Pre-Medical Advising
  - Dr. HonVu Duong - Senior Lecturer of Biology
  - Dr. Kayla Bieser - Associate Professor of Biology and Chair of Physical and Life Sciences
  - Dr. Samantha Jewell - Associate Professor of Biology
  - Dr. Kebret Kebede - Professor of Human Health Sciences
2. STEM focused Graduate School Advising
  - Dr. Samantha Jewell - Associate Professor of Biology, MARCOS Scholar Program
  - Dr. Kayla Bieser - Associate Professor of Biology and Chair of Physical and Life Sciences
  - Dr. Amber Howerton - Associate Professor of Chemistry

- Dr. Lance Hellman - Assistant Professor of Human Health Sciences
- Dr. El Hachemi Bouali – Assistant Professor of Environmental Sciences
- Dr. Laura Rosales Lagarde – Associate Professor of Environmental Sciences
- Dr. Jennifer Edmonds - Associate Professor of Biology
- Dr. Joseph Dertien - Assistant Professor of Biology
- Dr. Bryan Sigel - Associate Professor of Biology

### 3. Pre-Professional Health Advising

- Dr. Lance Hellman - Assistant Professor of Human Health Sciences
- Dr. Kayla Bieser - Associate Professor of Biology and Chair of Physical and Life Sciences
- Dr. Samantha Jewell - Associate Professor of Biology

## Teaching-Focused Research Publications

- [See faculty CV's](#)

## Biology Student Support, NSF S-STEM Grant \$649,963 (8/2018 - 5/2023)

- Dr. Samantha Jewell - Associate Professor of Biology, Director of the MARCOS Scholar Program
- Funds the Mentoring to Accelerate Retention and Change Outcomes in Science Program for biology student scholarships, retention efforts, advising and faculty mentorship.
  - 70% of the first MARCOS Scholar cohort graduated in spring 2022 in only 4 years.

## Field Experiences for Students

- 1. Overnight Geology Kayak and Canoe Trip from Hoover Dam to Willow Beach led by:** Dr. Laura Rosales Lagarde – Associate Professor of Environmental Sciences with faculty chaperones:
  - Dr. Samantha Jewell - Associate Professor of Biology
  - Dr. Amber Howerton - Associate Professor of Chemistry
  - Dr. Bryan Sigel - Associate Professor of Biology
- 2. Overnight trip to Beatty, NV to explore the J7 Ranch Nature Conservancy Field Station led by:** Dr. Jennifer Edmonds - Associate Professor of Biology with faculty chaperones
  - Dr. Kayla Bieser - Associate Professor of Biology and Chair of Physical and Life Sciences
  - Dr. Joseph Dertien - Assistant Professor of Biology
- 3. Week long STEM Outreach and Medical Mission Trips to Oaxaca, Mexico**
  - Primary Mentor: Dr. Samantha Jewell - Associate Professor of Biology
  - Dr. Jennifer Edmonds - Associate Professor of Biology
  - Dr. Laura Rosales Lagarde – Associate Professor of Environmental Sciences
- 4. Week long Medical Mission Trip, Kenya, Africa**
  - Dr. Kebret Kebede - Professor of Human and Health Sciences

## High Impact Teaching and Research Experiences in STEM

- 1. Biology Department Course-Based Undergraduate Research Experiences (CUREs)**
  - Dr. Kayla Bieser - Associate Professor and Chair of Biology - BIOL 190, BIOL 300, and BIOL 416
  - Dr. Samantha Jewell - Associate Professor of Biology - BIOL 351
  - Dr. Jennifer Edmonds - Associate Professor of Biology - BIOL 351
- 2. BIOL 491 / 492 Independent Undergraduate Research Mentors**
  - Dr. Bryan Sigel - Associate Professor of Biology

- Dr. Kayla Bieser - Associate Professor of Biology and Chair of Physical and Life Sciences
- Dr. Joseph Dertien - Assistant Professor of Biology
- Dr. Jennifer Edmonds - Associate Professor of Biology
- Dr. Samantha Jewell - Associate Professor of Biology
- Dr. Amber Howerton - Associate Professor of Chemistry
- Dr. Lance Hellman - Assistant Professor of Human Health Sciences
- Dr. El Hachemi Bouali – Assistant Professor of Environmental Sciences

### **3. Summer Nevada INBRE Undergraduate Research Experience Mentors**

- Dr. Bryan Sigel - Associate Professor of Biology
- Dr. Kayla Bieser - Associate Professor of Biology and Chair of Physical and Life Sciences
- Dr. Joseph Dertien - Assistant Professor of Biology
- Dr. Jennifer Edmonds - Associate Professor of Biology
- Dr. Samantha Jewell - Associate Professor of Biology
- Dr. Kebret Kebede - Professor of Biology
- Dr. Amber Howerton - Associate Professor of Chemistry
- Dr. Lance Hellman - Assistant Professor of Human Health Sciences
- Dr. El Hachemi Bouali – Assistant Professor of Environmental Sciences
- Dr. Laura Rosales Lagarde – Associate Professor of Environmental Sciences

## **Teaching-focused certifications and awards**

### **1. Participation in ACUE**

- Dr. Bryan Sigel - Associate Professor of Biology
- Dr. HonVu Duong - Senior Lecturer of Biology
- Dr. Joseph Dertien - Assistant Professor of Biology

### **2. CTLE Teaching Academy Foundations of Teaching -**

- Dr. Lance Hellman - Assistant Professor of Human Health Sciences
- Dr. Kayla Bieser - Associate Professor and Chair of Physical and Life Sciences
- Dr. Samantha Jewell - Associate Professor of Biology
- Dr. Nate Silva - Lecturer of Human Health Sciences
- Dr. HonVu Duong - Senior Lecturer of Biology
- Erica Tietjen, MS - Lecturer of Environmental Sciences and Biology
- Dr. Laura Rosales Lagarde – Associate Professor of Environmental Sciences

### **3. CTLE Teaching Academy Advanced Certificate of Teaching**

- Dr. Lance Hellman - Assistant Professor of Human Health Sciences
- Dr. Nate Silva - Lecturer of Human Health Sciences
- Dr. HonVu Duong - Senior Lecturer of Biology

### **4. CTLE Faculty Fellows -** The CTLE Faculty Fellow Award is an annual fellowship award to recognize one (1) faculty member for her/his commitment to excellence in teaching. The CTLE Faculty Fellow will be a full-time faculty member at Nevada State College (lecturer, tenure-track, or tenured) and will be selected via an application process. The award will include one course release/buyout (up to three credits) and a \$2,000 conference travel grant to present at a national or international conference on teaching and learning.

- Dr. Kayla Bieser - Associate Professor and Chair of Physical and Life Sciences
- Dr. Nate Silva - Lecturer of Human Health Sciences
- Dr. HonVu Duong - Senior Lecturer of Biology

## **5. Nevada State College iTeach Awards**

- Dr. Kayla Bieser - Associate Professor and Chair of Physical and Life Sciences
- Dr. HonVu Duong - Senior Lecturer of Biology
- Dr. Amber Howerton - Associate Professor of Chemistry
- Dr. Bryan Sigel - Associate Professor of Biology

## **STEM Focused Teaching Conferences and Professional Development**

### **1. AACU Transforming STEM Higher Education Conference (2015 - 2023)**

- Dr. Kayla Bieser - Associate Professor and Chair of Biology
- Dr. Amber Howerton - Associate Professor of Chemistry
- Dr. Bryan Sigel - Associate Professor of Biology
- Dr. Samantha Jewell - Associate Professor of Biology
- Dr. Joseph Dertien - Assistant Professor of Biology
- Dr. Jennifer Edmonds - Associate Professor of Biology
- Dr. Lance Hellman - Assistant Professor of Human Health Sciences
- Dr. El Hachemi Bouali - Assistant Professor of Environmental Science
- Dr. Kebret Kebede - Professor of Human Health Sciences

### **2. CTLE Faculty Learning Community Participation (semester long)**

- Dr. Kayla Bieser - Associate Professor of Biology and Chair of Physical and Life Sciences
- Dr. Samantha Jewell - Associate Professor of Biology
- Dr. HonVu Duong - Senior Lecturer of Biology
- Dr. Nate Silva - Lecturer of Biology
- Dr. Lance Hellman - Assistant Professor of Human Health Sciences
- Erica Tietjen, MS - Lecturer of Environmental Sciences and Biology

## **C. Student Evaluations**

1. Faculty teaching Biology courses rank high in overall course ratings, generally averaging between 4.4 to a 4.6 average (out of 5.0) over recent years. This trend appears to hold for both full-time and part-time instructors. In regard to quantitative student ratings, a 4.5 average has been Nevada State's typical standard for excellence in teaching in the LASB Standards of Academe.

## Faculty Ratings

	Spring 2018	Summer 2018	Fall 2018	Spring 2019	Summer 2019	Fall 2019	Spring 2020	Summer 2020	Fall 2020	Spring 2021	Summer 2021	Fall 2021	Spring 2022	Summer 2022	Fall 2022
Students	888	295	790	846	251	875	875	149	624	737	322	696	781	255	748
DFW or I grades	17%	8%	17%	15%	8%	17%	9%	9%	16%	13%	22%	27%	22%	19%	22%
Instructors	16	9	16	16	8	17	19	6	17	21	13	22	22	12	21
Instructors (FT)	9	3	6	8	5	11	11	3	11	13	5	11	13	7	14
Instructors (PT)	7	6	10	8	3	6	8	3	6	8	8	11	9	5	7
Rating (All)	4.6	4.5	4.6	4.5	4.7	4.5	4.5	4.6	4.4	4.4	4.5	4.4	4.5	4.6	4.5
Rating (FT) - LD	4.4	4.6	4.4	4.4	4.8	4.5	4.4	4.6	4.2	4.3	4.4	4.4	4.5	4.6	4.4
Rating (FT) - UD	4.7		4.6	4.6		4.6	4.7	4.8	4.6	4.4	4.8	4.3	4.4	4.8	4.5
Rating (PT) - LD	4.4	4.6	4.4	4.4	4.8	4.5	4.4	4.6	4.2	4.3	4.4	4.4	4.5	4.6	4.4
Rating (PT) - UD		4.6	4.6		4.4										
Rating (In-person)	4.6	4.5	4.5	4.5	4.7	4.5	4.5		4.4	4.4	4.5	4.5	4.5	4.6	4.5
Rating (Hybrid)					4.8			4.6							
Rating (Web based)															
Rating (Online Live)											4.3				
Rating (Remote Live)											4.5	4.4			
Rating (Remote Hybrid)															
Rating (Remote Asynch)								4.8	4.4	4.4	4.4	4.5			

## IV. STUDENT INFORMATION AND ASSESSMENT

### A. Post-Graduate Success

Our graduates have gone on to many professional programs throughout the country to pursue advanced degrees. A few examples are listed below.

#### Medical Schools:

- UNLV, UNR, Johns Hopkins, University of Arizona, Mayo Clinic School of Medicine, Arkansas College of Osteopathic Medicine

#### Physicians Assistant Programs:

- Touro University

#### Pharmacy Programs:

- Roseman University

#### Dental Programs

- UNLV

#### Veterinary Programs

- Ross University of Veterinary Medicine

#### Graduate Programs in Biology, Biochemistry, Biomedical Sciences, Public Health, Water Resource Management, Geosciences:

- UNLV, UNR, University of Kansas, University of Houston, University of Arizona, University of California Irvine, Tulane, University of Utah

Additionally, Nevada State Biology students have been exceptionally successful in obtaining Undergraduate Research Opportunity Program (UROPs) funds from NASA, NSF, INBRE and the UNLV REU programs. Most recent students with UROPs are outlined below and have been awarded \$4,000 - \$7,000 in scholarship funds per opportunity. Annually the department has 2-8 students working on self-funded research with faculty mentors.

### ***B. Student Learning Outcomes***

- Students will develop scientific literacy.
  - 1) Students will understand the definition and importance of scientific terms relevant to discussions of modern scientific issues.
  - 2) Students will be able to discern opinion from evidence-supported facts and theories.
  - 3) Students will be able to understand graphical representations, in addition to written descriptions, of data and the scientific process from primary literature.
  - 4) Students will be able to generate data and communicate the data (and the process used to obtain it) in graphical and written form.
- Students will develop proficiency with important tools of modern science
  - 1) Students will be able to effectively use equipment required for scientific discovery in the laboratory and in the field.
  - 2) Students will be able to effectively use relevant computational tools required for scientific discovery and analysis.
  - 3) Students will be able to design and execute experiments that would effectively address scientific questions.
- Students will appreciate the vast, interconnected biodiversity of life on earth
  - 1) Students will understand how mutation contributes to evolution and the generation of new species.
  - 2) Students will be able to identify various biotic and abiotic components of an ecosystem.
  - 3) Students will be able to predict impacts of disturbances on the biodiversity of an ecosystem.
- Students will understand the cell as a fundamental unit of life
  - 1) Students will be able to identify and describe the function of subcellular structures.
  - 2) Students will be able to predict physiological dysfunction in cells and organisms with impaired cellular or genetic components.

### ***C. Outcomes Assessment***

- The process of Outcomes Assessment occurs on a bi-annual basis for all degree programs. In October the Dean of the College of Liberal Arts and Sciences, in consultation with area Department Chairs, selects assessment chairs for each program under review, who in turn select a three-person committee of faculty reviewers. This committee typically consists of three individuals with expertise in the discipline under examination, but often will include a strategically-selected faculty member from outside of the discipline. In broad terms, the committee targets a single learning outcome, randomly selects student “artifacts” (i.e., major assignments) that presumably reflect outcome performance, and then devises a rubric to evaluate the artifacts. The resulting scores and qualitative observations are incorporated into a formal report that describes the strengths and weaknesses of the program and renders suggested revisions. The revisions are implemented and the process begins anew as faculty gauge the extent to which the program has improved.
- Several essential methodological elements enhance the quality and consistency of this process:
  - 1) Outcome alignment: Faculty strive to develop clear, concise learning outcomes that reflect meaningful achievements in the area of study. At the outset of each assessment cycle, faculty also are asked to carefully align these learning outcomes with institutional and school-wide missions and consensus goals of the field. In this fashion, we consistently ensure that each



program contributes to larger strategic objectives and maximizes each student’s potential for success in his or her respective field.

- 2) **Clear rubric:** Assessment is most effective if the evaluation of student performance is guided by a rubric that minimizes ambiguity by relying on clear, widely understood definitions and rating scales. A rubric is “a predefined scoring scheme to guide the analysis of student performance or artifacts” (Nicholas & Nichols, 2005, p. 110). It is applied as a set of rules for evaluating student performance, and it establishes a criterion by which the student will be deemed successful (e.g., at least a 3 on a 4-point scale). To this end, rubrics “set a common understanding among multiple judges about what represents success in student learning” (Nichols & Nichols, 2005, p. 110). The rubric answers fundamental questions about how student performance will be measured, it discriminates between high and low quality student work, and it helps ensure that our judgments are valid and reliable. In general terms, it does this by clearly identifying several criteria by which a student’s performance can be judged (e.g., relied on empirical data, provided a clear thesis statement, etc.) and then by delineating performance levels for each criterion (e.g., unsatisfactory, satisfactory, proficient, & excellent).
- 3) **Random Sampling:** A random and robust sample of student work (referred to as “artifacts”) in this circumstance is our best chance of taking a representative snapshot of NSC student performance, and thereby is most likely to guide improvements that assist a broad proportion of our student population. Moreover, the artifacts selected for analysis are “key assessments” – culminating assignments that are designed to showcase important student knowledge and skills.
- 4) **Value added:** For each outcome we assess a sample of student artifacts from lower division classes and a separate sample from upper division courses. In this fashion we can estimate how much progress students have made over time as a result of the quality of the instruction and curriculum in our law enforcement program.
- 5) **Iterative philosophy:** Importantly, the act of assessment does not exist in isolation; rather, it is a process that yields recommendations, the implementation of those recommendations, and a follow-up assessment to determine the effectiveness of the changes. At the close of this basic three-stage cycle, the process begins anew, which in many ways is the only response to a constantly evolving discipline and the ever-changing needs of businesses, organizations, and the community.

#### ***D. Student Satisfaction***

**Table 5. Biology students rate faculty as having higher effective teaching practices compared to students in other NS programs.**

Aggregate	Effective Teaching Practices - Amount instructors emphasized student comprehension and learning with clear explanations and organization, use of illustrative examples, and providing formative and effective feedback.	Other	N	All
				1,133
			Score	42.5
		% Diff. from Avg.	0%	
		BIBS	N	53
			Score	46.0
		% Diff. from Avg.	0%	

**Table 6. Biology students rated the quality of interaction with faculty slightly higher than students in other NS programs.**

Indicate the quality of your interactions with the following people at your institution. Faculty	Other	N	1,081
		Score	5.9
		% Diff. from Avg.	0%
	BIBS	N	53
		Score	6.0
		% Diff. from Avg.	0%

**Table7. Biology students rated their ability to discuss career plans, course topics, academic performance with faculty higher than other NS students.**

			All
Aggregate Student-Faculty Interaction - How often students had meaningful, substantive interactions with faculty members and advisors, such as talking about career plans, working on committees or student groups, discussing course material outside of class, or discussing their academic performance.	Other	N	1,164
		Score	22.8
		% Diff. from Avg.	0%
	BIBS	N	53
		Score	29.4
		% Diff. from Avg.	0%

### ***E. Demand for Graduates & Barriers to Success***

*Evaluate the demand for program graduates. Identify barriers to success for graduates if the barriers relate to course offerings, scheduling, and/or staffing at Nevada State.*

Our students who have had access to research experiences (primarily through our NIH INBRE program, the NSF-funded Fly-CURE, and independent study projects) have the greatest success at entry into graduate programs. The greatest barrier to our ability to offer more of these experiences is due to infrastructure needs. We have 1 dedicated research lab for 22 full-time science faculty. Faculty have been creative in utilizing CUREs to expose more students to research and exploring more field research opportunities, but ultimately additional lab spaces are needed for our faculty to offer more research opportunities for our students.

Although we have been successful at recruiting talented faculty, there is not a large STEM industry to pull in biology faculty for part-time employment. In fact, a strength of the biology program is the staffing of full-time faculty in all biology core courses but as we grow we are starting to struggle at staffing these courses without additional faculty particularly in the fields of cellular and molecular biology.

In the 2022 [Las Vegas Global Economic Alliance \(LVGEA\) Workforce Blueprint](#), careers with a STEM focus were identified to be in high demand in Nevada. Positions in Environmental Scientists and Specialists, including Health, is listed as number 7 among the Top 50 occupations for two-year and four-year programs in Southern Nevada, increasing in ranking from number 42 in 2019. Veterinarians, physician assistants, and medical scientists, all ranked in the top 25 in demand careers and an increasing need in Nevada. A Biology degree is the number one major for students entering medical school and other medically related professional programs such as physician assistants.

**Table 8. The table below provides Nevada Department of Employment, Training & Rehabilitation (DETR) data on projected openings, through 2028, for occupations related to a Biology degree:**

		Period				Total Annual Openings
		Base Year Employment	NV 2018-2028 Long-Term Projections Numeric Change	Projected Employment	% Change	
Biology (All Concentrations)	119121 - Natural Sciences Managers	1,356	192	1,548	85%	144
	191029 - Biological Scientists, All Other	966	78	1,044	48%	102
	251042 - Biological Science Teachers, Postsecondary	2,128	464	2,592	174%	248
	251081 - Education Teachers, Postsecondary	898	168	1,066	37%	96
	252022 - Middle School Teachers, Except Special and Career/	8,624	1,210	9,834	28%	802
	252031 - Secondary School Teachers, Except Special and Care	29,720	4,195	33,915	71%	2,650

## V. CURRICULUM INFORMATION

### A. Curricular Strengths & Weaknesses

- Provide evidence of curricular strength or weakness. This may include, but is not limited to, pass rates on certification or licensure exams, accreditation or other external review reports, results of exit exams, awards and honors (earned by faculty or students), explanations of course rotations and sequencing, and/or results of satisfaction surveys.

#### Curricular Strengths:

- Variety of degree paths including Biology BS and 3 concentrations
- 3+1 program in collaboration with Roseman University PharmD program
- Courses taught almost entirely by full-time faculty
- Hands-on experiences and skills-based curriculum that leads to employability
- Internships
- Advising and one-on-one relationship with students
- Research experiences within (Course-Based UG Research Experiences that have led to UG publications) and outside of the classroom
- Laboratory courses taught by faculty
- Intro level courses supported with embedded Peer supports

#### Curricular Weaknesses:

- Limited full time faculty or qualified part-time instructors available to cover course offerings, to offer a variety of class times or provide unique modalities (online, in-person, hybrid). Additionally, other faculty responsibilities result in course releases or teaching buy-outs. Our faculty are heavily involved in service and scholarship such as Department Chair, Senate Vice-Chair, Senate Chair, and Research or Educational Grants, which release them from teaching duties. As such, we are often unable to staff all the sections needed. This curriculum is highly technical and there is not a STEM industry in the valley to recruit part-time instructors for in-person instruction.
- Lack of transport vans / field resources to support student work for field experiences in courses such as: Ecology, Limnology, Plant Biology, Ornithology, Field Ecology, Entomology, and Bioremediation.
- There is no institutional budget to provide research experiences to our students. All summer research experiences have been completely funded through external grants. Although we are a teaching institution, the biological sciences cannot be fully taught to prepare our students for graduate programs and the workforce without providing them hands-on research opportunities.

### Biology, B.S. Course Work

Required classes:

**Mathematics (4 credits)**

<a href="#">MATH 181</a>	Calculus I
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**Natural Sciences (8 credits)**

<a href="#">CHEM 121A</a>	General Chemistry I
<a href="#">CHEM 121L</a>	General Chemistry Laboratory I
<a href="#">CHEM 122A</a>	General Chemistry II
<a href="#">CHEM 122L</a>	General Chemistry Laboratory II

**Biology Courses (21 Credits)**

<a href="#">BIOL 190A</a>	Introduction to Cell and Molecular Biology Lecture
<a href="#">BIOL 190L</a>	Introduction to Cell and Molecular Biology Lab
<a href="#">BIOL 191A</a>	Introduction to Organismal Biology Lecture
<a href="#">BIOL 191L</a>	Introduction to Organismal Biology Lab
<a href="#">BIOL 209</a>	Cell Processes
<a href="#">BIOL 220/ENV 220</a>	Introduction to Ecological Principles
<a href="#">BIOL 300A</a>	Principles of Genetics
<a href="#">BIOL 300L</a>	Principles of Genetics Laboratory
<a href="#">BIOL 415</a>	Evolution

### Related Math/Science Requirements (22 credits)

<a href="#">CHEM 241</a>	Organic Chemistry I
<a href="#">CHEM 241L</a>	Organic Chemistry for Life Sciences Laboratory I
<a href="#">CHEM 242</a>	Organic Chemistry II
<a href="#">CHEM 242L</a>	Organic Chemistry for Life Sciences Laboratory II
<a href="#">CHEM 474</a>	Biochemistry I
<a href="#">PHYS 151A</a>	General Physics I - Lecture
<a href="#">PHYS 151L</a>	General Physics I Laboratory
<a href="#">PHYS 152A</a>	General Physics II - Lecture
<a href="#">PHYS 152L</a>	General Physics II Laboratory
<a href="#">STAT 391</a>	Applied Statistics for Biological Sciences

Students must also complete [16 credits of upper-division biology electives](#).

### Concentration in Cell and Molecular Biology (16 credits)

At least one concentration course must be a 4-credit course that has a lab/field experience component. *No more than 6 total credit hours can come from: [BIOL 399](#), [BIOL 491](#), [BIOL 492](#).*

Students must take the following courses:

<a href="#">BIOL 405</a>	Molecular Biology
<a href="#">BIOL 453</a>	Immunology

Select 10 additional credit hours from the [following courses](#):

### Concentration in Evolution and Ecology (16 credits)

At least one concentration course must be a 4-credit course that has a lab/field experience component. *No more than 6 total credit hours can come from: [BIOL 399](#), [BIOL 491](#), [BIOL 492](#).*

Students must take the following course:

<a href="#">BIOL 441</a>	Field Ecology
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Select 12 additional credit hours from the [following courses](#):

### Concentration in Physiology

At least one concentration course must be a 4-credit course that has a lab/field experience component. *No more than 6 total credit hours can come from: [BIOL 399](#), [BIOL 491](#), [BIOL 492](#).*

Students must take the following courses:

<a href="#">BIOL 405</a>	Molecular Biology
<a href="#">BIOL 440</a>	Mammalian Physiology
<a href="#">BIOL 448</a>	Mammalian Physiology - Laboratory
<a href="#">BIOL 414</a>	Endocrinology

Choose 6 credits from the [following courses](#)

## Biology (PharmD Track with Roseman University) B.S.

### Upper Division Biology Electives (17 credits)

<a href="#">BIOL 428</a>	Medical Gross Anatomy
<a href="#">BIOL 440</a>	Mammalian Physiology
<a href="#">BIOL 448</a>	Mammalian Physiology - Laboratory
PHAR 410	Fundamentals of Drug Action & Metabolism
PHAR 411	Fundamentals of Molecular Biology, Nucleotide Metabolism, and Pharmacogenomics
PHAR 422	Gastrointestinal, Genitourinary and Skeletal Muscle: Pharmacology and Medicinal Chemistry

### General Electives

General elective course credits are taken to complete the 120 credits needed for graduation.

PHAR 414	Drug Information and Literature Evaluation I
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### Upper Division Electives (11 Credits)

At least 9 credits of electives must be Upper Division courses.

PHAR 413	Hematology and immunology
PHAR 420	Neuropharmacology and Medicinal Chemistry

## B. PROGRAM IMPROVEMENT

### Program Assessment

The College is exploring an overhaul to our assessment system, but currently we incorporate two primary modes of assessment, with one emphasizing a deeper analysis of student learning (the Nichols method; Nichols & Nichols, 2005) and the other complementing this approach with a broader look at program elements. The former method is referred to as "Outcomes Assessment," (section IV.C. of this report) and the latter is identified as "Program Assessment." In the years between the biannual Outcomes Assessment, faculty examine programs at a broader level. This type of assessment includes a comprehensive report from Institutional Research of the program's "vital signs" (e.g., enrollment, retention, and graduation trends) as well as another method that is

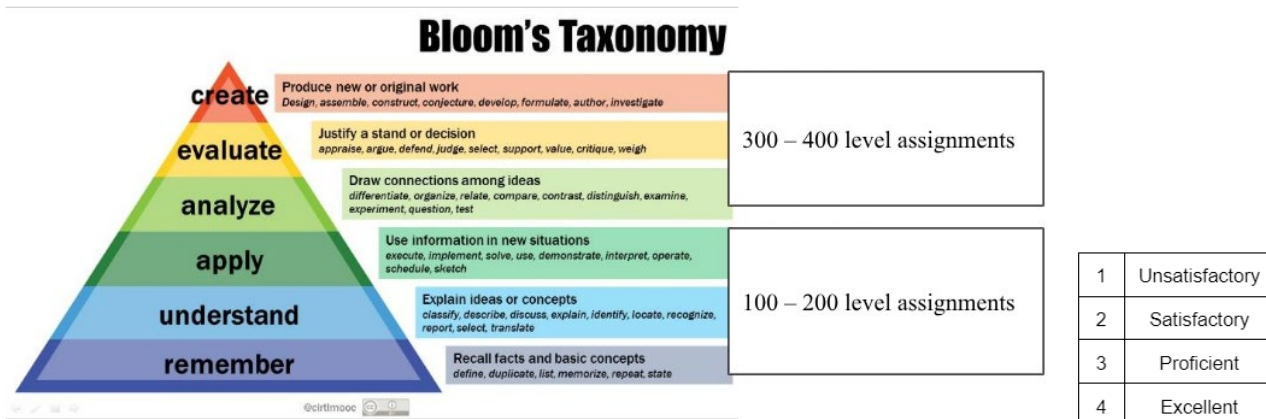
tailored to the unique needs of the program. To this end, faculty have implemented program assessments that include audits of assignment quality, student surveys of the program, alumni surveys, and reviews of syllabi across the curriculum.

The assessment plan for the Biology degree was revised in summer 2017, but was comprehensive to include the concepts assessed 2015 - 2016 in the plan below. The new format outlined when program outcomes would be assessed and which classes would be selected in the rotation. Each assessment year selected a core lower division course, a core upper division course and two elective courses identified in the curriculum (see Table 8). The evolution of the outcomes assessment rubrics is illustrated by comparing Figure 14 from 2018 and Table 9 from this past 2022 Biology Outcomes Assessment report.

**Table 9. Biology Assessment Plan (2017 - 2024).**

Year	Outcome	Question	3 Classes	Artifacts
2015	Scientific Literacy	Do the assignments meet scientific literacy for the course level?	190, 300, 405, 415	Syllabus, 1 Exam and 2 assignments
	Biodiversity	Do the assignments address biodiversity for the course level?	190, 300, 405, 415	Syllabus, 1 Exam and 2 assignments
2016	Cell as Foundation of Life	Are students improving?	209, 300, 453	1 assessment per course, assessments selected for analysis will be recommended by course instructors; n=8 student artifacts
		Have students achieved level mastery?		
2017	Scientific Literacy	Do the assignments provide evidence for implementing Tools of Science for the course level?	209, 300, 351, 453, 405	Syllabus, 1 Exam and 2 assignments
	Cell as Foundation of Life	Do the assignments reinforce the cells as a foundation of life for the course level?		Syllabus, 1 Exam and 2 assignments
2018*	Tools of Science	Are students improving?	191, 220, 433 or 441	1 assessment per course, assessments selected for analysis will be recommended by course instructors; n=8 student artifacts
		Have students achieved level mastery?		
2019*	Tools of Science	Do the assignments meet scientific literacy for the course level?	220, 415, 433, 440/448, 4xx	Syllabus, 1 Exam and 2 assignments
	Biodiversity	Do the assignments address biodiversity for the course level?		Syllabus, 1 Exam and 2 assignments
2020	No Assessment - COVID			
2021	Evaluated race, DFWI rates and progression to graduation for the department			
2022		Are students improving?		

	Scientific Literacy	Have students achieved level mastery?	190, 209, 415, 453	1 assessment per course, assessments selected for analysis will be recommended by course instructors: n=8 student artifacts
2023	Scientific Literacy	Do the assignments meet scientific literacy for the course level?	190, 209, 415, 405 or 453	Syllabus, 1 Exam and 2 assignments
	Cell as Foundation of Life	Do the assignments address biodiversity for the course level?		Syllabus, 1 Exam and 2 assignments
2024	Biodiversity	Are students improving?	220, 415, 441	1 assessment per course, assessments selected for analysis will be recommended by course instructors: n=8 student artifacts
		Have students achieved level mastery?		



**Figure 14. Biology Outcomes Assessment using Bloom's taxonomy and Rubric, 2017.**



**Table 10. Biology Outcomes Assessment Rubric, 2022.**

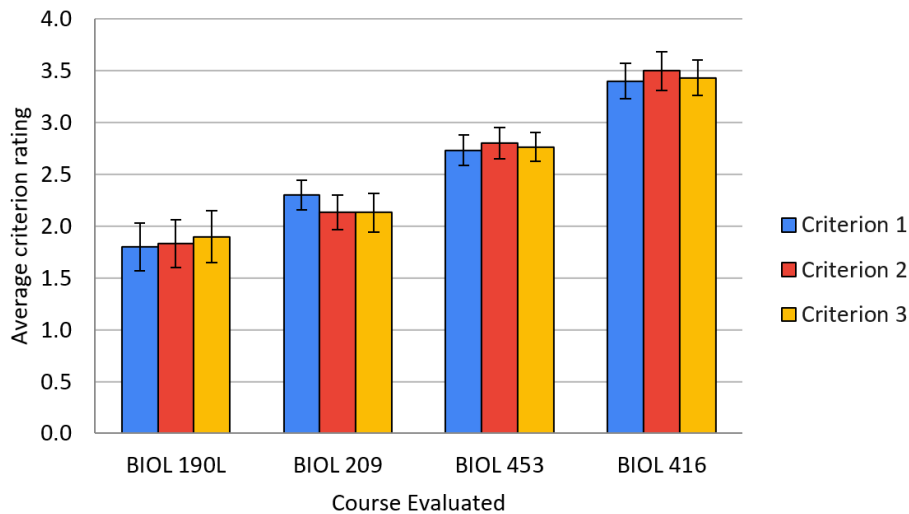
Program: BS-Biology

Committee Members: Kayla Bieser (chair), Vu Duong, Joe Dertien

Outcome: Students will develop scientific literacy

Guiding Question: Are students improving? Have students achieved level mastery?

	1 - Unsatisfactory	2 - Satisfactory	3 - Proficient	4 - Excellent
<b>Criterion 1</b> Students will demonstrate the use of scientific terminology and concepts in the proper context.	<ul style="list-style-type: none"> <li>Invalid or incomplete understanding</li> </ul>	<ul style="list-style-type: none"> <li>Valid Understanding</li> <li>One or more shortcomings</li> <li>Fairly thorough</li> <li>Acceptable writing &amp; critical thinking</li> <li>Poor evidence</li> </ul>	<ul style="list-style-type: none"> <li>Valid Understanding</li> <li>No major shortcomings</li> <li>Fairly thorough</li> <li>Good writing &amp; critical thinking</li> <li>Acceptable evidence</li> </ul>	<ul style="list-style-type: none"> <li>Valid Understanding</li> <li>No obvious shortcomings</li> <li>Thorough</li> <li>Very good writing &amp; critical thinking</li> <li>Good evidence</li> </ul>
<b>Criterion 2</b> Students discussion/narrative clearly distinguishes scientific facts and hypotheses from opinion supported by references.	<ul style="list-style-type: none"> <li>Invalid or incomplete understanding</li> </ul>	<ul style="list-style-type: none"> <li>Valid Understanding</li> <li>One or more shortcomings</li> <li>Fairly thorough</li> <li>Acceptable writing &amp; critical thinking</li> <li>Poor evidence</li> </ul>	<ul style="list-style-type: none"> <li>Valid Understanding</li> <li>No major shortcomings</li> <li>Fairly thorough</li> <li>Good writing &amp; critical thinking</li> <li>Acceptable evidence</li> </ul>	<ul style="list-style-type: none"> <li>Valid Understanding</li> <li>No obvious shortcomings</li> <li>Thorough</li> <li>Very good writing &amp; critical thinking</li> <li>Good evidence</li> </ul>
<b>Criterion 3</b> Students will be able to interpret/analyze and communicate about data in	<ul style="list-style-type: none"> <li>Invalid or incomplete understanding</li> </ul>	<ul style="list-style-type: none"> <li>Valid Understanding</li> <li>One or more shortcomings</li> <li>Fairly thorough</li> </ul>	<ul style="list-style-type: none"> <li>Valid Understanding</li> <li>No major shortcomings</li> <li>Fairly thorough</li> <li>Good writing &amp; critical thinking</li> </ul>	<ul style="list-style-type: none"> <li>Valid Understanding</li> <li>No obvious shortcomings</li> <li>Thorough</li> <li>Very good writing &amp; critical thinking</li> </ul>



**Figure 15: Average ratings for assessing scientific literacy in the biology program. Error bars = standard error of the mean.**

**Application of Assessment findings**

Results from Annual Biology Program Assessments are stored in a shared folder that all Biology faculty have access to and are reported out in the Physical and Life Sciences Canvas course for the department. In 2017 it was evident that students needed additional support to adequately meet Scientific literacy and as of 2022 students are showing improvement, Figure 15 with a more critically developed assessment rubric.

The most recent assessment highlighted the need for standardized artifact criteria so that classes can be compared directly, for example a literature review paper versus a single research paper synopsis do not align to the same rubric criterion. Specific recommendations from our most recent assessment are:

The following recommendations are based on our assessment of student artifacts across the biology program:

- Incorporate general computer skills into first year experience. This would include creating, naming, and saving documents, accessing, and using Microsoft products such as Word, and uploading the correct file types to canvas. These are skills required beyond the biology program.
- A longer-term goal would be to design and incorporate a scientific writing course into the curriculum or have this incorporated into a STEM specific first-year experience (FYE) course. A STEM specific FYE course would greatly enhance the proficiency of students entering STEM programs and likely improve retention.
- Refining assignments to better address students' own writing and usage of multiple primary sources. Assignments should ask students to synthesize from multiple sources as they reach upper-level courses. This is in contrast to two of the assessed assignments where students evaluated a single paper (BIOL 290 and BIOL 453) making it difficult to accurately assess our criterion.
- Ideally, we would include core classes at all levels for assessment. This assessment round, we were only able to pick an assignment from upper-level elective courses due to pandemic related changes in content.
- Encourage or require students to utilize the writing center.
- Create a standardized scientific writing module in canvas which could be copied into multiple courses.
  - This would help all faculty in establishing a shared set of standards across the program and help students recognize that the standards are consistent across the sciences.
  - The guidelines could progress as students advance through their degree.
  - Possibly collaborate with the writing center and/or the library in the creation of this module. There is currently a module for finding scientific references, but nothing in relation to the scientific writing process.
  - Utilize the existing Handbook in coordination with freely available web resources.
    - <https://esajournals.onlinelibrary.wiley.com/doi/full/10.1002/bes2.1258>
    - <https://journals.physiology.org/doi/full/10.1152/advan.00004.2017>
    - CSE manual for citations: <https://www.scientificstyleandformat.org/Home.html>
    - [https://owl.purdue.edu/owl/research\\_and\\_citation/using\\_research/resources\\_for\\_documenting\\_sources\\_in\\_the\\_disciplines/complete\\_discipline\\_listing.html](https://owl.purdue.edu/owl/research_and_citation/using_research/resources_for_documenting_sources_in_the_disciplines/complete_discipline_listing.html)
    - Boston University has created a guide with lessons for students with specific examples for biology, chemistry, and science in general. Adapting to canvas modules may make it more accessible for our students and faculty. <https://www.bu.edu/chemed/files/2021/02/UG-Guide-Writing-Sciences-v0.9.pdf>

## VI. EVALUATION OF RESOURCES

### A. Library Resources

- The Marydean Martin Library is an 8,000 ft<sup>2</sup> facility in the Rogers Student Center that provides 16 desktop computers (with additional laptops for loan), seating for 174 students, 14 collaborative work spaces, and in-person assistance with research and technology questions. The Library's collections model emphasizes easy discovery and retrieval of materials in a wide variety of formats. The Library provides access to approximately 100,000 journals and serials, 1.5 million e-books, and 10,000 streaming video and audio materials. The predominately digital collection allows for easy remote access to the majority of the library collection. Within Canvas (the campus LMS), instructors can easily link to appropriate library resources.
- Library staff regularly monitor statistics on the use of online information resources, including cost effectiveness and patterns of use. Periodically, subscriptions are canceled or added in order to adjust to the addition or growth of programs and to the research and teaching needs of new faculty. Interlibrary Loan data are regularly examined to determine the items that are most frequently requested and to make purchasing decisions accordingly.
- Academic journals are among the most important resources for our students and faculty, and the NSC library provides access to key databases in the field. These include ScienceDirect, BioMed Central, JSTOR, and PubMed.

### B. Computer Resources

- The Office of Information & Technology Services (ITS) maintains and supports computer labs, general-use workstations, and kiosks. NSC provides approximately 470 student workstations that offer access to the internet, printing, Microsoft Office, and specialized software such as SPSS and Adobe Creative Suite. Additional equipment is available for checkout at the library, including laptops, Chromebooks, iPads, Kindle readers, and video cameras. A student technology fee is allocated annually to support a 5-year replacement plan for all classroom, lab, and general-use student workstations. This replacement plan ensures that student workstations are never more than 5 years old. The technology fee also supports upgrades to classroom audio/visual systems, software, and infrastructure.
- Each full-time employee is provided with at least one desktop workstation or laptop and resources such as the internet, network file storage, printing, Microsoft Office, and, as needed, specialized software such as Camtasia, SPSS, or the Adobe Creative Suite. Laptops, tablets, and projectors are available for checkout. All campus workstations, including those in open computer labs and spaces, are available for use by NSC faculty and staff. Funds are allocated annually to support a 5-year replacement plan for all faculty and staff workstations.
- ITS maintains a wide area network in all buildings across the main campus. The internal core network runs at 10 Gb/s with 1 Gb/s connectivity to end devices. Both a guest and secured wireless connection is available at all facilities to provide connectivity for mobile devices. Internet connectivity for the campus is provided by the NSHE's statewide network, NevadaNet, providing speeds of up to 10 Gb/s.
- NSC's data center infrastructure consists of a Nutanix virtual server environment. This infrastructure supports over 70 virtual machines running on 4 physical hosts with approximately 50 terabytes of disk storage. Server infrastructure equipment is configured with multiple layers of redundancy and is housed between two campus data centers. Data center, core network, and telecommunication infrastructure is refreshed on a 10-year replacement cycle.
- NSC takes a cloud-first approach for enterprise applications in order to reduce staffing needs and eliminate the costs for acquiring, maintaining, and upgrading hardware and software. Through a single sign-on online campus portal, NSC's enterprise applications are accessible 24/7 from anywhere in the world. This provides faculty, staff, and students with access to electronic resources to support management and operational functions, academic programs, and support services, wherever offered and however delivered.

### ***C. Facilities & Instructional Equipment***

- While NSC has expanded its physical facilities significantly in recent years, securing sufficient space continues to be a challenge, given the College's rapid growth. Current facilities are adequate to meet current demands for instructional space, employee offices, and other uses. Program growth will require additional space for classrooms, science labs, research facilities (including equipment and materials storage), employee offices, and open spaces for studying and student activity.
- Every classroom at NSC is configured as a smart classroom with instructor workstations, projection systems, wireless connectivity, document cameras, and interactive touch devices that permit instructors to write digitally on a board or computer monitor. Over 40% of classrooms have lecture capture systems that allow instructors to record lectures, demonstrations, and clinical simulations. Video conferencing is available through online conferencing tools such as BlueJeans, Microsoft Teams, and Zoom. The campus has adopted Canvas as the learning management system.
- The Office of Instructional Technology has invested in in-person and online training opportunities and online technology workshops and real-time instructional resources. This ensures that faculty can receive the type of training that best fits their preferences, needs, and skills. Web-accessible resources ensure that course design and development assistance is available wherever faculty need it. Instructional Technology and Center for Teaching and Learning Excellence (CTLE) staff provide one-on-one consultations on course development, instructional design strategies, assessment methods, course communication, online course management, and the use of media and live lecture materials.
- NSC provides laboratory equipment that makes learning relevant to current industrial standards as well as future trends. Biology lab spaces are outfitted with equipment such as table-top refrigerated centrifuges, heated incubators, a deionized water station, and multiple classroom sets of high-end Motic digital microscopes with the capability to function with cameras. The College has two fluorescent microscopes, including one compound and one inverted microscope. Chemistry labs have eight dual-sided fume hoods with workstations that allow 32 students at a time to work safely. For lab preparation, two autoclaves, a large industrial dishwasher, two -80-degree Celsius freezers, three -20-degree Celsius freezers, and three 4-degree Celsius refrigerators are available. The College has a high-capacity Sorval Legend XTR centrifuge capable of spinning flow cytometry tubes. Molecular research uses both a Nanodrop spectrophotometer and a Qubit system for nucleic acid quantification, as well as multiple centrifuges, gel-rigs, and transilluminators for nucleic acid extraction, amplification, and visualization, including a LiCor imaging system. A Bio-Rad CFX96 Real-time System is available for quantitative PCR reactions, while a COY anaerobic chamber is used for culturing and measurements taken under anoxic conditions. Similar investments have been made for chemistry; NSC owns powerful high-performance liquid chromatography (HPLC) and gas chromatography (GC) instrumentation, a mass-spectrometer, ultraviolet-visible (UV-Vis) spectrophotometers, a HORIBA FluoroMax 4 scanning fluorometer, an infrared (IR) spectrophotometer, and a PicoSpin nuclear magnet resonance (NMR). The College maintains two biological biosafety hoods and has a designated BSL2 laboratory.
- Field instrumentation includes a YSI sondes, YSI Pro ODO meter, HACH HQ11D conductivity/pH probes, HACH DR1900 field spectrophotometer, and a Marsh McBirney Flo-Mate 2000. Field collection methods include 2 Malaise traps, a field-spotting scope, 30 pairs of binoculars, a soil auger, a soil hydrometer, a portable weather station, soil temperature probes, and handheld GPS devices. Two portable heat sensors and bat-call detection devices are used with phone apps for data collection. Faculty also have access through collaboration with the DRI to a FieldSpec 3 Spectroradiometer for field measurements of object spectra.
- One dedicated research laboratory. As we have grown in faculty numbers, student numbers, research grants, and acquiring equipment this space is no longer sufficient to meet the growing needs of the Biology department. This lab was outfitted from NIH INBRE funds and serves both curricular and research needs.
- Lack of service contracts and equipment repair budget to maintain lab equipment used for training students. Examples include: four Beckman Coulter PA800 capillary electrophoresis machines, an Amnis imaging flow cytometer that performs high-throughput cellular microscopy and standard flow cytometric spectral analysis of cells, the Gas Chromatography Mass Spectrophotometry, Fluorescent

Spectrophotometer, BD Accuri Flow Cytometer were purchased, but are no longer functional due to the inability to cover service contracts with student fees or indirect grant funds.

#### ***D. Non-academic Services***

- **Academic Advising**

Since 2013, the Academic Advising Center has nearly quadrupled its number of professional Advisors from three to eleven, restructured the center to establish a Director of Advising, and created two additional leadership positions within the office, the Associate Director of Academic Advising and Student Success Initiatives, and the Advising and Completion Manager. Equipped with these resources, the AAC has been integral to the implementation of several NSHE projects (e.g., 15-to-Finish; continuous enrollment in gateway math and English) and has enforced semester-by-semester mandatory advising for all degree seeking students with fewer than 90 credits.

This substantive investment in a comprehensive model of advising reflects both our commitment to student success and our belief that close guidance and mentorship can help our students achieve their highest potential. Owing to this expansion in capacity, the AAC assumed a number of key responsibilities, including oversight of our 15-to-Finish campaign, and continuous enrollment in college math and English. Moreover, to increase the probability of student success, mandatory advising is applied to specific populations and enforced through registration holds. The presence of a hold and the need to meet with an advisor are communicated to students via email and through a notification in PeopleSoft.

The AAC has established a team model where advisors serve on one of three advising teams: Liberal Arts, STEM (including Pre-Nursing), and Education/Pre-Education/Pre-Speech Pathology. The team model allows students to receive timely advising appointments. Each advisor is responsible for advising students on matters related to their academic success, including academic standing, Satisfactory Academic Progress for financial aid recipients, and adherence to NSHE policies related to remedial math (see NSHE Handbook 4.16.1). Advisors at all levels understand that a high proportion of our students come from nontraditional, first-generation backgrounds, and they remain vigilant in directing students to resources and experiences that may be unfamiliar to our students (e.g., supplemental instruction; the importance of research experience for those planning to apply to graduate school).

- **Academic Success Center**

The Academic Success Center (ASC) provides academic guidance and enhanced learning skills through peer-to-peer support and evidence-based initiatives, while leading students toward independent learning. The ASC provides free in-person and online tutoring services to all enrolled students. Online tutoring services are available 24 hours a day, 7 days a week, and through a concerted marketing effort, usage of these services has increased substantially. The ASC works with faculty to ensure tutors have access to key course materials (syllabi, lecture slides, etc.) that assist tutors in designing tutoring sessions and ensure consistency in the information students receive. The ASC also provides embedded peer-led Supplemental Instruction and conducts metacognition and learning strategy workshops for College Success courses.

- **Disabilities Resource Center**

The Disabilities Resource Center (DRC) provides eligible students with accommodations and services. The DRC recently implemented an online case management program that allows for more efficient and easier tracking of all DRC notifications and documentation. The DRC Director has also increased students' access to assistive technologies such as Read & Write, which is available to all NSC students for free. DRC staff train DRC students on how to use these assistive technologies, which can greatly enhance their academic success.

- **Student CARE Team and Counseling Services**

The Student Concern, Assessment, Referral, and Education (CARE) Team promotes students' wellbeing and success. The CARE Team consists of a full-time case manager, faculty representatives from each school, and staff members from key units (e.g., Financial Aid, the Academic Advising Center). Faculty and staff may refer any student who is in distress or otherwise poses a concern, and students may also self-refer. The CARE Team connects students with resources such as advising and tutoring; it also manages a food pantry and donated funds that can be used to cover emergency costs, psychological or disability assessments, or other needs. The College contracts with a private mental health provider and also employs one full-time staff member to offer free on-campus mental health services. Students receive several free sessions, and if longer-term therapy or other services are required, the case manager works with the student and recommendations from the therapists to connect the student with providers in the community who are covered by their insurance or accept sliding-scale fees.

- **Career Services Center**

The Career Services Center (CSC) organizes career fairs, mock and real interviews, resumé reviews, and other workshops that help students prepare for the job market. The CSC also offers students the opportunity to search for jobs through Handshake.

- **Financial Aid**

Financial aid programs at Nevada State College are directly aligned with our mission. Information about available financial aid programs is published on the NSC website and is discussed extensively at New Student Orientation. In addition to face-to-face and phone counseling, the Office of Financial Aid engages in extensive outreach to campus promoting financial aid and scholarship opportunities, and periodically conducts workshops on financial management and minimizing indebtedness. NSC provides each student with a membership to Financial Awareness Basics, an online, interactive financial literacy program maintained by the Educational Credit Management Corporation (ECMC). A library of topical videos and a chatbot also are available through Financial Aid TV (FATV) on the NSC website.

Generally, the number of aid packages has kept pace with our enrollment growth. Additional insight comes from an examination of the aid granted to IPEDs students, which can be compared to the data for our peer institutions. These data show that, starting in 2012–13, a greater proportion of NSC's first-year full-time students have received grants than those students at our comparison institutions (Figure 4B-7), with over 80% of our incoming IPEDs cohort receiving grant aid in every year of this accreditation cycle.

While DACA/undocumented students are not eligible for federal financial aid, they do qualify for some state and institutional scholarships if they graduated from a high school or community college in Nevada. NSC also partners with TheDream.US to provide scholarships to undocumented students.

## VII. INFORMATION PROVIDED BY THE DEAN

### ***A. Discipline-Specific Accreditation Status***

N/A

### ***B. Resource Analysis***

Necessary resources specific to the Biology program have been noted at various places in the self-review above and in the final summary below. The following resources appear to be a priority:

- More research laboratory space is needed.
  - The greatest barrier to Biology's ability to offer more research experiences to students is due to infrastructure needs. We have 1 dedicated research lab for 22 full-time science faculty. Faculty have been creative in utilizing CUREs to expose more students to research and exploring more field

research opportunities, but ultimately additional lab spaces are needed for our faculty to offer more research opportunities for our students.

- Very few qualified part-time instructors are in the area.
  - Although we have been successful at recruiting talented faculty, there is not a large STEM industry in the valley to pull in biology faculty for part-time employment. In fact, a strength of the biology program is the staffing of full-time faculty in all biology core courses but as we grow we are starting to struggle at staffing these courses without additional faculty particularly in the fields of cellular and molecular biology.
- Transport vans and field resources needed.
  - Lack of transport vans / field resources to support student work for field experiences in courses such as: Ecology, Limnology, Plant Biology, Ornithology, Field Ecology, Entomology, and Bioremediation.

While NS has expanded its physical facilities significantly in recent years, securing sufficient space continues to be a challenge, given the University's rapid growth. Current facilities are adequate to meet current demands for instructional space, but space is very limited for faculty and staff offices. Program growth will require additional space for classrooms, science labs, research facilities (including equipment and materials storage), employee offices, and open spaces for studying and student activity.

### ***C. Student Success Data***

Over the past review cycle, enrollment of Biology majors has gradually increased from 2012 (272) to 2019 (374). Since 2020, enrollment has started to slowly decline, likely due to pandemic effects (to 284 in 2022). Currently (2022), the majority of Biology majors have been women (68%), Hispanic (55%), and first generation (52%). One parameter in which Biology majors differ from the NS population is academic load. Percentage of Biology majors taking a full academic load has ranged from 35% to 46% between 2012 and 2022, while the percentage of total NS students taking a full academic load ranged from 29% to 37% during that same time. Additionally, since 2018, the majority of biology majors have been first year students (46-47%), while other NS programs are majority transfer students (52-55%). One-year retention rates of Biology students ranged from 55% to 71% from 2011 through 2022. Overall six-year graduation rates ranged from 35% to 51% between 2010 and 2020. Lastly, there has been gradual improvement of GPA scores in graduating Biology students, plateauing around 3.3-3.4 over the past three years.

## **VIII. IMPROVEMENTS SINCE LAST REVIEW**

### ***A. Improvements***

Several representative improvements made during the current review cycle include:

- The assessment plan for the Biology degree was revised in summer 2017. It examined outcomes using Bloom's taxonomy in addition to a clear rubric.
- In a 2022 assessment, it was found that students had improved in the metric of scientific literacy based on a rubric of key criteria.
- A new 3+1 articulation agreement and degree pathway was created in collaboration with Roseman University School of Pharmacy.
- Faculty have been creative in utilizing CUREs to expose more students to research and exploring more field research opportunities.
- Establishment of the Mentoring to Accelerate Retention and Change Outcomes in Science (MARCOS) Program for biology student scholarships, retention efforts, advising and faculty mentorship. 70% of the first MARCOS Scholar cohort graduated in spring 2022 in only 4 years.

## IX. FINAL SUMMARY & IMPROVEMENT PLAN

*Below are key recommendations and actions to be taken that achieve these recommendations:*

- Investigate and identify a mechanism to financially maintain laboratory equipment
  - 1) The institution needs to begin serious dialogue about gaining access to indirect grant funds to maintain classroom equipment for student use. To date, the department has been very successful obtaining grants to purchase equipment, but cannot keep the instruments functional over the course of time without expert support.
  - 2) Examine possible usage of service contracts and/or equipment repair budgets to maintain lab equipment used for training students. Examples include: four Beckman Coulter PA800 capillary electrophoresis machines, an Amnis imaging flow cytometer that performs high-throughput cellular microscopy and standard flow cytometric spectral analysis of cells, the Gas Chromatography Mass Spectrophotometry, Fluorescent Spectrophotometer, BD Accuri Flow Cytometer were purchased, but are no longer functional due to the inability to cover service contracts with student fees or indirect grant funds.
- Pursue the following recommendations established by the assessment committee in the most recent (i.e., 2022) assessment of student artifacts:
  - 1) Design and incorporate a scientific writing course into the curriculum or have this incorporated into a STEM specific first-year experience (FYE) course. A STEM specific FYE course would greatly enhance the proficiency of students entering STEM programs and likely improve retention.
  - 2) Refining assignments to better address students' own writing and usage of multiple primary sources. Assignments should ask students to synthesize from multiple sources as they reach upper-level courses. This is in contrast to two of the assessed assignments where students evaluated a single paper (BIOL 290 and BIOL 453) making it difficult to accurately assess our criterion.
  - 3) Encourage or require students to utilize the writing center.
  - 4) Create a standardized scientific writing module in canvas which could be copied into multiple courses.