El Camino Community College

PROGRAM REVIEW 2019

NATURAL SCIENCES DIVISION

LIFE SCIENCES

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SECTION 1
Overview of the Program

A) Provide a brief narrative description of the current program, including the program's mission statement and the students it serves. Also include in this section any program highlights and/or accomplishments, as well as the most critical needs of the program.

The mission of the Life Sciences department is to meet the educational requirements of our students to transfer to four-year universities and acquire an AA or AS degree that will enhance their career opportunities and academic success. It is committed to provide its students with a positive learning experience and ensure student success.

The program includes courses in anatomy, microbiology, and physiology that are core subject areas for all the major health care fields. These courses also fulfill lower-division requirements for science majors to transfer to a four-year university. However, the awarding of a Pre-Health degree on successful completion of the program would have a far stronger positive impact on future career opportunities for our students. In addition to providing a comprehensive set of educational opportunities, the Life Sciences program offers a wide array of campus activities such as science club, STEM activities, and Onizuka Space Science Day.

A well-qualified faculty maintains high academic standards by providing additional student support services like tutoring and open labs. Owing to the diverse population served by our college with most being underprepared students for the rigorous courses of this program, faculty believes that there is a critical need to add a one-unit introductory course as a prerequisite for Anatomy-32. The inclusion of this course will help pave the path for success in these rigorous courses in an equitable manner for all students. Additional support in the form of Supplemental Instruction while taking these difficult courses is also much needed.

The Life Sciences program has one of the highest enrollment rates, yet faculty continue to turn down students due to a limited number of classrooms and labs. Moreover, the present state of the laboratories is inadequate to cater to the needs of our students. Major setbacks in this regard include an inadequate number of anatomy models, low tech resources and the absence of a cadaver. To prepare our students for today's high-tech healthcare industry, it is imperative to integrate technology into our curriculum. While other community colleges are employing state-of-the-art technologies, for instance, virtual dissection table and 3D anatomy apps, success and retention rates of our program continue to be hampered due to lack of these resources. Implementing these high-tech devices will not only equip our students with the necessary tools to succeed in this program but will also drastically reduce the cost of their textbooks.

To close the achievement gap and attain excellence in student learning it is crucial that factors contributing to racial disparity are duly addressed and resolved. A few of these have been highlighted here and are further elaborated in the related sections.

B) Describe the degrees and/or certificates offered by the program.
Life Sciences program does not offer a degree or a certificate. It is strongly recommended to offer a Pre-Health AS degree on successful completion of the Life Science Program. A Pre-Health degree would not only satisfy the transfer needs of our students but at the same time will allow our students to become competitive candidates in health care occupations like medical assistant, dental assistant, phlebotomist or pharmacy technician.

STRATEGIC INITIATIVES

1. **Student Learning:**
   The Life Science department continues to incorporate instructional strategies that enhance student success. Giving students hands-on experience through dissection of animals and study of anatomy models remains the mainstay of the program. In addition, wet labs and simulated labs in microbiology and physiology reinforce the concepts learned in lectures.

2. **Student Success and Support:**
   The Life Science Department offers academic support to its students outside of class by providing open lab hours. However, additional services in the form of Supplemental Instruction are needed to improve student success. Our faculty are making use of workshops like Equity-Minded Teaching Institute, aimed at providing tools to instructors to help achieve equitable outcomes.

3. **Collaboration:**
   The Life Sciences department teams with other departments of Natural Sciences Division for ECC STEM Superstars Day and Onizuka Space Science Day that are held annually. We collaborate with the Learning Resource Center to provide academic support to our students in the form of tutoring.

4. **Community Responsiveness:**
   Faculty of Life Sciences department actively participates in community outreach programs. This includes partnering with the Leuzinger High School CARS Program (College Access, Readiness & Success) a non-profit that focusses on low-income, underserved students interested in STEM, along with other departments. On Onizuka Science Space Day, our faculty holds workshops for middle and high school students to inspire and evoke their interest in science.

5. **Institutional Effectiveness:**
   The Life Sciences Department participates in assessment of students, program review and student learning outcomes. Most students taking these courses are underprepared students who have not taken any science class in high school. This highlights the need for an introductory one-unit course for students who take General Human Anatomy (Anatomy-32) as there is no prerequisite for this course. Additional support in the form of SI is also highly recommended to achieve equitable outcomes for all students.

6. **Modernization:**
   There has been rapid technological advancement in the health care industry and as a result, the list of skills that our students need to develop to adapt to these changes is also growing. Current technological resources available in our department are below par. To support our students in achieving academic excellence, acquisition of a virtual dissection table, a cutting-edge technology is highly recommended. It will allow our students to experience dissection of a virtual cadaver and learn in an interactive manner. A virtual dissection table is helping not only students but medical professionals in diagnosing, treatment planning and patient care. Another option is procurement of a site license for a 3D anatomy app which is very similar to the virtual cadaver except that it is on a computer instead of a dissection table.

C) Discuss the status of recommendations from your previous program review.

1. **Recommendation:** Acquire an alarm system to indicate if and when the Cadaver Refrigerator shuts down.
   Status: On hold
   Notes/Comments: After the loss of two cadavers in Fall 2015, due to failure of the cold room refrigeration there has been no replacement. New cadavers cannot be obtained until a formaldehyde health and safety plan is in effect, ventilation facilities have been improved, and our refrigeration facilities are made reliable.

2. **Recommendation:** Facility improvements, such as better ventilation in the LS lab rooms.
   Status: On hold
   Notes/Comments: Better ventilation continues to be a problem but due to meagre funds this issue has not been rectified.

3. **Recommendation:** Purchase enough microscopes to be able to standardize the types of microscopes being used in each classroom.
   Status: Active
   Notes/Comments: For anatomy and physiology, microscopes are standardized but microbiology still needs microscopes to achieve an equitable outcome.

4. **Recommendation:** Purchase more models and equipment for the Anatomy and Physiology courses.
   Status: Active.
   Notes/Comments: There is a constant need to repair old anatomy models and buy new ones to provide access to all students. This has a direct impact on student success.

5. **Recommendation:** Provide faculty compensation for cadaver dissection.
   Status: On hold.
   Notes/Comments: After the loss of the human cadaver in 2016 no new cadaver has been bought. But when it becomes available in the future, the faculty involved in the meticulous process of dissection must be compensated.

6. **Recommendation:** Construction of additional laboratory classrooms.

Status: Active.
Notes/Comments: Over the past eight years, there has been a consistent increase in the number of sections for these courses each semester. This has led to an increase in the annual enrollment rate. However, without a parallel increase in the classrooms, labs, and lab equipment, this has led to a hindrance in achieving equitable outcomes. Over enrollment by the faculty to meet the high student demand has compounded the problem. As a result, the program has not grown over the past 8 years and its success and retention rates, continue to remain low.

7. **Recommendation:** A lot more money to be available for tutoring and supervision.
Status: Active.
Notes/Comments: Tutoring funds for both anatomy and physiology are provided through the learning resource center or through the instructor funds which would normally be used for graders or student lab aides. These funds are usually used for Open Labs. However, they are extremely limited and fail to adequately fund the open labs. In addition, these limited funds make it very difficult to acquire qualified tutors. It presents as a major impediment to our achieving SLOs.

8. **Recommendation:** Do the necessary research needed to establish an English prerequisite for targeted courses.
Status: Active
Notes/Comments: Many community colleges require English as a prerequisite for health science courses. As many of our students taking these courses are underprepared to take these rigorous courses, it is compelling that English be included as a prerequisite for these courses to achieve equitable outcomes for all students.

9. **Recommendation:** Schedule combined meetings with the Nursing and Allied Health Faculty
Status: Active.
Notes/Comments: Our attempt to meet regularly with the Nursing faculty has not met with much success. Due to frequent off campus clinical visits of the Nursing faculty there is conflict with our schedule.

SECTION 2
Analysis of Research Data

A) Head count of students in the program shown as total number of students enrolled each year with the four-year average.

TABLE 1:

Years	2014-2015	2015-2016	2016-2017	2017-2018	4-Year Average
Students Enrolled	1,967	1,952	2,006	2,080	2,001.25

Annual enrollment for the Life Sciences Department shows a slight increase with a 4-year average of 2,001.25 students during the 2014 - 2018 academic period. This increment in the enrollment rate can be attributed to an increase in the number of course offerings. According to the 2018 Student Success Scorecard, El Camino College served 33,208 students. Thus, the Life Sciences program served 6.3% of that total. However, we cannot continue to increase our enrollment without a new building, more classroom space, and more lab technicians.

B) Course grade distribution is presented by the total number of students achieving each letter grade of A through F including W across the 2014 - 2018 academic period.

TABLE 2: Course Grade Distribution for all 4 years

Course	Total # Sections/ Sessions	A	B	C	D	F	W
Anatomy 30	12	181 (16%)	214 (19%)	279 (26%)	66 (6%)	54 (5%)	341 (30%)
Anatomy 32	14	441 (16%)	658 (24%)	467 (17%)	159 (6%)	135 (5%)	858 (32%)
Anatomy 34A	12	127 (16%)	166 (21%)	150 (19%)	82 (10%)	55 (7%)	206 (26%)
Anatomy 34B	8	88 (20%)	139 (31%)	104 (23%)	43 (10%)	14 (3%)	59 (13%)
Microbiology 33	12	250 (18%)	372 (26%)	332 (24%)	62 (4%)	39 (3%)	353 (25%)
Physiology 31	12	308 (21%)	440 (31%)	273 (19%)	57 (4%)	54 (4%)	304(21%)

The data reflects a 4-year total percentage of each letter grade given in each course for this program. Most courses had 12 sections for the 4 years, except Anatomy 32 and Anatomy 34B. In all courses, except for Anatomy 30, a B letter grade had the highest percentage of grades assigned. In all courses, an F letter grade was the lowest percentage of grades assigned. Between 16% - 21% of students earned A's and 17%-26% earned C's. A faculty member is of the view that this may reflect that grade inflation is not occurring. The high number of withdrawals is concerning and can be attributed to the challenging nature of these courses and an underprepared student body. Student surveys show that many of these students are working more than 20 hours

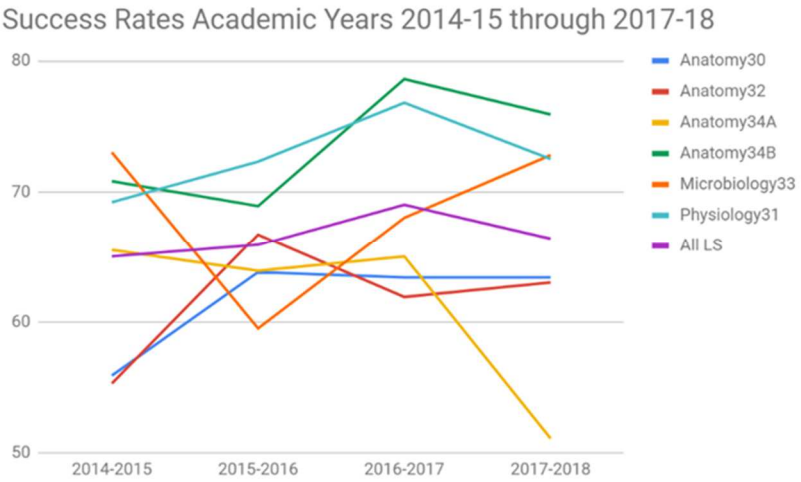
a week and are also enrolled in other classes. Balancing work with these difficult courses is not easy, especially when students are expected to put in at least 20 hours of studying time outside of class.

C) Success rates are presented by academic year and individual semesters. All success rates are the average for the time period covering the academic years 2014 - 2018. The institutional average success rate is **71.6%.** In addition, success rates are presented across the semesters/sessions for comparison to the time of year the course is taken.

TABLE 3: Yearly Success Rates for all courses in the Life Sciences Department

Course	2014-2015	2015-2016	2016-2017	2017-2018	Course Average 2014-2018
All Life Sciences	65.0%	65.9%	69.0%	66.4%	66.5%
Anatomy 30	55.9%	63.8%	63.4%	63.4%	61.6%
Anatomy 32	55.3%	66.7%	61.9%	63.0%	61.7%
Anatomy 34A	65.5%	63.9%	65.0%	51.1%	61.4%
Anatomy 34B	70.8%	68.9%	78.6%	75.9%	73.5%
Microbiology 33	73.0%	59.5%	68.0%	72.8%	68.3%
Physiology 31	69.2%	72.3%	76.8%	72.5%	72.7%

FIGURE 1:



1. Given the data in Table 3 and Figure 1, what are the trends observed?

Average success rates in the Life Sciences Program show a slight increase over the four years with the greatest increment in 2016-2017, that may be explained by the highest enrollment rate of the program during that school year. The overall success rate of the program (66.2%) is low compared to the institutional success rate (71.6%). The most likely explanation for this

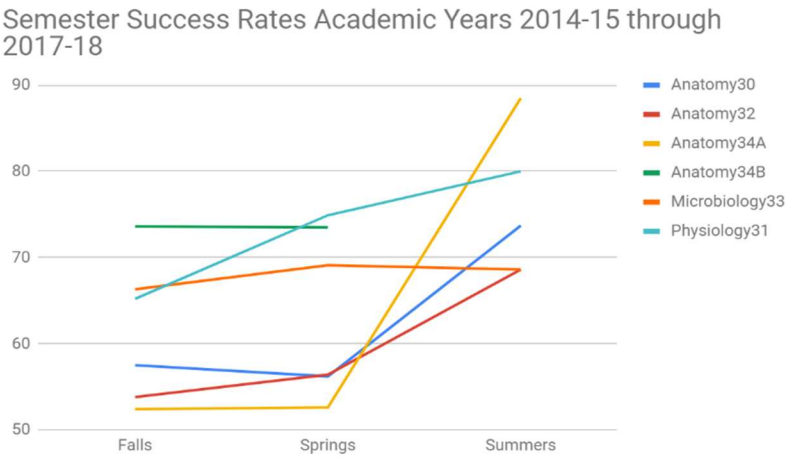
disparity is the rigorous nature of these courses, and that most of the students enrolling in these classes are underprepared. This argument is also supported by the higher success rates for courses with prerequisites, like Anatomy 34B and Physiology 31, compared to courses with no or few prerequisites like Anatomy 30 and Anatomy 32. Interestingly microbiology shows the greatest variation in the success rate, and the same trend was seen in the previous program review. During 2017-18 there is a marked drop in the success rate for Anatomy 34A. There appears to be no obvious reason other than a cohort of unprepared students. All instructors teaching this course during that year had a low success rate.

TABLE 4: Semester Success Rates

Course	Falls	Winters	Springs	Summers
Anatomy 30	57.5%	-	56.2%	73.7%
Anatomy 32	53.8%	77.7%	56.4%	68.6%
Anatomy 34A	52.4%	-	52.6%	88.5%
Anatomy 34B	73.6%	-	73.5%	-
Microbiology 33	66.3%	-	69.1%	68.6%
Physiology 31	65.2%	-	74.9%	80.0%

Dashes represented courses not offered during those sessions.

FIGURE 2:



1. Given the data in Table 4 and Figure 2, what are the trends observed?

When comparing each session's success rates, the values are approximately similar for fall and spring semesters in five out of six courses. Only one course, Anatomy 32, is taught during winter and it has its highest success rate during this period. Interestingly most of the courses show higher success rates during summer except for Microbiology 33 that does not show any significant change. Identifying the factors that lead to these higher success rates could help in modifying our strategies to achieve the same outcome in other semesters. Some possible explanations for this disparity may be that students are taking only one class during the session,

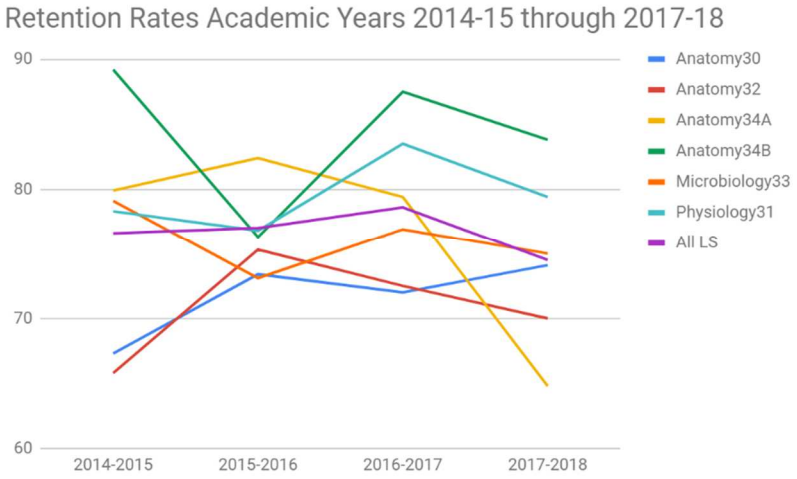
they are better prepared, or they are more experienced. Another possible cause is that life events are less likely to hinder students from studying during a short time frame.

D) Retention rates – presented as academic year and individual semesters. All retention rates are the average for the time period covering the academic years 2014 - 2018. The institutional average retention rate is **84.1%.** In addition, retention rates are presented across the semesters/sessions for comparison due to time of year the course is taken.

TABLE 5: Yearly Retention Rates

Course	2014-2015	2015-2016	2016-2017	2017-2018	Course Average 2014-2018
All Life Sciences	76.6%	77.0%	78.6%	74.5%	77%
Anatomy 30	67.3%	73.4%	72%	74.1%	72%
Anatomy 32	65.8%	75.3%	72.5%	70.0%	71%
Anatomy 34A	79.9%	82.4%	79.4%	64.8%	77%
Anatomy 34B	89.2%	76.3%	87.5%	83.8%	84%
Microbiology 33	79.1%	73.1%	76.9%	75%	76%
Physiology 31	78.3%	76.8%	83.5%	79.4%	80%

FIGURE 3:



1. Given the data in Table 5 and Figure 3, what trends are observed?

Each course in the Life Science program shows a variation in the retention rates during the overall four years. The overall retention rate for the Life Science program is, however, low at 77% compared to the institution retention rate which is 84.1%. It is notable that most of these courses are prerequisites for highly competitive programs like Nursing. Students who do not attain an A or a B grade in these courses have a slim chance of getting into such competitive programs and therefore drop leading to a lower retention rate. The retention rates for Anatomy

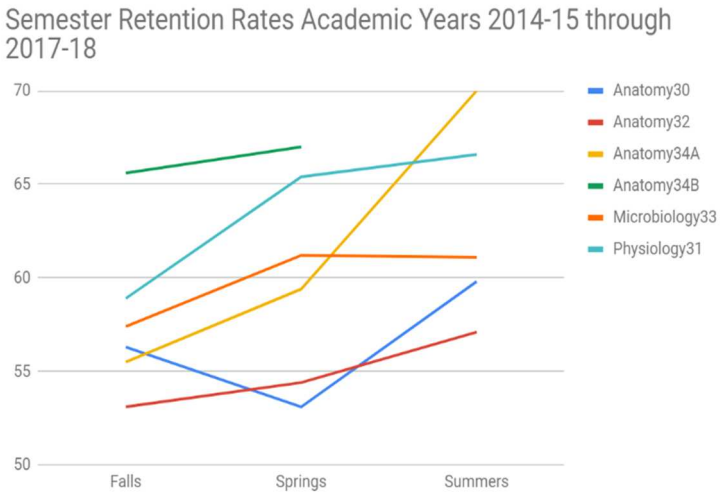
34B and Physiology 31 were at or near the institutional average, probably because the students taking these classes have completed the pre-requisites and have acquired the necessary study skills. Moreover, the success rate is also higher for both these courses compared to other courses.

TABLE 6: Semester Retention Rates

Course	Falls	Winters	Springs	Summers
Anatomy 30	56.3%	-	53.1%	59.8%
Anatomy 32	53.1%	52.6%	54.4%	57.1%
Anatomy 34A	55.5%	-	59.4%	70.0%
Anatomy 34B	65.6%	-	67.0%	-
Microbiology 33	57.4%	-	61.2%	61.1%
Physiology 31	58.9%	-	65.4%	66.6%

Dashes represented courses not offered during those sessions.

FIGURE 4:



1. Given the data in Table 6 and Figure 4, what are the trends observed?

When comparing each session's retention rates, the values typically increase from fall to spring semesters, except for Anatomy 30 which decreases in spring. The only course not offered during summer is Anatomy 34B. Interestingly most of the courses show higher retention rates during summer except for Microbiology that does not show any significant change. The higher retention rate seen in summer may be a result of several factors that include students taking only one class, life events that keep students from the class are less likely to happen within the shorter period and a student body that includes more prepared students. Identifying the factors that cause a higher retention during summer session could reveal what is needed for higher success rates during fall and spring.

E) A comparison of success and retention rates in face-to-face classes with distance education classes

There were no online or hybrid courses offered during the 2014 – 2018 academic years. The previous program review including an Anatomy 30 hybrid course, which is no longer being continued due to low success and retention rates of the course. The faculty teaching this course commented that students did not adequately participate or utilize the at-home resources.

F) Enrollment statistics with section and seat counts and fill rates are shown across the academic years. Commonly, faculty will over enroll their courses due to large waitlists and number of crashers.

TABLE 7: Total sections, seats available in each section and average fill rates

	2014-2015	2015-2016	2016-2017	2017-2018
Total Sections	58	59	60	63
Average number of seats per course	36	36	36	36
Average fill rates	94% 1,967	92% 1,952	93% 2,006	92% 2,080

1. Given the data in Table 7, what trends are observed?

The faculty in this program consistently over enroll their courses in attempts to reduce the demand for the courses. In addition, this program has consistently added more sections in the academic period of 2014 - 2018 to address the growing demand for these courses. These two interventions have not led to a decrease in the demand. The courses in this program continue to have high fill rates, full waitlists, and large numbers of students crashing every semester.

2. What adjustments are indicated?

The solution to the high demand for the courses is not to increase the class size, which presents a major safety issue due to the nature of the labs. And it is not to offer more sections as there is not any addition space. Moreover, with the lack of increased class spaces there has become a shortage of lab facilities like anatomy models, microscopes, and other lab equipment that have not increased in proportion to the number of students. Inadequate lab facilities may be one of the contributing factors to the low success rate of this program. Moreover, the inadequate lab facilities present equity issues due to some students using newer versions of materials while other use the old versions. The solution would be a new building, more classroom space, and more lab technicians. Some faculty argue another option is to reduce the number of sections offered so that the available spaces could have open lab time for students to study and practice to improve the success rates.

G) Scheduling of courses (day vs. night and days offered) are shown by the percentage of fully enrolled courses across the different time offerings.

TABLE 8: Percentage of Course Offering for Day, Evening, and Weekends

	2014-2015	2015-2016	2016-2017	2017-2018
Day	94%	94%	99%	92%
Evening	94%	85%	87%	92%
Weekend	99%	97%	85%	87%

1. What is indicated by the student's satisfaction with scheduling?

Most classes within the Life Science Department are offered during the day, and this matches the student preferences as described in the survey results in Section 5. However, it is notable that most students (64%) prefer that classes end by 9 p.m., while only 24% preferred that classes end by 10 p.m. One of the reasons for this preference for timing may be that many students use a bus for commute, and the later the class ends the difficult it becomes for some students to travel back home.

2. Are there time periods of high student demand which are not addressed?

In due consideration of students' preferences for daytime classes, there is a need for more classrooms where more sections could be offered during the day.

H) Improvement Rates (Course success by placement method, if applicable)
There are no placement methods used by this program.

I) Additional data compiled by faculty includes success rates of students enrolled in Life Sciences courses disaggregated based on either ethnicity or gender or both across the 2014 - 2018 academic period.

TABLE 9: Success Rate Disaggregated by Race

Demographic	Percentage of Student Population	Success Rate
Overall	---	66.2%
Hispanic	44.1%	55.4%
Asian	27.1%	73.4%
White	11.8%	72.6%
African American	9.6%	51.9%
Pacific Islander	0.4%	66.0%

1. Given the data in Table 9, what trends are observed?

The highest enrollment rates are for students with Hispanic origin (44.1%). Asian (27.1%) is the next common ethnicity with white (11.8%), African American (9.6%), and Pacific Islander

being less common. Despite their high enrollment rates, Hispanics have a low success rate (55.2%), compared to Asians and White who have a high success rate at 73.4% and 72.6% respectively. A lower success rate is also seen for students of African American origin. Similar results are seen in the institution data.

TABLE 10: Success Rate Disaggregated by Race and Sex

Combined Demographic	Success Rate
Hispanic Female	54%
Hispanic Male	59%
Asian Female	75%
Asian Male	70%
White Female	73%
White Male	72%
African American Female	52%
African American Male	52%

1. Given the data in Table 10, what trends are observed?

It seems that males and females of the same ethnicity have very similar success rates. As mentioned above, there exists an equity gap as the Hispanic and African America students are not as successful as their White and Asian counterparts.

J) Enumerate any related recommendations. (Items listed are not prioritized)

1. Allocate funding to a new Life Sciences building and classrooms to meet the growing student demand for courses within this program.
2. Distribute funding to data-supported student success programs such as Supplemental Instruction (SI), open lab and tutoring.
3. Instill faculty agency through critical analysis of disaggregated course outcome data for their classes.
4. Assess current pedagogies and implement empirically derived race-conscious strategies that reduce equity gaps in student success and retention.
5. Recognize faculty members implementing pedagogies to reduce equity gap in their classrooms.
6. Develop and employ program maps to increase student retention rates in the program.
7. Allocate funds to well equip classrooms with proper furniture and lab tools, including cutting edge technology.
8. Inclusion of a certificate/degree at the successful completion of the program.
9. Collaborate with counseling faculty to improve student advising in their choice of course.
10. Collaborate with Institutional Research and Planning to develop survey to assess student need and interest regarding additional lab time.
11. Inclusion of an introductory course as a prerequisite for Anatomy-32 to help underprepared students for these rigorous courses.

SECTION 3
Curriculum

Review and discuss the curriculum work done in the program during the past four years, including the following:

A) Provide the curriculum course review timeline to ensure all courses are reviewed at least once every 6 years.

The Allied Health Program consists of 6 courses with a total of 28 sections: Anatomy 30 (5 sections), Anatomy 32 (8 sections), Anatomy and Physiology 34A (3 sections), Anatomy and Physiology 34B (2 sections), Physiology 31 (5 sections), and Microbiology 33 (5 sections).

TABLE 11:

Course	Last Review	Next Review
Anatomy 30	Fall 2014	Fall 2020
Anatomy 32	Fall 2015	Fall 2021
Anatomy 34A	Fall 2018	Fall 2024
Anatomy 34B	Fall 2018	Fall 2024
Physiology 31	Fall 2016	Fall 2022
Microbiology 33	Fall 2014	Fall 2020

B) Explain any course additions to current course offerings.

Since the last program review, no new course has been developed.

C) Explain any course deletions and inactivations from current course offerings.

As of 2019, no course deletions have been made. For each semester, every section of the total 28 of the 6 Allied Health Courses has been full and large numbers of students have been turned away in many cases.

D) Describe the courses and number of sections offered in distance education. (Distance education includes hybrid classes.)

There were no online or hybrid courses offered during the 2014 – 2018 academic years. The previous program review included an Anatomy 30 hybrid course, which is no longer being continued due to low success and retention rates of the course. The faculty teaching this course commented that students did not adequately participate or utilize the at-home resources. Some faculty members would like to reinstate a hybrid course after contemplating setbacks for the previous course and consulting Distance Education Center for overcoming them.

E) Discuss how well the courses, degrees, or certificates meet students' transfer or career training needs.

1. **Have all courses that are required for your program's degrees and certificates been offered during the last two years? If not, has the program established a course offering cycle?**

   There is no degree or certificate for Life Sciences program. All the courses within the program have been offered each semester for the last 2 years. They will continue to be offered each semester in the future semesters.

2. **Are there any concerns regarding program courses and their articulation to courses at other educational institutions?**

Concerning articulation, there have been no problems with any of the course offerings.

3. **How many students earn degrees and/or certificates in your program? Set an attainable, measurable goal related to student completion of the program's degrees/certificates.**

Currently, there are no individual degrees or certificates offered for just the Life Science Program specifically, but the program personnel are continuing to discuss future offering and awarding the "Pre-Health" A.S. Degree. A major benefit of awarding a Pre-Health degree for our students is that they become competitive candidates for certain support occupations in the health care like medical assisting, dental assisting, phlebotomist, and pharmacy technician.

4. **Are any licensure/certification exams required for program completion or career entry? If so, what is the pass rate among graduates? Set an attainable, measurable goal for pass rates and identify any applicable performance benchmarks set by regulatory agencies.**

F) Enumerate any related recommendations.

1. Inclusion of a Pre-Health degree at the successful completion of the program.
2. Inclusion of a one-unit introductory course as a prerequisite for Anatomy-32 to increase student preparation for our courses. It is crucial to intervene at the beginning of the program's journey and provide our students with the tools that will help them complete the course successfully. It may be argued that student enrollment might drop if this requirement is included but we serve our community according to its needs and tailor our courses to fulfill them, as stated in our mission statement. Besides, some other community colleges do require prerequisites for Anatomy-32. This one-unit introductory course can be a hybrid or an online class.

SECTION 4
Assessment of Student and Program Learning Outcomes (SLOs & PLOs)

A) Provide a copy of your alignment grid, which shows how course, program, and institutional learning outcomes are aligned. (This will be Appendix A.)
See Appendix A

B) Provide a timeline for your course and program level SLO assessments. (This will be Appendix B.)
See Appendix B

C) Summarize the SLO and PLO assessment results over the past four years and describe how those results led to improved student learning. Analyze and describe those changes. Provide specific examples.

In spring 2018, our faculty assessed the "Anatomical structures and physiology explanations" SLO. For this assessment, faculty members incorporated the following three questions into quizzes or exams for students to answer:

1. Red blood cells are observed under a microscope, then a 20% saline solution is added to them. Which of the following would you expect to see?
    a. The cells would swell up and lyse
    b. The cells would crenate (shrink)
    c. The cells would look the same as before the saline solution was added
    d. The cells would turn inside out
    e. The cells would dance the Macarena
2. In Tay-Sachs disease, glycolipids build up in nerve cells and cause neuronal death because the organelle that normally degrades the glycolipids is nonfunctional. Which one of the following 5 organelles is responsible for this disease?
    a. Mitochondrion
    b. Smooth Endoplasmic Reticulum
    c. Ribosomes
    d. Lysosomes
    e. Golgi Apparatus
3. The phospholipids of a cellular membrane will have their ____ends facing each other and their _____ ends facing either the intracellular or extracellular space.
    a. hypotonic; hypertonic
    b. hypertonic; hypotonic
    c. hydrophilic; hydrophobic
    d. hydrophobic; hydrophilic
    e. hypotonic; hydrophobic

The rubric for assessing the student learning outcomes was as follows:

Level 0	Student answered all three questions about cell structure and transport incorrectly.
Level 1	Student can answer one question about cell structure and transport.
Level 2	Student can answer two questions about cell structure and transport.
Level 3	Student can answer all three questions about cell structure and transport.

To be considered successful, it was expected that 65% of students would score at level 2 or higher on this SLO. Further, for each of the individual questions posed, it was expected that 65% of students or greater would be able to answer the questions correctly.

- Overall, the average percent of students in the Allied Health Sciences Program who answered two or more questions correctly was about 64%, which did not quite meet the rubric target of 65% of students. However, some courses in the Program met or exceeded the target, whereas other courses fell short of the target.
- Courses that met or exceeded the target included Anatomy 32, with 69.2% of students meeting the target, Physiology 31, with 80.7% of students who met the target. It makes sense that the Physiology 31 students would have more students who exceeded the target goal because the students in that course have had to pass the prerequisites of Chemistry and Anatomy 32 to enter the course.
- Courses that did not meet the target included Anatomy 30, with 62.2% of student who met the target; Microbiology 33, with 57.5% of students who answered two or more questions correctly; Anatomy & Physiology 34A, with 55.5% of students on target; and Anatomy and Physiology 34b, with 58.3% of students meeting the target. It is puzzling as to why Anatomy and Physiology 34A and 34B students had sub-par scores because they both require prerequisites that should have prepared the students for the rigorous material, and they include the same material as the other Anatomy and Physiology courses.
- The Anatomy 30 classes averaged a slightly higher percentage (62.2%) than that of the A & P 34A and 34B classes, even though Anatomy 30 is an entry level course that has no prerequisites to enter the course. However, Anatomy 32, which is a higher-level entry course than Anatomy 30, did have a greater percentage (69.2%) of students who achieved the target level.
- An examination of the methods whereby the questions' topics are taught in Anatomy 32 and Physiology 31 compared to those used in Anatomy 30, as well as A & P 34A and 34B could help to improve the scores in those classes. Microbiology 33 students also scored lower (57.5%) than the target level, which is another quandary because those students have successfully completed Anatomy 32 or A & P 34A and 34B, and often Physio. 31 prior to their entry into Microbiology. In terms of the overall percent of correct student answers to the individual questions, question #2 had the greatest percent of correct answers, at 61.7%, followed by question #3, at 59.8%, followed by question #1, at 56.2%. All of these fell short of the desired 65%.

In response to the above data, faculty discussed methods whereby Student Learning Outcomes could be improved in future assessments. The department shared ideas for different teaching techniques and online resources. Faculty agreed on using a worksheet that would help students to better understand the concepts of phospholipid bilayer membrane construction and osmosis. The students were given the handout to improve their success in answering the questions. The results for the Allied Health Science courses were as follows:

1. Questions 1 and 2 referred to the nature of a cell's phospholipid bilayer. Most of the students (>75%) in all sections got this question correct.

2. Question 3 referred to the types of substances that can diffuse through a membrane. Most students who got this question wrong had included that ions diffuse across a cell membrane in addition to water, oxygen and carbon dioxide. This confusion arose because ions do not use simple diffusion, rather they use facilitated diffusion to pass through the cell membrane and the question did not specify the type of diffusion.

3. Questions 4 and 5 referred to what would happen to cells if they were place in carious tonicity solutions. More than 80% of the students got all three questions correct. Few students reversed what happens when cells are placed in hypotonic and hypertonic solutions.

- To conclude the worksheet allowed most the students to grasp the concept of the cell membrane structure, the transport of substances across the cell membrane and the effect of various tonicities on a cell. The only misconception that came to light was about the diffusion of ions across cell membrane that can be resolved by including the type of diffusion in the question in the future.

In **spring 2017**, our faculty assessed the "Use of scientific instruments" SLO. In this assessment, students are required to place microscope slides on compound microscopes, center the slides, focus on the slides, and identify the object on the slide. The assessment rubric for this activity was as follows:

Level 1:The student is unable to locate the specimen on the slide under the microscope. (Not proficient)

Level 2: The student can locate the specimen on the slide, but cannot focus on the specimen. (Minimal proficiency)

Level 3: The student can locate the specimen, get it into focus, but cannot identify the specimen. (Proficient)

Level 4: The student can locate the specimen, get it into focus, and identify the specimen. (Very proficient)

Success was determined by the number of students who were assessed at levels 3s and 4s. For this student population, if the student was able to locate the specimen and get it into focus, this was acceptable. For those students who were also able to identify the specimen (level 4s) this reflected a higher level of proficiency. A proficiency level of 75% or above was considered a satisfactory success rate.

- Students in the Physiology 31 were the most proficient in their use of the microscope, 89% scoring at level 4 (very proficient), with a combined average of 96.6% scoring at levels 3 (proficient) and 4. This was followed by students in Anat. 34A (75.5% at level 4 and 96.3% scoring at levels 3 and 4), Anat. 32 (70.2% scoring at level 4 and 92.4% at levels 3 and 4), and Anat. 34B (73.5% scoring at level 4 and 87.8% at levels 3 and 4). The percentage of Anatomy 30 students at level 4 was the lowest, at 50%, but their combined levels of 3 and 4 was 92.2%. Students in Microbiology 33 averaged 55.6% at level 4, with a combined average of 82.1% at levels 3 and 4 as shown in the table and chart below. All of the courses assessed exceeded the goal of 75% of students achieving level 3 or 4 in the use of the microscope.

The data implies that in the higher-level courses, such as Physiology 31, Anatomy & Physiology 34A and 34B, and Anatomy 32, students demonstrated greater mastery of the microscope that those in the entry level Anatomy 30 course. One reason could be that students in these courses (except for Anatomy 32) have already successfully completed other prerequisite science courses and have therefore had previous experience in handling scientific instruments such as microscopes.

Microbiology 33 is an exception to the previous statement because students in those classes exhibited less proficient microscope use in terms of their combined level 3 and 4 percentages, even though they had already completed an Anatomy prerequisite. However, Microbiology requires the

use of the oil immersion lens, which requires greater expertise than the use of the low power and high power lenses employed in the other courses, thus is more challenging to master.

Anatomy 30 students had the fewest students achieve a level 4 mastery of microscope use of all of the courses assessed. This is because Anatomy 30 is a lower level course with no prerequisites, therefore many students in the classes have had no previous experience with microscope use. Also, the microscope is used less frequently in the Anatomy 30 classes than in the other courses, so the students have less practice using the instrument. Moreover, some students had difficulty locating specimens and focusing their slides because those slides were of poor quality. Some slides have faded to the point that the specimens on them can barely be found, let alone be identified. Obviously, this is an obstacle to students attempting to demonstrate their proficiency with a microscope.

During faculty discussions of the data, some suggestions were made for teaching strategies to improve student learning. One instructor with above average results said that she employed a pretest to assess student weak points in microscope use, then encouraged her students to improve their techniques, advising them that they would be tested on their microscope use. Finally, she administered a post-test in which the students demonstrated their use of the microscope. Another instructor used a more individual approach, in which she went to each student in her classes during lab and had them place a slide on their microscope, focus on a specimen and identify the specimen. If they couldn't do one or more of these tasks, it became a teachable moment in which the instructor could coach each student in good microscope technique. A microscope check list handout was also developed to aid students in the effective use of a microscope. All of these methods of instruction help to improve student mastery of the microscope.

In **spring 2016**, our faculty assessed the "Health science language" SLO. The questions employed to assess student understanding of the language of Health Sciences were:

1) Cytology is best defined as a study of:
A. gross structures of the body B. cells C. tissues D. organs E. cyclones

2) Which of the following terms describes cell death?
A. mitosis B. lysis C. necrosis D. atrophy E. hypertrophy

3). The net movement of water molecules through a selectively permeable membrane from an area of higher water concentration to an area of lower water concentration is called:
A. endocytosis B. osmosis C. simple diffusion D. active transport E. facilitated diffusion

The target for student success for this assessment was that 70% of participating students were expected to answer the questions correctly. The results were as follows:

- In the results of the student assessment for question #1 about the definition of cytology, all five of the course disciplines exceeded the expected level that 70% or more students would answer the question correctly. Anat. 30 Students had an 83.1% success rate; 91.3% of the Anat. 32 students answered the question correctly; AnPhys34A students had an 88.4% success rate; 92.5% of the AnPhys 34B students answered correctly; Physio. 31 students had an 87.4% success rate; 84.3% of the Micro. 33 students answered the question correctly. Only a small percentage of students answered this question incorrectly. The highest

percentage of students with incorrect answers were as follows: 8.4% of Anat. 30 students, 10.1% of Anat. 34A students, and 8.1% of Physio. 31 students answered with letter "C" – Tissues. They confused the term cytology with histology. 10.8% of Micro. 33 students answered this question with the letter "A" – "gross structures of the body." Although Anatomy is a prerequisite for Microbiology, this small percentage of Microbiology students didn't remember the terminology they learned previously. The mean percentage of correct answers for question #1 for students in all courses in the Allied Health Sciences Program was 87.8%, which indicates a clear understanding of this term by a vast majority of students.

- In the results of the student assessment for question #2 about the term that best describes cell death, the Anat. 30, AnPhys 34A, and Physio. 31 students all met or exceeded the expected range of 70% or more students who answered the question correctly. Anat. 30 students had a 73.5% success rate; 72.5% of the AnPhys 34A students answered correctly; Physio. 31 students had a 77.5% success rate. However, students in the Anat. 32, AnPhys 34B, and Micro. 33 classes all scored below the 70% success mark. 46.3% of Anat. 32 students answered the question incorrectly, with 45% of them answering with letter "B" – Lysis, rather than the correct answer of Necrosis. Similarly, only 37.7% of AnPhys 34B students answered the question correctly, while 49.1% of them also answered with the letter "B." Micro. 33 students fared slightly better, with 55.4% of them answering the question correctly, but 26.5% answering with the letter "B." The confusion between the terms "lysis" and "necrosis" may lie in the fact that during "lysis" a cell ruptures, which results in cellular death, whereas "necrosis" refers more directly to cell death in a tissue or organ. The two terms may be too similar, so perhaps the "lysis" choice should be replaced with another term that is not quite so similar to "necrosis." 9.6% of Anat. 30 students, 6.3% of Anat. 32 students, 18.8% of AnPhys34A students, 11.3% of AnPhys. 34B students, 15.5% of Physio. 31 students, and 18.1% of Micro. 33 students chose answer "D" – atrophy, which refers to a decrease in cell size, or tissue wasting, and clearly reflects a lack of understanding of the term necrosis. The mean percentage of correct answers for question #2 for students in all courses in the Allied Health Sciences Program was 60.5%, which indicates that about 2/3 of the students in the Program understood the term, whereas approximately 1/3 of students did not have a clear understanding.

- In the results of the student assessment for question #3 about osmosis, students in all of the courses, with the exception of AnPhys 34A, met or exceeded the expected 70% or more students who answered the question correctly. 75.9% of Anat. 30 students, 87.5% of Anat. 32 students, 75.5% of AnPhys 34B students, 74.8% of Physio. 31 students, and 84.3% of Micro. 33 students answered correctly. The AnPhys 34A students, however, were very close to the 70% range, at 69.6% students answering the question correctly. The next most frequently selected answer was letter "C" – simple diffusion, with 14.5% of Anat. 30 students, 6.3% of Anat. 32 students, 20.3% of AnPhys 34A students, 18.9% of AnPhys 34B students, 16.2% of Physio. 31 students, and 10.8% of Micro. 33 students selecting this incorrect answer. Although osmosis is a type of simple diffusion, osmosis is distinct in that it is the diffusion of water molecules across a membrane. The students who selected letter "C" did not understand this distinction. The mean percentage of correct answers for question #3 for students in all courses in the Allied Health Sciences Program was 77.9%, which indicates a good understanding of this term by a healthy majority of students in the program.

During discussions of the above results, faculty agreed to develop a worksheet to aid student understanding of the terms assessed, and to place more emphasis on the difference between osmosis

and simple diffusion. The worksheet did seem to help most students to understand the difference between the terms. Further, due to the apparent confusion between the somewhat similar terms "lysis" and "necrosis," it was agreed to replace the answer "lysis" with another term that is not as similar to "necrosis" to minimize confusion.

D) Describe how you have improved your SLO/PLO assessment process and engaged in dialogue about assessment results.

Following each of the previously described assessments, faculty met to discuss the results and to engage in meaningful dialogue about how to improve the overall and individual Student Learning Outcomes. It was determined that some of the answers to some assessment questions were too similar or vague, so the questions or answers were changed to make the answer more apparent. Examples include changing the term "diffusion" (in the question about what types of materials move across cell membranes) to "simple diffusion" to eliminate the confusion between the different types of diffusion. Another example is the replacement of the answer "lysis" in the question about cellular death to minimize confusion between somewhat similar answers. Moreover, several student worksheets have been developed as a result of faculty dialogue about our assessment results, with the aim of better student understanding of the concepts presented in the assessments. Further, the sharing of teaching methodologies during our discussions have contributed to new ideas for our faculty to use to improve student understanding of the information we present.

E) Enumerate any related recommendations.

1. Faculty have made numerous requests for additional tutoring help for the students in our classes. The Learning Resource Center tutors are very helpful, but they do not usually have enough qualified tutors to serve all our students who want or need tutors. Online tutoring programs are somewhat helpful, yet many students are still resistant to using the online programs for some reason.
2. More funding for work study students to administer open labs that students can attend outside of class time for additional study time would be very beneficial.
3. A one-unit online introductory course for students who are struggling could mean the difference between student completion or failure in our classes. Other departments, such as the Mathematics Department, have already implemented these one-unit tutoring classes for their higher-level courses. The students in our classes deserve the same consideration.

SECTION 5
Analysis of Student Feedback

Provide a copy of any feedback reports generated by Institutional Research and Planning for your program. Review and discuss student feedback collected during the past four years including any surveys, focus groups, and/or interviews.

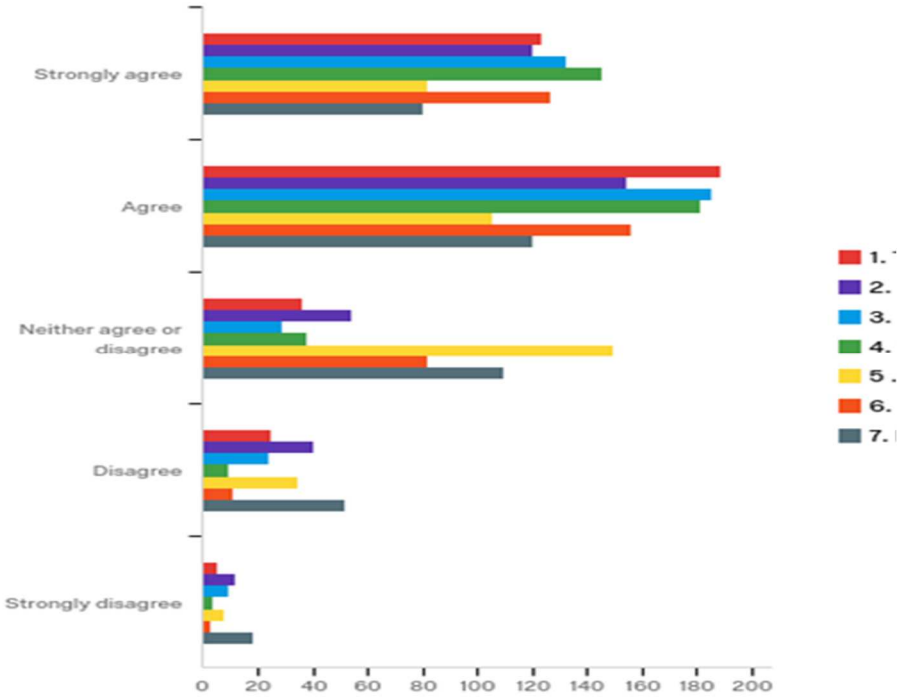
A) Describe the results of the student survey in each of the following areas:
Surveys were sent out to the students in all Life Sciences courses during Spring 2019. In total, the survey received 396 responses. Survey links were emailed out to the students and faculty were encouraged to explain to students the importance of their feedback. Some faculty gave extra credit for completing the survey, others devoted class time to the survey, and some informed through email. Students enrolled in multiple Life Sciences courses were told not to complete the survey multiple times. Most responses came from students in Microbiology 33 (31%) or Physiology 31 (28%). The fewest responses came from Anatomy 30 (7%).

1. Student Support

The following questions addressed student support and were answered using the Likert scale of strongly agree to strongly disagree:

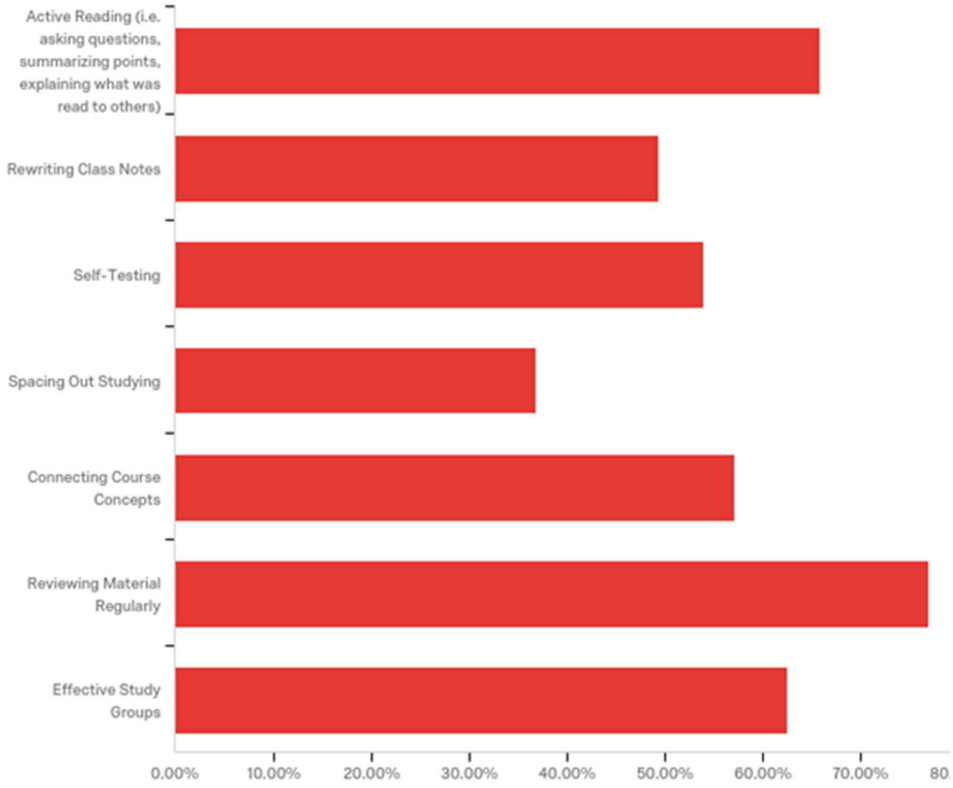
1) Instructors in this program have helped me achieve my goals.
2) Instructors in this program have been helpful when I have approached them with academic concerns.
3) Instructors in this program provide opportunities to actively participate in class.
4) Instructors in this program provide an adequate number of office hours.
5) Instructors in this program are available when I go see them during office hours.
6) I have felt a sense of community within this program.
7) Student contributions have been valued by instructors in this program.

FIGURE 5: Student support by the instructors of the Life Sciences Program



Most students answered either strongly agree, agree, and neither agree nor disagree with these statements. Some noticeable results include the high level of agreement on opportunities to actively participate in class (90%) and that student contributions are valued (84%). A small population of students do not feel a sense of community in the program (26%). Possible methods to improve the sense of community are to provide addition funding for programs such as SI, open labs, and tutoring to allow for students to collaborate with one another outside of class time. However, to do so this program would also need additional classroom spaces.

FIGURE 6: Percentage of Students Advised to Perform Specific Study Techniques



An additional question was included to address student support- "Do instructors in this program provide information on successful study approaches?" Most of the students (94%) agreed while only 6% did not agree. A follow-up question asked which study approaches were explained. Results are depicted in the graph above (Figure 6). Some noticeable points include the high recommendation of active reading and reviewing the material regularly that are both supported by research as effective study tools. One of the least recommended technique, though highly supported by educational research data, was spacing out studying. Also, the survey inquired if students were using these techniques. Most of the students (93%) responded in affirmative while 7% replied in negation.

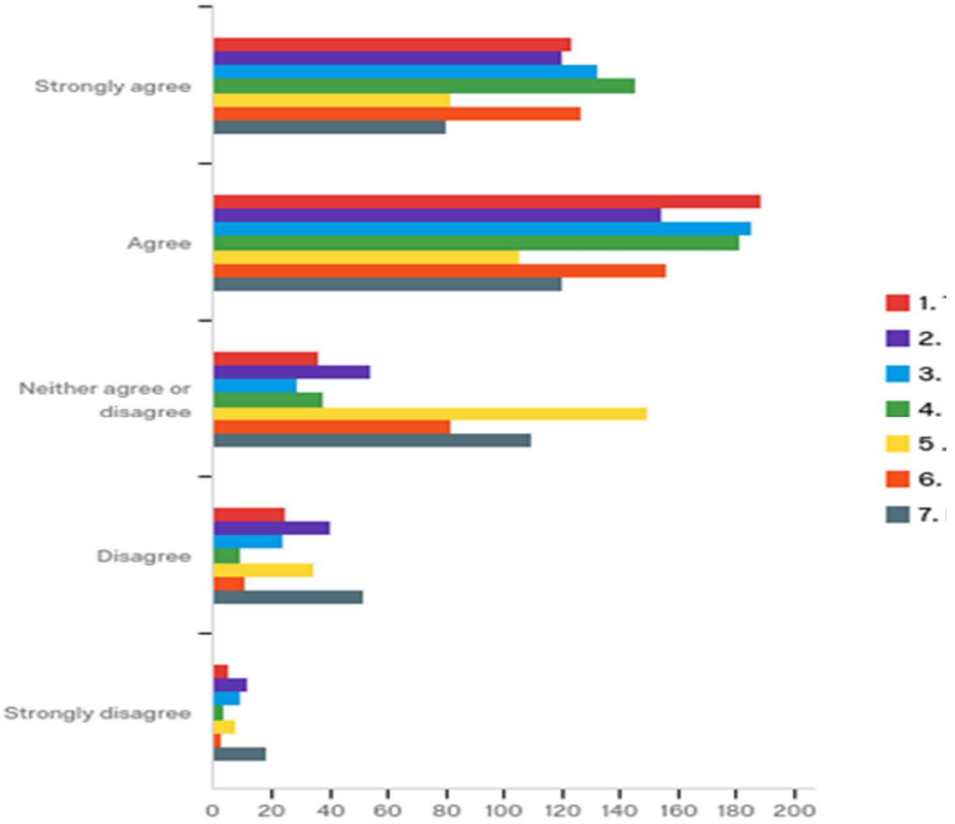
The survey also aimed to address the question if students would use open laboratory times for this program's courses. The open laboratory times require a paid student or faculty member to be present. Currently, the program only offers open laboratory hours for Anatomy courses. Most responses requested a Microbiology open laboratory time (22%). However, this would require additional lab technicians and more classroom space.

2. Curriculum

The following questions addressed student support and were answered using the Likert scale of strongly agree to strongly disagree:

1) There is an appropriate range of courses offered in this program.
2) Courses were scheduled on days and times that were convenient to me.
3) I've been able to register for the classes I need within the program.
4) The courses in this program have helped me meet my academic goals.
5) There is a variety of extracurricular activities related to this program.
6) The library has the resources to help me succeed in this program.
7) I actively participate or have participated in tutoring when available.

FIGURE 7: Academic and other opportunities in the Life Sciences Program



Most students answered either strongly agree, agree, and neither agree nor disagree with these statements. Some noticeable results include agreement with range of courses offered (83%), ability to register (84%), and courses reaching academic goals (87%). About half of the students disagree that there are extracurricular activities for them (51%). Some possible solutions would be to increase the awareness of clubs on campus and begin collaboration with local businesses to provide students with hands on experiences.

In addition, many students do not participate in tutoring when available (47%). The reason as to why they don't attend was not studied. If it were due to schedule conflicts, there could be more funding allocated to these programs so that they could offer more diverse hours.

The survey also asked about ideal times for courses to be offered to see if this program's scheduling fits the student's needs.

Other session options

74% of students would take courses during winter session.
84% of students would take courses during summer session.

Time of course

55% of students prefer to take courses in the morning.
18% of students prefer a 7AM start time.
43% prefer 8AM.
39% prefer 9AM.
24% prefer to take courses in the afternoon.
21% prefer to take courses in the evening.
64% of students prefer to end by 9PM.
28% prefer 10PM.
8% prefer 11PM.

Given these preferences, opening more morning and winter or summer sessions would be recommended. However, there is no additional classroom space. A new building would have to be funded in order to meet these student needs. Piloting an 8-week long section that occurs during the regular semester provides students with an additional course offering. However, there is not sufficient data to support that students would be successful in the rapid time period. An Institutional Research and Planning research process has begun to determine the demographics of summer students in comparisons to fall and spring students. Some faculty are not in agreement with offering 8-week courses due to the unknown nature of the increased student success as well as concerns of maintaining the same rigor as the 16-week semester.

3. Facilities, Equipment, and technology

The following questions addressed student support and were answered using the Likert scale of strongly agree to strongly disagree:

1) The buildings, classrooms, and labs used by this program are satisfactory.
2) I am satisfied with the equipment (projector, screens, microscopes, etc.) used in this program.
3) I am satisfied with the computers and software used in this program.
4) I am satisfied with WiFi connectivity available in this program's buildings, classrooms, and labs.

Most students answered either strongly agree, agree, and neither agree nor disagree with these statements. Some noticeable results include: most students agree that the classroom spaces are satisfactory (95%) and that the equipment provided is satisfactory (91%). Some students are not satisfied with WiFi connectivity (34%).

These percentages are misleading due the student's lack of experience and knowledge about lab equipment. The lab spaces are most inadequate, with many areas lacking such as cadavers, anatomy models, microscopes, and other supplies. Since students have no other experience to compare their experience to, their opinion is very naïve.

4. Program Objectives

Students were asked to answer the following using the Likert scale of strongly agree to strongly disagree: "I am aware of the course outcomes- what I should be able to learn and what

skills I should possess after completing the courses in this program." 94.5% of students strongly agreed or agreed.

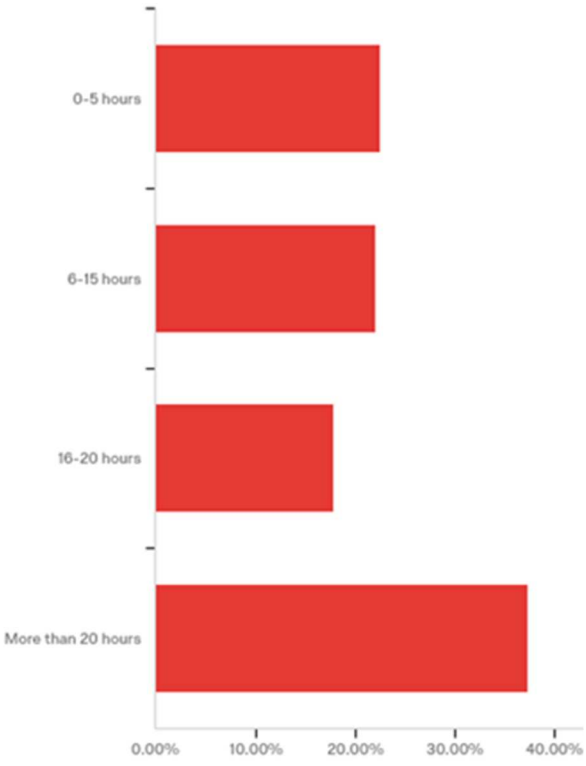
B) Discuss the implications of the survey results for the program.

The results showed mostly positive responses to the survey questions, showing the students feel this program supports their education and career goals. Some of the responses highlighted possible areas of improvement such as creating a sense of community, offering more open lab hours, working to create more extracurricular activities, offering more tutoring, adjusting the course schedules, and improving WiFi connectivity across the campus. Allocating funding to programs such as SI, open labs, and tutoring could help improve these student responses. In addition, promoting clubs and creating additional experience with local business would improve the extracurricular options for the students.

For this program, the current start and end times (8 a.m. and 9 p.m. respectively), align with student priorities for most courses. However, some courses that finish after 10 p.m. become a challenge for students, especially those using a bus to commute. The high preference for day-time classes provides a reason to offer more morning classes, but a fewer number of classrooms pose an obstacle to meet this demand. Moreover, given the high success rate in summer and winter sessions, more sections could be offered to help improve the student success rate. But again, there is not enough classroom space to do this.

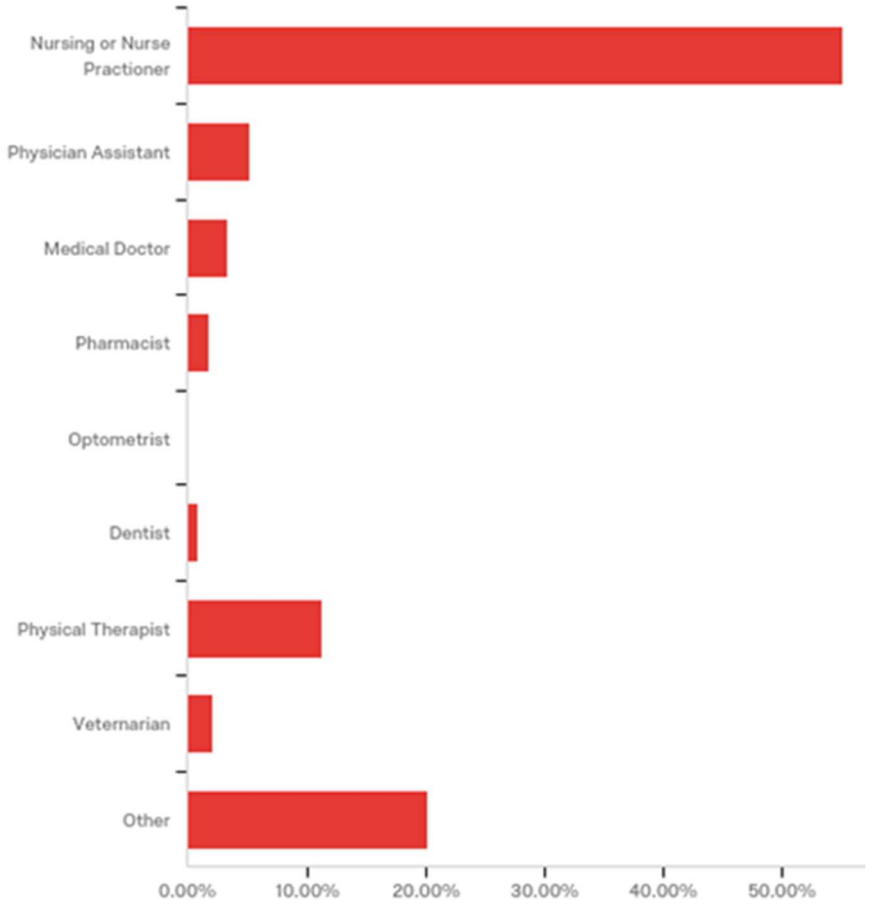
C) Discuss the results of other relevant surveys.

FIGURE 8: Number of hours worked per week by the students enrolled in the Life Sciences Program



On this program review survey, it also asked students what their desired career goals were and how many hours per week they worked. The results found that the students are working many hours on top of going to school.

FIGURE 9: Career goals of the students enrolled in the Life Sciences Program



The results found that most of the students aim to enter the nursing field (Figure . Items students listed as other include clinical lab scientist, respiratory care, radiological technology, occupational therapist, healthcare administration, nutritionist, marine biologist, environmental engineer, fitness trainer, etc. Many careers listed might have come from Anatomy 30 students who are non-majors and take this course to fulfill the requirement of a lab.

D) Enumerate any related recommendations

1. Allocate funding to a new Life Sciences building and classrooms to meet the growing student demand for courses within this program.
2. Dedicate funding to data-supported student success programs such as Supplemental Instruction (SI), open lab, and tutoring.
3. Pilot 8-week long sections during the regular 16-week semester. There is disagreement over this recommendation due to the unknown reasons for success of summer and winter students as well as concerns of maintaining rigor. An Institutional Research & Planning data request is on-going to identify the demographics of summer students in comparison to fall and spring students.
4. Allocate funds to well equip classrooms with proper furniture and lab tools, including cutting edge technology.
5. Inclusion of a certificate/degree at the successful completion of the program.
6. Partner with local businesses to create extracurricular opportunities for students.
7. Promote the Pre-Allied Health Club and other clubs to the students to increase their involvement on campus.

SECTION 6
Facilities and Equipment

A) Describe and assess the existing program facilities and equipment.

The existing program facilities and equipment are inadequate for the health sciences program. Limited classroom availability, out of date equipment and insufficient lab models, pose a hindrance to improving our success and retention rates.

Current facilities include 4 classrooms. Three of these rooms are utilized for anatomy and/or physiology courses (LS 109, LS 113, and NATS 123) while one is for microbiology (LS 130). With the current enrollment rates these rooms have become smaller. Storage space for models and equipment has also become insufficient. The scheduling of additional sections of anatomy and/or physiology has become impossible.

We have been awarded, via the Planning Process, $19,000 in 2017 and $50,000 in 2018 to purchase new and replacement Human Anatomy Models. Despite the addition of these new items, the normal wear that occurs with constant use of models, microscopes, slides and other equipment for all these classrooms is tremendous, requiring frequent replacement as the items fail from semester to semester.

We replaced numerous slides in LSAH including those on the nervous system, endocrine system, heart/blood vessels, respiratory system, and urinary system. In 2018, approximately $10,000 worth of slides were obtained for Aphy-34A/B, Anat-30, and Anat-32. These slides enriched the student experience in our programs.

Anatomy Model List
Muscular System

Model	LS109	LS113	NATS123
Tiny Tim	6	7	3
Head & Shoulder	2.5	2	2
Arm	4	5	3
Leg	5	6	4

Integumentary System

Model	LS109	LS113	NATS123
Skin Model	3	3	3
Skin Burn	1	1	0
Older Skin Model	2	0	1

Cellular Models and Molecular Kits

Model	LS109	LS113	NATS123
Molecular Kits	9 kits to be shared		18
Cell Model- animal	2	2	1
Cell Model- Plant	0	1	0
Paramecium	0	1	0
Euglena	0	1	0
DNA Model	2	2	2
Tissues Set	1	1	1
Mitosis Animal	1	1	0
Mitosis- Plant	0	1	
Meiosis Plaque	1	1	1
Muscle Fiber	1	1	1
RBC	1	1	0
WBC	1	0	0

Circulatory System

Model	LS109	LS113	NATS123
Small Heart- DG	8	7	7
Large Heart	2	2	1
CV Flat Man	4	3	3
Vascular Arm	1	1	0

Skeletal System

Model	LS109	LS113	NATS123
Bone Histology	1	2	1
Disarticulated Skeleton	18	18	0
Articulated Skull- Real	4	10	0
Articulated Skull- Plastic	14	8	0
Disarticulated Skull	7	12	0
Somso Beauchene Skull	1	1	0
Fetal Skull	1	1	1
Demo Cart	1	1	0.5
Sectioned Bone Box	1	2	0
3-Vertebrae Stand	1	1	0
Knee Joint	7	7	1
Section Knee Joint	2	2	0
Section Hip Joint	2	2	0
Female Pelvis	2	1	1
Male Pelvis	1	2	1
Artic. Skele- no muscle marks	1 (no skull)	1	3
Artic. Skele w muscle marks	1	2 (broken)	0
Articulated Upper Limb	2	1	1
Articluated Lower Limb	2	1	1
Whale Vertebrae	1	1	0

Respiratory System

Model	LS109	LS113	NATS123
Flat Nose Model	2	2	1
Lung (3B-white back)	1	2	2
Lung (Clay Adams)	1	1	0
Lung (AM100-no back)	2	2	2
Large Larynx	2	2	1(+1-broken)
Small Larynx	3	3	3
½ Head Model (sagittal cut)	1	1	1
Glass Lung model	1	1	1
Alveoli	1	1	0

Nervous System

Model	LS109	LS113	NATS123
Synapse	1	1	1
Neuron	2	2	1
Ventricles	3	4(+1 broken)	3
Baldwin Brain (in head)	2	3	1
Functional Brain (colorful)	3	3	1
Brain (older)	3	3	3
Cervical Spinal Cord	3	3	1
DG Spinal Cord (wood)	2	3	1
Spinal Cord (plastic)	3	2	1
Sacrum on Stand	1	1	0
Flat Nerve Guy	3	3	3
Ear(DG- attached)	4	5	1
Ear (blue- detaches)	2	1	3
Cochlea	1	2	1
Large Eye	4	4	2
Small Eye	3	3	2
Purple Eye	6	5	3

Urinary System

Model	LS109	LS113	NATS123
Single Standing Kidney	4	3	1(old)
Urinary Apparatus/system	3	3	2
3 part Kidney	4	4	4
Nephron	2	1	1

Digestive System

Model	LS109	LS113	NATS123
Large Tooth	1	2	1
Jaw- DG no glands	0	1	1
Jaw- DG w glands	1	1	1
Villi	2	2	2
Liver (on plastic base)	3	3	2
Liver (on wood stand)	1	1	0
Pancreas	3	3	3

Reproductive System

Model	LS109	LS113	NATS123
Ovary	1	1	1
Female Repro- Somso	1	1	1
Female Repro- 3B	5	4	2
Male Repro- Somso	5	4	2
Male Repro- 3B	2	1	1
Embryo Development	1	1	1
2 upright female	0	2	0

One-of-a-Kind

Model	Location
Silicone Heart Replicas (2)	LS113
Medical Bladder (sectioned bladder on	LS113
Hepatic Disease	LS109
Fetal Pig Display	LS109
Pregnancy/Fetal Development Series	NATS 123

B) Explain the immediate (1-2 years) needs related to facilities and equipment. Provide a cost estimate for each need and explain how it will help the program better meet its goals.

The following is a list of recommendations for equipment and facilities for Life Sciences for Allied Health.

1. Purchase new and replace broken human anatomy models. For the 2018-19 year we did not get funding to purchase models. There are several models that need to be replaced and several rooms need additional models of those already there. The mean price per model is $3,000 and we have three classrooms to outfit. New and replacement models are still needed for the anatomy and physiology labs. Currently anatomy and physiology courses are held in three different rooms that do not provide equivalent access to students enrolled in the same subject. We would like to standardize the rooms in addition to replace broken models and increase the numbers of certain models. The recommendation will be achieved once students enrolled in the same subject have equal access to models regardless of the room the class is held. This step will help achieve equitable outcomes for all the students. Cost estimate: $80,000.

2. Cadavers: Our anatomy and physiology students have been without cadavers or cadaver substitutes since 2015, which severely impacts our ability to run a comprehensive program. One of the student learning outcomes is identification of the various structures of the human body. Absence of a cadaver severely hampers achievement of this goal. Cadavers and dissection services would cost ~$20,000, though new cadavers cannot be obtained until a formaldehyde health and safety plan is in effect and our refrigeration facilities are made reliable. Another option would be a virtual dissection table, Anatomage.

3. Purchase Replacement Binocular Microscopes. The LS rooms have several binocular microscopes that are broken and need replacements. In LS130, not all microbiology students get to use the same microscope because their number is insufficient. This is an equity issue since some students are more advantaged than others by having the opportunity to use a better microscope. In LS109 and 113, some of those are broken from normal wear and tear, and we need additional microscopes for exam stations and demonstrations. Cost estimate: $3200.

4. Replace cabinet locks. The cabinet locks originally installed in LS130 are not functioning and thus items cannot be properly secured. It is important to replace these locks for safety and security purposes. Cost estimate: $1500.

5. Hot Plates. Purchase 9 Corning hot plates to replace those that have stopped working. Additional units are also needed for labs in which groups need more than one hot plate for the experiment. Cost estimate: $5600.

6. Purchase new Ophthalmoscope-otoscope Kits. The physiology labs and Aphy34B labs use ophthalmoscope kits that include an otoscope for nervous system labs. The current state of this equipment is in dire need for replacement. The set of 9 we once had broke down and currently we only have 2 functioning kits for an entire class. This needs to be

immediately addressed as it is not functional to run a lab with 40 students and only two working kits. Cost estimate: $4800.

C) Explain the long-range (2-4+ years) needs related to facilities and equipment. Provide a cost estimate for each need and explain how it will help the program better meet its goals.

Additional Lab Space Usable for Anatomy and/or Physiology Courses. This would require 2 rooms approximately 700 sq. ft. each (20'x35'). Total Cost Estimate: $ Unknown
Needed to add additional sections of anatomy and/or physiology courses so that the student demand level for these courses can be met in the future. Program expansion will not be possible without additional space for these courses.

D) Enumerate specific recommendations based on the information provided above, as well as any related recommendations (e.g., creating and budgeting for a cycle for ongoing maintenance, repair, and replacement).

As anatomy models are very expensive and delicate, it would be ideal for us to have a regular budget for anatomy model replacements. Our courses cannot be effectively taught without adequate anatomy models.

SECTION 7
Technology and Software

A) Describe and assess the adequacy and currency of the technology and software used by the program.

Each of the health sciences classrooms is equipped with a multimedia computer and a projector. In addition, there are nine laptops in NATS 123 that are primarily utilized for simulated labs in physiology. As of now we are using BioPac, a software for carrying out the simulated labs. However, owing to the outdated processors, the laptops are extremely slow, and it becomes a challenge to complete labs within a limited time.

B) Explain the immediate (1-2 years) needs related to technology and software. Provide a cost estimate for each need and explain how it will help the program better meet its goals.

There has been rapid technological advancement in the health care industry in the last few years. New healthcare electronic technologies are being introduced for clinical use at an unprecedented pace. As a result, the list of skills that our students need to develop to adapt to these changes is also growing. To better prepare our students to meet the demands of a technological world, we must integrate technology into our current academic curriculum. A virtual dissection table is one means to achieve this goal. It is the latest cutting-edge technology for studying the anatomy of the human body. It provides an interactive way to learn anatomy where students get to study a digital cadaver. This technology is also being utilized at healthcare facilities to help diagnose, plan treatment and patient care. There are no facility costs and no maintenance costs for a virtual dissection table.

Another option is acquiring a site license of a 3D Human Body Atlas app, a software that enables students to touch and rotate virtual body images. The ability to visualize structures in three-dimensional space helps in developing clear concepts that are extremely helpful in clinical settings. It also leads to more engaging and interactive learning that will impact student success and retention rates positively. Acquiring a site license will allow the use of the app campus-wide by students and faculty alike. This could eliminate the need for a textbook. However, the site license has to be renewed annually.

C) Explain the long-range (2-4+ years) needs related to technology and software. Provide a cost estimate for each need and explain how it will help the program better meet its goals.

The cost estimate for the Anatomage Table is $75,000.
The site license for a 3D atlas app must be renewed every two years. $21,000

D) Enumerate specific recommendations based on the information provided above, as well as any related recommendations (e.g., creating and budgeting for a cycle for ongoing maintenance, repair, and replacement).

The 3D app does not require any maintenance apart from renewal of the license while the virtual dissection table has zero maintenance cost.

SECTION 8
Staffing

A) Describe the program's current staffing, including faculty, administration, and classified staff.

2018 FTEF (full-time equivalent faculty): 11.68
2018 FTES (full-time equivalent student): 237.20
2018 FT/PT Ratio (full-time/part-time ratio): 1:1
(26 sections: Full time faculty 47.26% / Adjunct faculty 52.74%)

2017 FTEF (full-time equivalent faculty): 11.68
2017 FTES (full-time equivalent student): 246.48
2017 FT/PT Ratio (full-time/part-time ratio): 1:1.25
(26 sections: Full time faculty 44.09% / Adjunct faculty 55.91%)

2016 FTEF (full-time equivalent faculty): 10.82
2016 FTES (full-time equivalent student): 229.92
2016 FT/PT Ratio (full-time/part-time ratio): 1:1
(24 sections: Full time faculty 51.11% / Adjunct faculty 48.89%)

B) Explain and justify the program's staffing needs in the immediate (1-2 years) and long-term (2-4+ years). Provide cost estimates and explain how the position/s will help the program better meet its goals.

The current Allied Health Science program's technician staffing needs appear to be sufficient. The classified staff includes three laboratory technicians, Christie Killduff, Linda Ohara, and Cynthia Hoover, which duties include preparation of all Anatomy, Physiology and Microbiology laboratory sections.

- In fall 2016, the FTEF was 10.82. The FTEF increased to 11.68 for fall 2017 and held steady at 11.68 for fall 2018. The increase in FTEF was due to the hiring of full-time faculty members, one of whom specializes in microbiology, and another of whom specializes in anatomy and physiology. We also lost one physiology full time faculty member to retirement.

- The full-time faculty to part-time faculty load ratios (FT/PT load ratios) have remained around 1:1. This shows that we have many sections taught by part-time instructors. The largest disparity occurred in fall 2017, where we employed 10 adjuncts and 7 full-time instructors. By fall 2018, we had 8 adjuncts and 8 full-time instructors.

- The FTES values ranged from 229.92 to 237.20. The number of FTES increased when the number of sections was increased from 24 (fall 2016) to 26 (fall 2017).

- An additional laboratory technician is required for night and weekend classes.

Name	Reassign Time	Currently on Leave	Retired Last 3 Yrs	FT Hired Last 3 Yrs	Anticipated to Retire
Thuy Bui					
Merium Mubarak				X	
*Jessica Padilla					
*Polly Parks				X	
*Teresa Palos					
Margaret Steinberg					
Michael Stupy					X (in three years)
Anne Valle					
Simon Trench			X		

*Faculty members that also teach in the Biology component of the Life Sciences

C) Enumerate specific recommendations based on the information provided above, as well as any related recommendations.

Life Sciences Allied Health has had the opportunity to hire full-time faculty for the last two years. Polly Parks was hired for microbiology and general biology in 2017 to replace Todd White, and Merium Mubarak was hired for anatomy and physiology in 2018 to replace Simon Trench. These hires have contributed greatly to providing excellent and consistent instruction to our students. Our ratios of FT to PT are slightly complicated because several faculty teach both in the LS Allied Health area and the LS Biology area, and they migrate between areas in different semesters. We have also grown by two sections of anatomy since 2016.

- Another new faculty member was hired for 2019-2020 in anatomy and physiology.
- The full-time to part-time ratio could be further improved by the addition of another full-time faculty member.
- A higher FT/PT ratio gives students more office hours, more access to instructors, and higher involvement in department, division, and campus-wide activities.
- An additional faculty member would cost the district approximately $90,000 per year in salary and benefits.

SECTION 9
Direction and Vision

A) Describe relevant changes within the academic field/industry. How will these changes impact the program in the next four years?

Given the growing healthcare demands and an aging population, the healthcare industry is projected to grow faster than average for all other occupations in the next ten years, according to the Bureau of Labor Statistics. Moreover, the recent trend of technological advancements in the healthcare systems is expected to continue as new healthcare technologies such as 3D printing, wearable devices etc., are introduced for clinical use. We must prepare our students for this technology-driven world. Technology in the form of virtual labs, 3D animations, and advanced computer programs along with proper laboratory equipment and laboratory testing procedures, are essential for subject matter mastery and proficiency that will allow students to succeed in academia and their professional goals.

Life Science building facilities need repair and even to maintain the current program, we face a constant need to replace or update the equipment, but budget constraints continue to hinder our progress. It continues to prevent the expansion of the program and implementation of new courses in areas such as Pathophysiology and Forensic Pathology. While there is a clear rationale for these types of courses to meet the ever-evolving student needs in the workforce, the funds and facilities are simply not there. Our current inability to obtain these facilities will ultimately result in the need for an expedited catch-up program after the next four years.

B) Explain the direction and vision of the program and how you plan to achieve it.

The direction of the program is to prepare students academically to successfully enter healthcare professions such as PA programs, nursing, radiology technology, respiratory technology, kinesiology, and so forth. Health science courses are both intensive and thorough that emphasize the structure and function of the human body together with the causes of physiology dysfunction, disease, and the role of microorganisms in developing these pathologies. Using real tissue specimens including preserved cats we were able to effectively illustrate and teach human morphology and the pathologies that frequently arise. Owing to the rapid advancement in technology many teaching institutions and health facilities are employing the virtual dissection tables for teaching health sciences courses as well as for patient care, treatment, and diagnosis. We need to integrate state-of-the-art technology in teaching anatomy and physiology in our current curriculum to prepare our students to succeed in their future careers.

We envision to close the achievement gap and improve our success and retention rates. Toward this end, we have our recommendations outlined in detail in related sections.

C) Enumerate specific recommendations based on the information provided above, as well as any related recommendations.

It is evident in our current political environment that careers in the medical fields are going to continue to grow. This will and has led to increased student demand for health science courses. Additional sections need to be available to meet this increasing demand. Since the lack of

additional facilities is the major impediment to achieving this, our primary recommendation would be for the college to include a budget for the expansion of the life sciences facilities and staff to accommodate additional class sections.

For an effective illustration of human morphology and the pathologies associated with the disease state a human cadaver is indispensable. With the failure of the cold room refrigeration and subsequent loss of the human cadavers, we have been without a cadaver for the last four years. On top of that there is also a shortage of preserved cats and all these issues are posing severe hindrance to running a comprehensive program. A virtual dissection table is another alternative that is being utilized in other colleges. Acquiring a virtual dissection table would not only impact our success and retention rates positively but it will also prepare our students to do well in their professional fields.

Furthermore, we strongly recommend improving student preparation before taking the life science courses. For anatomy, English and a one-unit introductory course should be added as a prerequisite. More advanced courses would also require a background in Chemistry and Math. Chemistry, Anatomy 32, and English are already prerequisites for Physiology. We have found that students weak in these prerequisite fields struggle greatly in the major Life Sciences courses leading to low retention rates. With these prerequisites, the retention rate and success rate are much higher as is student satisfaction and future career success. Should additional facilities and the corresponding necessary equipment become available, then additional full-time lab technical staff should also be available to provide quality instruction.

SECTION 10
Prioritized Recommendations

A) Provide a single, prioritized list of recommendations and needs for your program/ department (drawn from your recommendations in sections 2-8). Include cost estimates and list the college strategic initiative that supports each recommendation. Use the following chart format to organize your recommendations.

	Recommendations	Cost Estimate	Strategic Initiatives
1.	Allocation of funds for Supplemental Instruction, open labs, and tutoring.	Unknown	A, B
2.	Inclusion of an introductory one-unit course as a prerequisite for Anatomy-32.	No cost	A, B
3.	Construction of new Life Science Building/lab rooms	Unknown	A, B
4.	Inclusion of a degree at the successful completion of the program.	Unknown	B
5.	Purchase of a cadaver.	$ 20,000	A, B
6.	Allotment of an annual budget for replacement of broken microscopes and anatomy models.	$3,200	A, B
7.	Purchase of a Virtual Dissection Table (Anatomage Table)/site license for Human Body Atlas (Visible Body App).	$78,000/ 21,000	A, F
8.	Improving ventilation system in classrooms	Unknown	F
9.	Purchase of new anatomy models and repair of broken models	$ 80,000	A, B
10.	Procurement of Cardiovit and Spirometer	$ 24,000	A, B, F
11.	Buy new Ophthalmoscope-otoscope Kits	$ 4,800	A, B, F
12.	Buy Hot plates	$ 5,600	A, B

B) Explain why the list is prioritized in this way.

In order to improve the success and retention rates it is imperative that we offer our students additional support in the form of Supplemental Instruction, open labs, and tutoring. As most of the students taking these classes are underprepared for these courses, help outside of class would be extremely beneficial to them. To achieve equitable outcomes for all students it is essential that a one-unit course be added as a prerequisite for Anatomy-32. Current facilities are inadequate to cater to the needs of existing enrollment rate. Construction of a new building has become a crucial need of this program.

All other recommendations include the necessary equipment that is essential for successful completion of this program. A cadaver and a virtual dissection table is a critical requirement to achieve the student learning outcomes for anatomy and physiology courses.

Appendix A
ALIGNMENT GRIDS

NATURAL SCIENCES
Institutional (ILO), Program (PLO), and Course (SLO) Alignment

Program: **Life Science: Allied Health**	**Number of Courses:** 6	**Date Updated:** 09.10.2014	**Submitted by:** T. Jim Noyes, ext. 3356

ILOs	**1. Critical Thinking** *Students apply critical, creative and analytical skills to identify and solve problems, analyze information, synthesize and evaluate ideas, and transform existing ideas into new forms.*	**2. Communication** *Students effectively communicate with and respond to varied audiences in written, spoken or signed, and artistic forms.*	**3. Community and Personal Development** *Students are productive and engaged members of society, demonstrating personal responsibility, and community and social awareness through their engagement in campus programs and services.*	**4. Information Literacy** *Students determine an information need and use various media and formats to develop a research strategy and locate, evaluate, document, and use information to accomplish a specific purpose. Students demonstrate an understanding of the legal, social, and ethical aspects related to information use.*

SLO-PLO-ILO ALIGNMENT NOTES:

Mark boxes with an 'X' if: SLO/PLO is a major focus or an important part of the course/program; direct instruction or some direct instruction is provided; students are evaluated multiple times (and possibly in various ways) throughout the course or are evaluated on the concepts once or twice within the course.

DO NOT mark with an 'X' if: SLO/PLO is a minor focus of the course/program and some instruction is given in the area but students are not formally evaluated on the concepts; or if the SLO/PLO is minimally or not at all part of the course/program.

PLOs	**PLO to ILO Alignment** *(Mark with an X)*			
	1	**2**	**3**	**4**
PLO #1 Language Students will be able to use language appropriate to anatomy and physiology and the health sciences.		X		

PLO #2 Instruments Students will demonstrate the use of instruments for dissection, histology, and to gather data.	X			
PLO #3 Structures Students will be able to identify higher vertebrate body structures, and explain the functions of body systems.	X			

SLOs	**SLO to PLO Alignment** *(Mark with an X)*			**COURSE to ILO Alignment** *(Mark with an X)*			
	P1	**P2**	**P3**	**1**	**2**	**3**	**4**
ANAT 30 Essentials of Anatomy and Physiology: SLO #1 Language Students will be able to use language appropriate to anatomy and physiology and the health sciences.	X						
ANAT 30 Essentials of Anatomy and Physiology: SLO #2 Instruments Students will demonstrate the use of instruments for dissection, histology, and to gather data.		X		X	X		
ANAT 30 Essentials of Anatomy and Physiology: SLO #3 Structures Students will be able to identify higher vertebrate body structures, and explain the functions of body systems.			X				
ANAT 32 General Human Anatomy: SLO #1 Language Students will be able to use language appropriate to anatomy and the health sciences.	X						
ANAT 32 General Human Anatomy: SLO #2 Instruments Students will demonstrate the use of instruments for dissection, histology, and to gather data.		X		X	X		
ANAT 32 General Human Anatomy: SLO #3 Structures Students will be able to identify higher vertebrate body structures of all body systems.			X				
APHY 34A Anatomy and Physiology I: SLO #1 Language Students will be able to use language appropriate to anatomy and physiology, and the health sciences.	X						
APHY 34A Anatomy and Physiology I: SLO #2 Instruments Students will demonstrate the use of instruments for dissection, histology, and to gather data.		X					
APHY 34A Anatomy and Physiology I: SLO #3 Structures Students will be able to identify structures of the integumentary, skeletal, muscular, and nervous systems, in addition to explaining the functions of the systems.			X	X	X		
APHY 34B Anatomy and Physiology II: SLO #1 Language Students will be able to use language appropriate to anatomy and physiology, and the health sciences.	X						

APHY 34B Anatomy and Physiology II: SLO #2 Instruments Students will demonstrate the use of instruments for dissection, histology, and to gather data.		X					
APHY 34B Anatomy and Physiology II: SLO #3 Structures Students will be able to identify structures of the nervous, endocrine, circulatory, respiratory, digestive, urinary, and reproductive systems, in addition to explaining the functions of the systems.			X				
MICR 33 General Microbiology: SLO #1 Language Students will be able to use language appropriate to microbiological studies and the health sciences.	X			X	X		
MICR 33 General Microbiology: SLO #2 Instruments Students will demonstrate the use of instruments to gather data.		X					
MICR 33 General Microbiology: SLO #3 Microbes Student will be able to identify microbes and explain their roles in health and disease.			X				

SLOs	**SLO to PLO Alignment** *(Mark with an X)*			**COURSE to ILO Alignment** *(Mark with an X)*			
	P1	**P2**	**P3**	**1**	**2**	**3**	**4**
PHYO 31 Human Physiology: SLO #1 Language Students will be able to use language appropriate to physiological functions and the health sciences.	X						
PHYO 31 Human Physiology: SLO #2 Instruments Students will demonstrate the use of instruments to gather physiological data.		X					
PHYO 31 Human Physiology: SLO #3 Mechanisms Students will be able to describe mechanisms and explain physiological processes that occur in the human body on cellular, organ, systemic, and organismal levels.			X	X	X		

Appendix B
SLO/PLO TIMELINES

Calendar Year	Semester	Course-Level SLOs Assessed	Program-Level SLOs Assessed
Year 1 of 4-Year SLO Cycle *(3 years before Program Review)*	Spring Year 1	Health science language SLO (All sections) 2020	Health science language SLO (All sections) 2020
	Fall Year 1		
Year 2 of 4-Year SLO Cycle *(2 years before Program Review)*	Spring Year 2	Use of Scientific Instruments SLO (All sections) 2021	Use of Scientific Instruments SLO (All sections) 2021
	Fall Year 2		
Year 3 of 4-Year SLO Cycle *(1 year before Program Review)*	Spring Year 3	Anatomical structures and physiology explanations SLO (All sections) 2022	Anatomical structures and physiology explanations SLO (All sections) 2022
	Fall Year 3		
Year 4 of 4-Year SLO Cycle *(Year of Program Review)*	Spring Year 4	Program Review 2023	
	Fall Year 4		

Appendix C
6-YEAR CURRICULUM COURSE REVIEW TIMELINE

Course	Last Review	Next Review
Anatomy 30	Fall 2014	Fall 2020
Anatomy 32	Fall 2015	Fall 2021
Anatomy 34A	Fall 2018	Fall 2024
Anatomy 34B	Fall 2018	Fall 2024
Physiology 31	Fall 2016	Fall 2022
Microbiology 33	Fall 2014	Fall 2020