BIOLOGY Program Review 2019-2025 Latest Version

Biology Program Review (Six-year Cycle)

Program Review Introduction

Section IA: Basic Program Information - INTRODUCTORY INFORMATION 10/29/18 : Version by **Mueller, Joseph** on **06/30/2022 23:24**

Department/Program

Names/roles of those who participated in program review
Life and Earth Sciences/**Allied Health Program**:
The faculty and staff of the Biology Program are dedicated to providing the public with the highest quality education possible. Our enjoyable collective success in meeting this challenge lies squarely with the positive, "can do" attitude of the individual members of our department. All members of our department are active learning participants in their individual fields who try to stay current by doing research, professional development and attending conferences. All members of the department are committed to producing a friendly, non-threatening learning environment for the student. Student diversity and expertise are viewed as an honored contribution to the classroom. Our methodologies for delivering course curriculum are as diverse as the content of our individual disciplines. We endeavor to adopt those methodologies best suited for specific content and the learning styles of our students. We strive to maintain a curriculum current in content and supported with appropriate technology. In practice, we emphasize modem scientific theoretical models, processes, and practices. To be a good scientist requires a broad background in all science and mathematics. A good scientist must also be a good communicator, strong English skills are a must.
Broadly defined, we serve six groups of students: Biology transfer students, Allied Health transfer students, students completing their general education requirements, students interested in completing our Natural History Certificate Program, and community members interested in learning something new in the life sciences arena. In practice we emphasize modern scientific theoretical models, processes, practices, and environmental stewardship. Finally, our curriculum is well-integrated with as well as dependent on the curricula of the entire college.

General Outcomes
Students that complete an introductory course in Biology or a course in Allied Health series within our department will leave with a greater appreciation of the complexity of the planet, Human Biology and Cell Biology.
In general, the successful learner will complete our program possessing:
a basic knowledge of the scientific method and cognitive processing skills of a scientist
the ability to derive, by inductive reasoning, plausible explanations of observed phenomena
clinical skills, laboratory skills, research skills, microscopy skills, and/or field techniques
the skills to do basic scientific calculations and to properly convert metric system measurements.
a fundamental understanding of natural selection and evolution
an understanding of the integrated nature of Earth system dynamics, limited resources, and overpopulation issues.
an appreciation of the intrinsic value to society of scientific research and the dilemma of scientific research presents to non-scientists
describe the general anatomy and functions of the human body systems, how “form fits function”, and the homeostatic mechanisms by which body functions are known to be regulated.
skills distinguish between normal and pathological changes in the body.

Upon completion of an Associate degree granted from the Life-Earth and Environmental Science Department, or all Allied Health Courses the student possesses the fundamental skills and

knowledge to succeed at any four-year institution or professional program, such as nursing. In addition to the qualitative understanding of science acquired by the student they will also possess the following skills:

- quantitative analytical problem-solving skills
- the ability to obtain, record, quantify and graphically display data in a usable systematic manner
- the ability to develop problem solving and planning strategies that enable timely completion
- of large scope studies and projects
- the ability to work under high stress conditions and meet deadlines
- the ability to use basic modem scientific technologies and methodologies and recognize the benefits and limitations of those technologies
- an understanding of the importance of input by the scientific community in public policy and decision-making processes
- the laboratory and field skills requisite for maintaining a safe and healthy working
- environment
- the ability to procure research documents from libraries and Internet sources
- the skills to write a technical report

(Note that within the Life and Earth Science Department, we have other areas that have their own program descriptions: the Major's Program, Natural History Program, Geography Program and Geology Program.)

Tina Christensen, David Egert, Emily Fox, Erin Jacobs, and Sung-Ji Schmidt

Major's Program
Fernando Agudelo-Silva
Emily Fox
Rebecca Werlin (Part-time)
Jeannine Williams (Part-time)

Natural History Program
Joe Mueller
Dayna Quick
Number of faculty (full- and part-time)

Allied Health
As of Spring 2022, we have 7 full-time faculty in the Life and Earth Sciences department that teaches courses in the allied health track (Introductory Biology and Lab, Nutrition, Human Anatomy, Human Physiology and Microbiology).
Note: An increase in the number of full-time faculty that can teach many different courses will likely result in a decrease in the number of part-time faculty (unless there is an increase of units within the department). This decrease in the part-time/full-time faculty ratio would lead to increased stability for the department when it comes to scheduling. The optimum balance between full-time and part-time faculty would ideally enhance both diversity of faculty expertise and stability of staffing of courses. The ideal ratio would likely be a slight increase of more full-time and slightly fewer part-time faculty than at present. With the loss of Paul DaSilva and Becky Brown (due to recent retirements), there is currently a need for a new hire (or even 2 new hires) with expertise in botany, ecology, entomology, zoology, that can step in and teach courses such as BIOL 110, 110L, 112A and 112B. In addition, our current part-time faculty is limited in the courses they can teach. For example, some only teach Human Anatomy, others only teach BIOL 110L. Hiring more part-time faculty who can teach many different courses (instead of specializing in one, like Anatomy) is valuable for the department. It gives a lot more flexibility and job security to the part-time faculty. It also helps part-time faculty to secure a steady workload each semester. It would also reduce stress for the department chair when scheduling classes and dealing with last minute schedule changes. In addition to several full-time

faculty approaching retirement age, several of our part-time faculty could also retire in the next 5 years, it will therefore be critical for us to hire a couple of part-time faculties in the next semester that could teach either Anatomy, Physiology, Human Biology and/or Biology 110/110L.

Name	Courses Taught (since last full PR)
Agudelo-Silva, Fernando	Biology 100, 107, 110, 110L, 112B, 160, 162, 240,
Christensen, Tina	Biology 110, 110L, 120, 224
Egert, David	Biology 120, 224
Fox, Emily	Biology 240
Jacobs, Erin	Biology 110, 110L, 120
Mueller, Joe	Biology 110, 169A, 169B, 171, 141, 162, 235, 237, 101,
Schmidt, Sung-Ji	Biology 120, 224

Several retirements may occur in the next 5 years, therefore it is important to make sure the number of full-time faculty in the discipline does not become dangerously low, placing increased pressure on all personnel and reducing efficiency in operation. Therefore, hiring faculty that are able to teach many different courses (not only Anatomy, Physiology, and Microbiology i.e., 1 subject expertise) is important for the well-being of the department. By having faculty that can teach many different courses, it is much easier to adjust to retirements, sabbaticals and last-minute changes in the schedule.

In addition, as of Spring 2022, we have part-time faculty teaching courses that serve the Allied Health Program:

Name	Courses Taught Recently (since last full PR)
Rossi, Aviva	Biology 110, 110L, 101
Chin, Jett	Biology 120
Gamal, Arif	Biology 120
Mahmoud, Eiman	Biology 120, 240
Rodriguez, Elena	Biology 110L
Rossi, Aviva	Biology 110, 110L
Shaw, Brieanna	Biology 110, 110L
Smith, Vic	Biology 110, 110L, 112A
Wenck-Reilly, Brennan	Biology 110, 110L
Werlin, Rebecca	Biology 110, 110L, 112C, 240
Williams, Jeannine	Biology 110, 112C, 224, 240

Major's Program
Full-time:
Fernando Agudelo-Silva
Joe Mueller
\u200B\u200B\u200B\u200B\u200B\u200B\u200B
Part-time:
Rebecca Werlin
Jeannine Williams
Natural History Program

Full-time:
Joe Mueller (program coordinator)
Dayna Quick
Part-time:
Aviva Rossi
Number of staff (full- and part-time)
Allied Health, Major's Program and Natural History Program
1 full time for Microbiology and Human physiology - Daudi Manento
1 full time shared with Allied Health and Major's Biology and Introductory Labs - Lauren Amundson
1 Part time shared with Bio 110/Intro Biology and Natural History Program (Specimens Museum Tech) - Sandy Imazumi

Description of any grant, partnership (internal or external), and/or outreach the program is engaged in
Allied Health (Emily Fox)

Tiny Earth Partnership
College of Marin BIOL 240 students, in collaboration with researchers at University of Wisconsin, Madison, are engaging in scientific research in which they search for soil bacteria that produce natural antibiotics for further study. Antibiotic resistance is increasing all the time, which makes it imperative to discover new antibiotics. Antibiotic discovery through brute-force isolation and characterization of microbes is time consuming and expensive with no guarantee of success so most drug companies do not pursue this approach. By enlisting thousands of students in this research project, a large number of isolates can be screened. The students gain the experience of participating in a meaningful research project. The world, hopefully, will gain new antibiotics.

Black Tie and Blue Jeans Grant
Learning to evaluate and interpret images seen under the microscope is a universal student learning objective in nearly every biology course at College of Marin (COM), including BIOL 110, 110L, 112A/B/C, 120, 138, 160, 161, 162, 165L, 169A/B, 224, 235, and 240. In all, more than 700 students per semester are striving to meet microscopy-related learning objectives. This project aims to enhance student learning, improve access to microscopy during distance learning, and improve microscope accessibility for visually or physically impaired students through the creation of a permanent digital library of micrographs and microvideos.

Partnership with Bayside MLK Jr. Academy
In 2019 The California Attorney General issued a court order to end unequal treatment of students who attended Bayside Martin Luther King Jr. Academy.
The report that led to this decision found that there was a disproportionate allocation of resources towards another school, hindering the completion and performance of MLK schoolchildren. Most of the MLK student population is from African American origin, increasing further the racial disparities already present in Marin. College of Marin faculty from the physics, chemistry, and biology departments are leading hands-on science activities at Bayside MLK Jr. Academy with the goals of:

1. Increasing students' interest in science, with particular attention to building a pipeline that lead to college
2. Training MLK educators to be able to implement activities in their curriculum to improve student performance
3. Improving student performance in science related classes

Major's Program
(F. Agudelo-Silva)

Started process to establish cooperation with the California Dept. Of fish and wildlife to establish a site at College of Marin to monitor bumble bee populations.

Has cooperated for many years with the Salomon Protection and Watershed Network, SPAWN, to work on ecological restoration in the Lagunitas Creek watershed. This cooperation promotes the image of college of Marin in the community and provides very good hands-on opportunities for students to learn ecological concepts.

Has cooperated for many years with the Marin Municipal Water District to work on ecological restoration in the Mount Tamalpais watershed. This cooperation promotes the image of college of Marin in the community and provides very good hands-on opportunities for students to learn ecological concepts.

Natural History Program (Joe Mueller)

Ocean Science Trust Collaborative Program
Natural History Program Coordinator is involved with DEI roundtable discussions with universities and community colleges throughout the state to explore how to best include DEI in ocean sciences

This Roundtable gathering provides a venue for participants to provide input and reflections on institutional challenges and opportunities for advancing inclusion, equity, and diversity in academia and beyond for ocean-focused professionals in California. They give participants the opportunity to share perspectives, using breakout room conversations to spark collaborative ideas that the ocean science academic community can advance on. This has proven to be very useful for developing a center of science equity at the future Bolinas Field Station.

John H. Prescott Marine Mammal Assistance Grant Program.

The Life and Earth Sciences Dept. has agreed to collaborate with the California Academy of Sciences (CAS) on the FY22 Prescott proposal to develop a marine mammal stranding response internship for undergraduates from underrepresented groups in science. The L & E Sciences Dept. has agreed to work with CAS to recruit and hire undergraduate students for two summer internships in marine mammal science, one beginning June 2023 and the other beginning June 2024.

Program Coordinator has meet with the director of **ACR (Audubon Canyon Ranch)**, a non-profit outdoor education and research organization that offers historically underserved, inner city school groups opportunity to participate in overnight nature-based experiences. The plan is to collaborate with ACR to develop a partnership where COM facilitates ACR's efforts to illuminate the wonders of the outdoors by offering the use of COM's Bolinas Field Station, which in close proximity to ACR's Martin Griffin Preserve. Dr. Coon has with ACR's executive director in late June of 2022 to discuss how best to move forward. ACR's E.D. is also interested in developing Naturalist job opportunities for the graduates of our Natural History Program.

Environmental Action Committee of West Marin has been working with our Life & Earth Sciences Dept. to provide research opportunities, environmental educator positions and internship opportunities for participants and graduates of our Natural History Program

Program Coordinator has met with Pt. Reyes National Seashore Association **Cal Naturalist Program** director to collaborate on promotion for COM's Natural History Program

Section IB: Basic Program Information - 11/2/18 : Version by **Mueller, Joseph** on **06/30/2022 23:24**

Units offered & related data
Enrollment & related data (zipcode/other data points)
Persistence (overall)
Persistence by race/ethnicity
Persistence by gender
Persistence by age
Seat Availability
#/% of courses with wait lists
#/% of courses with no materials cost (including textbooks, software, supplies, etc.)
#/% of courses low-enrolled

Allied Health

We offer a number of courses in our department that are taken primarily by students who are intending to either apply to nursing school or enter into other allied health professional fields. These classes (often considered 'pre-nursing courses') are typically fully enrolled with wait lists, and include: Human Anatomy (Biol 120), Human Physiology (Biol 224), and Microbiology (Biol 240). While the students taking these classes generally do not get associate degrees or transfer to 4-year institutions and thus do not count in the typical rubrics the college uses to quantify a 'successful' program, the students are still getting critical prerequisites that will allow them to continue on and fulfill their educational and professional goals.

Units offered & related data

In recent years, we have been offering 5 sections of Human Anatomy, 3 sections of Human Physiology, and 2 sections of Microbiology each Fall and Spring semester. These are 5 (student) unit lecture and laboratory classes. They are expensive to run and require 8 teaching units each, in addition to requiring extensive laboratory support both in terms of skilled lab techs, materials, equipment, and service contracts. In past years we have experimented with offering Anatomy and Physiology sections over the summer as well (in response to student requests) using an extended 8-week summer session, however it was quite problematic logistically, as well as pedagogically, to compress the class into half the normal time given the intensity of the classes and the complexity of setting up and running the lab components (which includes lab tech time in addition to instructor units).

Enrollment & Overall Persistence

Here is the overall enrollment, persistence, and success data for the trio of prenursing classes – cumulative over five years from Fall 2017 to Fall 2021, across all demographic groups:

Course	Intial enrollments	Retention rate	Success rate
Biol 120 – Human Anatomy	951	83.54%	79%
Biol 224 – Human Physiology	693	88	82
Biol 240 – Microbiology	499	92	87

The retention and success rates for Human Anatomy are not that surprising given that this class is often the students' first exposure to such a challenging and rigorous course at the college level. In order to take Physiology and Microbiology, students have already taken a chemistry prerequisite and theoretically have more background knowledge, experience and study skills. Microbiology tends to be last class of the three that the students take, hence both a winnowing down in numbers, along with a concomitant increase in retention and success given that these are students who have managed to successfully complete the other two classes already.

Persistence by Race/Ethnicity

Here is data for the trio of pre-nursing classes, cumulative over five years from Fall 2017 to Fall 2021, breaking down retention and success rates by a variety of race/ethnicities. (See bar charts below in Section IIA for a more complete breakdown of retention and success rates by race/ethnicity). All three of these classes demonstrate a marked disparity in retention and success rates between different groups.

	Retention rate			Success rate		
Course	White	Hispanic	Black/AA	White	Hispanic	Black/AA
Biol 120 – Human Anatomy	87.9%	79.4%	76.3%	83.5%	73.7%	65.8%
Biol 224 – Human Physiology	92.1%	83.4%	84.2%	89.4%	72.7%	84.2%
Biol 240 – Microbiology	94.4%	91%	85.7%	91.1%	82.6%	78.6%

The college as a whole, especially recently, has been very focused on implementing and expanding multiple approaches to reduce these disparities, which are found far beyond just our pre-nursing classes. Unfortunately, the COVID-19 pandemic over the past years has tended to exacerbate problems and its extreme disruption of people's lives and the very nature of instruction at the college, has confounded our ability to work with and assess the efficacy of various interventions.

To improve access to these classes, we have been utilizing the library's LTP program to provide free textbook loans to students for the duration of the class, eliminating the need for the

students to purchase extremely expensive books. While this is not necessarily a zero-cost approach (students still need to purchase lab notebooks, etc., the outlay is in the tens of dollars rather than hundreds of dollars...

Major's Program

Units offered
BIOL 112A: 5 units
BIOL 112B: 5 units
BIOL 112C: 5 units

Enrollment
Between 85 and 138 biology majors in this time period

BIOL 112A FA17-FA21: 138 students
BIOL 112B FA17-FA21: 85 students
BIOL 112C FA17-FA21: 88 students

INSERT GRAPHS major's program

See Persistence (overall) Bar graph
First time students Fall-to-Spring Persistence, Program Majors and all CoM First time Students. Fall 18 to Fall 20

See Persistence by race/ethnicity Table
First time students Fall-to-Spring Persistence by Race/ Ethnicity Fall 18 to Fall 20

See Persistence by gender Table
First time students Fall-to-Spring Persistence by Gender, Fall 18 to Fall 20

See Persistence by age Table
First time students Fall-to-Spring Persistence by Age Fall 18 to Fall 20

Seat Availability
#/% of courses with wait lists: three (BIOL 112A, B, and C)
#/% of courses with no materials cost (including textbooks, software, supplies, etc.): none
#/% of courses low-enrolled: none

NATURAL HISTORY PROGRAM
Units offered

GEOG 101 Physical Geography: 3 units
BIOL 161 Field Botany: 3 units
BIOL 162 General Ecology: 3 units
BIOL 235 General Marine Biology:4 units

BIOL 101 Intro. to Natural History/Field Biology: 3
BIOL 169A Intro to Ornithology: 3
Total 19 units to complete the Natural History Certificate

Seat Availability
Some course fill and some have seats available. All have 15 or more.

#/% of courses with wait lists
None

#/% of courses with no materials cost (including textbooks, software, supplies, etc.)
None

Section IC: Basic Program Information - DISCUSSION 11/2/18 : Version by **Mueller, Joseph** on **06/30/2022 23:24**

What is the enrollment trend over the past three years? How does this compare to the institutional trend?

REFLECTION & PLANNING SUMMARY:

Allied Health
Based on data from Fall 2017- Spring 2020, enrollment has remained consistent with the lowest at 744 students in Spring 2018 and a high of 855 students in Fall 2019. Most students were between 10-24 years of age consistent with institutional trends. There were considerably more female (66.2 - 68.1%) compared to male (31.0 - 32.7%) students enrolled.

Major's Program

Enrollment has remained consistent. Classes are fully enrolled.

	students/semester offered
112A	19.375
112B	24
112C	23.5

Natural History Program

Enrollment has increased in the last 5 years. Most classes are fully enrolled or close to it.
How does this trend influence the master schedule and scheduling of courses?

REFLECTION & PLANNING SUMMARY:

Allied Health
Consistent enrollment in these courses indicates an ongoing offering of the number of courses as well as optimal timing of the courses (day vs night; days of the week) while keeping in mind time and space constraints (instructor availability, lab space, etc).

Major's Program

High enrollment in these courses suggests that returning to the original plan to offer all three courses at least once every three semesters would benefit our students. Students have petitioned at least twice in the past few years to have a section of 112C added due to transfer constraints.

In certain occasions there is a waitlist for some of these classes, especially BIOL 112A/B. Thus, for the future it may be advisable to have two sections of Biology 112A/B offered during the same semester. We propose to observe the enrollment trends after the online period of instruction due to Covid 19-to determine if there is a need to create more class sections. BIOL 112C usually has the lowest enrollment.

Natural History Program

Dept. asked PRAC for an increase of one course for every other semester. This would allow more participants in the program to graduate in a more timely manner.
Decision is pending.
If there are particular courses that routinely have wait lists and/or are not getting sufficient enrollment (15-student minimum), how is this being addressed?

REFLECTION & PLANNING SUMMARY:

Allied Health
The pre-nursing courses (120, 224 and 240) have been impacted for a number of years now as student interest in the health-care fields has ballooned. In the past few years, the department has been active in recruiting faculty who have the necessary expertise to teach these courses.

Over the next few years as we observe the impact of enrollment at COM's nursing program as well as other neighboring ones, we can get a better idea of whether or not we need to consider expanding our pre-nursing offerings. At this point, the bottleneck for student enrollment seems to be at the nursing program level as they have plenty of applications for a limited number of acceptances. If nursing programs open up more spots to more students then we may consider doing the same. But at this point, it would be premature to do so.

Major's Program
Based on the unusual enrollment situation caused by online teaching during the last two years, we plan to wait for two more years to determine what to do in terms of enrollment.

Natural History Program
None
What factors may be influencing the program's trends?

REFLECTION & PLANNING SUMMARY:

Allied Health
Of significance, the current data that we have omits the enrollment numbers from the upheaval of the pandemic and as such we do not yet fully understand the impact of switching from emergency remote vs pivoting back to primarily in-person delivery of these courses. Scheduling continues to be a challenge as the department adapts to institutional as well as global changes that impact enrollment and as such will have to be addressed on a semester-by-semester basis.

Major's Program
Unknown at this time but some guesses without evidence might be:
Changes in technology
Job market
Accessibility

Interests

Natural History Program
Recruitment. Word of mouth is the only way prospective participants in the program are able to learn about the Natural History Program as the college puts little to no effort into promotion. Mistakes have been made in the Catalog of Courses and so many students and counselors have had misinformation in the recent past. Counselors by-and-large do not support the program and have been known to dissuade interested students from entering the program. Participation in the program has increased over the last few years even though the program is up against these unusual challenges. Dept. recommends that Counselors become educated about the value of the program.
What discussions is the department having about program cost (textbooks, material fees, etc.) that may be affecting student access?

REFLECTION & PLANNING SUMMARY:

Allied Health
The department has a number of instructors who participate in the Library Textbook Program (LTP) and the Zero Textbook Cost (ZTC) programs. We would highly recommend the continuation or even expansion of these programs as student response has been overwhelmingly positive.

Major's Program
We have discussed the development of our own teaching resources, in particular textbooks and laboratory manuals. Many within the dept, are developing databases of images to support the instruction.

Natural History Program
Recently discussions have taken place that explore the idea of accepting the many offers of donations to a Natural History Program fund that pays for student park fees, transportation and other costs associated with field trips. Unfortunately, the college requires such a fund to have a minimum of $1000 to remain solvent and functional. This requirement keeps us from developing such a fund.
What discussions is the department having about instructional methods and experiential learning opportunities to support equitable access and success?

REFLECTION & PLANNING SUMMARY:

Allied Health
Instructional methods that support equitable access and success continues to be an ongoing area of instructor experimentation and learning. Quality in-person hands-on laboratory learning continues to be one of the hallmarks of our courses.

Major's Program

We plan to have meetings to determine what changes in our teaching are necessary to support equitable access and success. One major need we have is for remedial classes in biology and math for some students who enroll in the bio112 series. These classes should be available every semester any of the biology 112 series are offered. Instructors can determine early in the semester which students need remedial classes and recommend they enroll in these classes.

We need one more fully equipped lab room to successfully teach the biology 112 series. We currently only have one lab and that lab is not appropriate to teach the variety of material we teach in the series. For example, BIOL 112C requires a lab where work in molecular biology can be done with minimum degree of contamination. The current laboratory for all three courses is used to study plants, animals and soil which are a potential source for contamination in the molecular biology done in Biology 112C.

Natural History Program

See Descriptions of Grants and Partnerships above to get a sense of the rich cornucopia of discussions we've been having in this area.

Our Dept. plans to have meetings to determine what changes in our teaching are necessary to support equitable access and success. The program coordinator will be sure to be a part of these ongoing discussions.

What objectives related to these trends might the program consider?

REFLECTION & PLANNING SUMMARY:

Allied Health

Continue to monitor enrollment trends as the full impact of the pandemic reveals itself.

Continue to monitor county and statewide employment trends in order to best anticipate student demand for certain courses.

Major's Program

No Answer

Natural History Program

We need to recruit more students from historically disadvantaged groups as our Natural History Program provides an optimum steppingstone to the more academically challenging science programs.

What activities have been designed to achieve the objectives?

REFLECTION & PLANNING SUMMARY:

Allied Health

See Above

Major's Program

No Answer

Natural History Program

None

What professional development would be most helpful to achieve the objectives?

REFLECTION & PLANNING SUMMARY:

Allied Health

N/A

Major's Program

N/A

Natural History Program

Flex activities on the subject for managers and counselors would be very useful so they can understand how important environmental programs like the natural history program are. There is uniform agreement among faculty who understand the environmental crisis and how intimately it is related to the DEI challenges we face. Management and counselors need to experience a paradigm shift which is most likely due to lack of an environmentally functional perspective. \u200B\u200B\u200B\u200B\u200B\u200B\u200B

Section IIA: Student Success Trends - COMPLETION DATA BY ETHNICITY 11/2/18 : Version by **Mueller, Joseph** on **06/30/2022 23:24**

Course completion rates, including by DE vs. in-person, and by student group (ethnicity, gender, age).

Course success rates (institution-set rate is 70%), including by DE vs. in-person, and by student group (ethnicity, gender, age)
Course success and retention were not significantly different for DE vs. in-person courses or between students of different genders or ages for any biology courses at COM. However, there are differences in success and retention by ethnicity. 52 – 87% of African-American students were retained, 40 – 65% of African American students succeeded, and 56 – 70% of Hispanic students succeeded in biology courses overall. This is compared to 66 – 100% retention and 50 – 100% success for students of other demographics. In the Allied Health Program, disproportionate success and retention are seen in courses that do not have science course pre-requisites, but are not seen in those courses that do have pre-requisites. The largest disparity in retention and success is seen in the general education course BIOL 110, which is a pre-requisite for BIOL 224 and BIOL 240.

Course	Pre-requisites
BIOL 110	none
BIOL 100	none
BIOL 120	BIOL 110
BIOL 224	BIOL 110 and CHEM 110 or 114
BIOL 240	BIOL 110 and CHEM 110 or 114

See Course Retention and Success by Ethnicity in all BIOL courses Bar Graph
Course Retention and Success by term Race/Ethnicity

See Course Retention and Success by Ethnicity in Allied Health courses and Pre-requisite BIOL 110 Fall 2018 – Fall 2021
5 Bar Graphs
1) Biol 110 Success and Retention
2) Biol 100 Success and Retention
3) Biol 120 Success and Retention
4) Biol 224 Success and Retention
5) Biol 240 Success and Retention

Major's Program

Course success and retention were not significantly different for DE vs. in-person courses or between students of different genders or ages for any biology courses at COM. However, there

are differences in success and retention by ethnicity. 52 – 87% of African-American students were retained, 40 – 65% of African American students succeeded, and 56 – 70% of Hispanic students succeeded in biology courses overall. This is compared to 66 – 100% retention and 50 – 100% success for students of other demographics. However, in the biology majors program (BIOL 112A, B, C), retention and success are similar across all ethnicities. The largest disparity in retention and success is seen in the general education course BIOL 110, which is a pre-requisite for BIOL 112B/C

INSERT GRAPHS
See the course success and retention rates by ethnicity for all biology courses:
Bar graphs depicting Course Retention and Success by Term and Race/Ethnicity
Fall 18 to Spring 21

The course success and retention rates by ethnicity for 112A, B and C:
4 Bar Graphs
1) 112A Success and retention FA17-FA21
2) 112B Success and retention FA17-FA21
3) 112C Success and retention FA17-FA21
4) BIOL 110 Success and retention FA17-FA21

Natural History Program

N/A there are no control groups to provide a frame of reference

The course success and retention rates by ethnicity for all biology courses:
See Section IIA in Bio Majors section of this program review

The course success and retention rates by ethnicity for the Natural History Program:

Ethnicity	Course Success/Retention	Graduated with Certificate
African American	100%	1 in program
Latinx	100%	2 recently graduated
Asian	100%	1 recently graduated
Caucasian	80%	7 graduated/17 in program

Section IIB: Student Success Trends - DISCUSSION 11/2/18 : Version by **Mueller, Joseph** on **06/30/2022 23:24**

Are course *completion* rates at or above the institutional average? Discuss to what this can be attributed and summarize any efforts underway or being considered.

REFLECTION & PLANNING SUMMARY:

Course completion rates for the biology department are at the institutional average.
If the course success rates for any group of students is above that of the institution (70%), discuss to what this success can be attributed and summarize any particularly effective activities.
If the course *success* rates for any group of students is above that of the institution (70%), discuss to what this success can be attributed and summarize any particularly effective activities.

REFLECTION & PLANNING SUMMARY:

Course success rates for the biology department are at the institutional average for all groups except for Black or African American students and Hispanic students. Course success rates for these two demographic groups decreased compared to institutional success rates. This same trend is not seen in the Allied Health program courses that have pre-requisites. Students of all demographics who pass the prerequisites are exceeding the institutional success rate in Allied Health courses.

The data indicate that pre-requisite courses are preparing students to succeed in the allied health courses. The disparity in success and retention of Black or African American students and Hispanic students compared to students of other ethnicities in BIOL 110 requires the attention of the department

If the course *success* rates for any group of students is below that of the institution (70%), discuss objectives aimed at addressing this.

REFLECTION & PLANNING SUMMARY:

Objective: increase success and retention of Black or African American students and Hispanic students in BIOL 110

Summarize program efforts to understand and, where necessary, improve course completion and course success rates.

REFLECTION & PLANNING SUMMARY:

The department met to discuss disparate course completion and success rates and identified several remedies to explore further.

First, more information is needed to understand why there is disparity in BIOL 110. Potential reasons for disparity that were discussed include:

- Institutionalized and structural racism in society
- Institutionalized and structural racism at COM
- Resource disparity: financial, mental health, family obligations
- Preparedness disparity: math/English
- Lack of community and a feeling of inclusion
- Lack of representation
- Poor class attendance due to many of the factors listed above

It was discussed that student exit surveys may be useful in identifying why they do not complete a course. A review of educational research may also yield better understanding. Finally, a review of what has been tried in the past at COM and what the outcomes were will help guide our understanding and future goals for improvement.

Second, we identified many possible avenues for improving completion and success rates for African American and Latinx students. Those are listed below. Once the review of research, surveys, and prior efforts at COM has been completed, these can be evaluated for implementation. Current ideas to consider include:

- Professional development training in equitable practices and pedagogy
- Supplemental instruction
- Embedded tutors
- Sections of BIOL 110 with embedded Umoja and Puente cohorts
- Outreach to younger students in the community: Bolinas Marine Center (center for science equity), partnership with Bayside MLK Academy and Audubon Canyon Ranch etc.
- Outreach through the COM museum
- Design experiences that invite biophilia
- Faculty resource sharing for equitable strategies

We agreed to have an ongoing agenda item in dept meetings that focuses on this work.

What objectives/activities will the program engage in related to improving student completion and success?

REFLECTION & PLANNING SUMMARY:

Objective 1: better understand the disparity between ethnicities in success and retention for BIOL 110
Possible actions to support this objective:

- Student exit survey for those who do not complete the course
- Review of educational research
- Review of outcomes from past strategies tried at COM

Objective 2: Improve completion and success rates for African American and Hispanic students in BIOL 110
Possible actions to support this objective:

- Have an ongoing agenda item in dept meetings that focuses on this work
- Choose and implement strategies

Strategic Plan objectives, performance indicators, and action steps (pending completion in May, 2018)

REFLECTION & PLANNING SUMMARY:
EQUITY EMP GOAL 1: Decrease toward elimination of existing racial equity gaps at the College, with the goal of eliminating gaps by the conclusion of the EMP in 2025.

- Strategic Plan Objective EQ1.3
  All academic programs identify and carry out data-informed, equity-minded, program-specific changes through the program review process toward Equity Goal 1 attainment.
- Action Step 3.2 Develop equitable practice and policies designed to support differences in the contexts of students' learning—not to treat all students the same.

Progress Indicator EQ1.3
As documented in program review, all academic programs have interventions in place by 2022 to decrease racial equity gaps.

Section IIC: Student Learning Outcomes - ASSESSMENT 10/16/18 : Version by **Mueller, Joseph** on **06/30/2022 23:23**

If courses have been offered without being assessed, why has this occurred?
Did this happen during COVID remote teaching? If so, COVID probably was the reason it did not happen.

Major's Courses have been assessed according to the scheduled of course assessments.

How do you assess Student Learning Outcomes (SLOs) at the course level?
Lecture Exams, Laboratory Practical Exams, quizzes, student presentations and research projects...
Does meaningful dialogue take place on shaping, evaluating, and assessing program SLOs? Please describe this activity.
Faculty who teach the same classes work together to change and improve laboratory practical exams or rewrite laboratory exercises to improve teaching the concepts covered in those labs.

Major's Program
There were extensive dialogue between instructors who teach Biology112A, B and C. during last program review. The full time instructor who taught biology 112A has left. For this current

program review two full time instructors, F. Agudelo-Silva, Emily Fox and two part time instructors have had several discussions.

How has the assessment of and reflection on course-level SLOs data led to course-level changes?
Some laboratory exercises have been redesigned to have clearer instructions and better teach the scientific concepts to students. We have developed accessory material such as videos and photographs to enhance learning of the concepts.

BIOL 112B course assessment led to increased field study and collaboration with other faculty.

There is no evidence that there is a need for course-level changes in the N.H. Program
How has assessment of and reflection on SLOs contributed to achieving overall goals at the department/program level? What connections can be drawn between course-level SLO assessment and program and/or institutional SLOs?
Our course assessment data supports what we are seeing across all departmental courses, which is that our students struggle with low-level math skills (addition, subtraction, division, multiplication, fractions, percentages) along with fundamentals in reading and writing. These weaknesses are impeding the ability of our students to succeed in the rigorous scientific curriculum that requires strong mathematical and verbal/written skills.

Assessing SLOs for students ensured courses were aligned for transfer.

Assessing SLOs for students ensured N. History courses were properly examined and evaluated for transfer or provided skills necessary for hiring in the field of study.
What SLO assessment-related work within the program has been most useful? What work should be highlighted for other areas to learn from?
We increasingly find that our incoming students have poor study habits and struggle with high school level math and language skills. To address this trend, our faculty have put a great deal of effort into creating supplemental materials and resources to help our students meet the needs and expectations of college level curricula. These resources include both written and video materials that help students with time management, developing “smarter” studying strategies, and reviewing key prerequisite mathematical and scientific concepts. Faculty also work with the tutoring center, giving tutors access to classroom resources so they can provide individual student support.

According to one instructor it has been determined that having broad SLOs rather than very detailed SLOs is the most successful approach. Broad SLOs give students more perspective and allow faculty latitude in creating exciting and effective classroom experiences that make strong use of faculty expertise.
What objectives/activities will the program engage in related to improving SLO assessment?
We will continue the dialogue between faculty within the department. Learning from our success stories and brainstorming about how to improve our content to be clearer and more user friendly.

Participation in FLEX activities to increase knowledge and implementation of equitable practices in pedagogy and assessment.

Section IID: CTE/Workforce Programs Only 11/2/18 : Version by **Mueller, Joseph** on **06/30/2022 23:23**

What are the primary TOPS Codes for your program?
N/A
What is the regional three-year projected occupational growth for your program? Include regional supply and demand.
N/A
What are the top four occupations and the median salaries for the region for certificate and AS degrees completion?
N/A
What are the top four skills needed for the high-demand occupations?
N/A
What is being done at the program-level to assist students with job placement and workforce preparedness?

N/A

Please show the number of EDS (economically disadvantaged students) in each program. Please provide persistence and completion rates of EDS.

N/A

Please show evidence that the program Advisory Committee met and reviewed curriculum, certificates, SLOs, labor market and other programmatic areas to help contribute to the relevance of your program.

N/A

If your program has other program-level outcomes assessments (beyond SLOs and labor market data), discuss how that information has been used to make program changes and/or improvements.

N/A

Please provide annual certificate completion rates including all industry relevant third party certificates.

N/A

Please show evidence of student skill attainment, completion, persistence, and job attainment by reviewing the CTEOS (Career Technical Education Outcomes Survey) and the Perkins (VTEA) Indicator data.

N/A

Please show evidence of student job attainment or salary increase by students who have left the program. For assistance, refer to the CTE Outcomes Survey and the Workforce Specialist to engage CTEOS data and data from LaunchBoard.

N/A

What objectives/activities will the program engage in related to meeting labor market need, improving student job attainment, or other workforce-related trends?

N/A

Section III: Optional Discipline-specific Information 9/28/18 : Version by **Mueller, Joseph** on **06/30/2022 23:23**

Specific needs for 112A:

1. New specimen slides and models for 112A. Many of the necessary slides for zoology are damaged or missing. Slides purchased approximately 5 years ago are not adequate. Many of the slides are of poor quality, confusing and are mislabeled. A large number of the slides currently housed in the zoology cabinets are for a specialized course in entomology and not useful for general zoology.
2. Updating the laboratory content and focus to include increased work with living animals with more emphasis on observation of movement, behavior, physiology and physical requirements. More activities focused on phylogeny and systematics.
3. Resources and support for the saltwater tank in SMN 108. Provide a cooling schedule with timers so that the tank chiller is not on during times when instructors are lecturing. Or build a requisition M&O to build a simple sound proof box to house the small chiller so it will not disturb the class during lecture. This would provide students with opportunities to observe many living invertebrate species in the lab.
4. Within a year or two our dept. will have access to the new Bolinas Field Station which will provide field access for Major's students.
5. The availability of carpool van(s) for off-campus trips (field, museum, etc.) making transportation more available and equitable for students. Vans are often available if they are reserved by the SMN Admin. Assistant.

Specific needs for courses in Natural History Program

1. Transportation. Academic programs should have priority in scheduling van use
2. Field Station to house living animals for close study and close proximity to unique ecological communities
3. Living animals such as amphibians and reptiles would be good to house in our labs to increase excitement and support the natural biophilia in students.
4. More support and interest from management and counselors

Section IV (Year 6): Department Summary : Version by **Mueller, Joseph** on **06/30/2022 23:23**

Department Summary:
Please summarize the key trends, issues, initiatives, and objectives that the department has considered during this six-year program review cycle.
We have considered:

- Current and expected demographics in Marin county
- Current enrollment and expected trends in enrollment
- Current state of knowledge in biology applied to the Majors Biology series
- Current state of technology to study biology

- Hiring more Faculty in the Biology Department
- **For Natural History Program**
- Current and expected demographics in the N.H. Program
- Current enrollment and expected trends in enrollment
- How to ensure that the Natural History Program continues to be successful
- The need to promote the program to the public as we know there's significant interest due to very high interest in Cal Naturalist Program

A summery of the Natural History Program is here.

Background and Current Professional Context
The field of Natural History has the benefit and the challenge of being one of the earliest sciences. Because of its long history, it is often associated with bygone times, early explorers, and recreational nature observations.
However, from a modern career development perspective - it's important to keep in mind that the current
profession of those educated in Natural History goes far beyond the initial foundations of this field. It is also one of the few roles within science where students can obtain a six-figure job with an associate degree or equivalent coursework (such as the Natural History certificate), because it is the skills that matter for employment.
It is easy to mistake ornithology as a profession for birdwatching as a hobby, as some of the foundational skills are the same.
Natural history skills are in high demand within government and private organizations in charge
of not only managing natural resources, but also of assessing impacts of development and climate change in our current world. Anytime a road is repaved, a utility line is run, or an organization wants to expand build a new building - the impacts on the environment must be assessed. All this work must go through environmental review dictated by laws such as the California Environmental Quality Act, the Endangered Species Act, etc.- and that includes first identifying the flora and fauna present. It is professionals with skills and training in natural history that do this work. There are 6,500 species of plants in California alone, over 500 species of birds, and 27,000 invertebrates - and it takes someone trained in natural history to be able to identify them in situ. For experienced professionals, it is a 6-figure job and one that cannot be done remotely or outsourced to other regions. Natural History skills lead to well-paying, stable careers for those in our community.
Natural History Program and Certificate
Although the Certificate itself is not currently a requirement for many of the positions discussed above, the coursework and knowledge gained from the courses in the COM Natural History Certificate Program absolutely is required. The benefits from this program are not limited to those who obtain the certificate.
Complement to 4-Year Programs
For students who do plan to pursue a bachelor's degree, these foundational natural history courses make them much more competitive for internships and research opportunities in natural resource management, ecology, and environmental studies programs at 4-year institutions. Colleagues in natural history programs at universities, such as Humboldt State
University, have communicated to our faculty that the students entering their program from College of Marin are noticeably better prepared for this field of study than other transfer students. These internships then lead to more opportunities upon graduation, whether they are going onto graduate school or employment. The Bolinas Field Lab will make the applied training portion of the College of Marin Natural History program even stronger.

Bridging the Gap Between Higher Education and Employers

Natural history coursework has been slowly eroding from undergraduate curriculums as many in higher education administration do not realize it's modern applicability (Tewksbury et al, 2014). This loss is frequently bemoaned by those hiring in government jobs (which still require the natural history coursework, such as botany, ornithology, or mammalogy to get through Human Resources screening), as well as students with undergraduate degrees now focused more on theoretical or lab biology coursework who did not intend that as a career. Community college courses in Natural History provide the skills and required coursework needed to obtain the type of work many undergraduate students were entering higher education for in the first place, and that many employers wanted graduates to have. These types of participants in the COM Natural History Program might not need the Certificate, but they need the coursework. Many students in this program already have a bachelor's degree and are
taking these Natural History Program courses to meet the federal or state job coursework requirements, or graduate school coursework requirements. Past students in this position have taken the courses they needed from the COM Natural History Program, although not the certificate, and gone onto obtain PhDs and are now in roles such as Research Directors and leaders within our local scientific community.

Some positions, such as Field Research Technician and Biological Science Technician, can function as stepping-stones to additional higher education as well as a future in government employment. See attached Job Announcement as a good example of how natural history is one of the few programs that gives you a foot in the door to federal employment in the sciences with only an AS.

This disconnect between undergraduate curricula and needed professional skills has been recognized in the field, and many professional societies and agencies are shifting requirements away from the 4-year undergraduate degrees and focusing more on the skills and coursework offered by the COM Natural History Certificate curriculum. See the California Native Plant Society Botanist Certification as an example - https://www.cnps.org/education/botanist- certification. The type of work you can get with this certification and some experience pays 100k+ for a job in the sciences that does not require a bachelor's degree. For example - https://www.salary.com/research/salary/benchmark/botanist-salary/san-francisco-ca (and this title doesn't necessarily capture those who go into management as their career advances and their title changes).

Educating the Educators

Many people who study natural history choose to go into natural history interpretation or education. Teaching the public about how the natural world works is important for public understanding and engagement on environmental issues is one of the most important
roles. The voting public is what ultimately determines the future of the world we live in, and the natural history coursework at COM provides the foundation for these educators. They include positions such as:

• National and State Park Ranger Advancement

Naturalist Educator for Private Companies (Kayaking tours, River rafting, Ecotourism Co.), non-profit environmental organizations, public and private summer camps, public and private schools

- Environmental activists
- Biological specimen museum technician
- Public Natural History Museum tour guide/educator
- Freelance Naturalist Educator (there's more gig work than there are certified naturalist)

Inspiring Those in Transition

Natural History is a field of study that is often appealing to many students who aren't otherwise inspired school in general. A past Director of a Smithsonian Research Center told a story of how his childhood teachers had told his parents that he "wouldn't amount to much", as he stared earnestly at the outside through the classroom window. There are so many stories of students who did very poorly in K-12 because they couldn't connect, and then took a Natural History class in the COM program because it sounded interesting while they were trying to figure out what to do with their life, and they found their path. These past students are now Research Directors for Universities, scientists, naturalists in our community, educators, and many other roles within the sciences and other fields. The power of the natural appeal of this topic of study for engaging students should not be diminished.

Equity and the Natural History Program

The Natural History Program is the only academic program offered at COM that can be completed nights and weekends. This gives students who have full time Mon-Fri 8 to 5 jobs the opportunity to complete a certificate/course work that will lead to good paying employment.
The Natural History Program has given reentry women, who have been traditionally underserved in the sciences, the opportunity to complete a science program and find employment opportunity in a way that circumvents many of the barriers that still exist in many bachelors granting institutions.
Docents that complete Natural History courses use their knowledge to share their natural science passion and knowledge with historically excluded youth. This opportunity nourishes their interests in the Life Sciences and increases the likelihood that they will be interested in pursuing a career in the sciences.

Section V (Year 6): 360-FEEDBACK : Version by **Hernandez, Carol** on **10/27/2022 17:26**

Administrator Feedback:
The Life and Earth Sciences department continue to offer a quality education to Biology Majors, Allied Health students, Natural History Certificate students, and Life-Long Learners as demonstrated in the program review. The department discussed the need for a Full Time Faculty member in their program review. It should be noted that they were approved for a FT Biology recruitment this fall, but they choose not to move forward with the recruitment. They are in the process of changing the Majors Biology Sequence from 3 semesters to two semesters. This reduction should result in decrease time to degree for students that need to take the Majors Biology Sequence. This is a huge win for our students. They are in the process of analyzing the department's needs due to this change including what the focus of the new FT hire should be in the future.

The Biology department is committed to providing students with opportunities for research as demonstrated by their involvement with Tiny Earth Partnership and John H. Prescott Marine Mammal Assistance Grant programs. They are engaged in a number of grants, partnerships, and outreach programs including partnering with Bayside MLK Jr. Academy with the goal of "Increasing students' interest in science, with particular attention to building a pipeline that lead to college." This is a great partnership especially given the need to diversify our STEM pipeline.

Several Faculty members utilize the Library Textbook Program and the Zero Textbook Cost programs and they have discussed developing their own materials. It should be noted that the success and retention rates of Black or African American and Hispanic students in BIOL 110 are below the institutional average. It is nice to see that the department faculty members are in discussions on how to address the problem. They have listed a number of strategies to improve the success and retention rates for African Americans and Latinx students. Yet, it would be great for the department to identify specific teaching strategies that they could implement in BIOL 110. My recommendation is for the faculty to continue to meet and share best practices including discussing strategies that they are piloting and what is working and what is not working.

Program Review Team Feedback:
No Value
PRAC Feedback:
No Value