Life Sciences-Biology Program Review 2011
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Overview

Description of Program

The Mission of the Biological Sciences Department is to offer quality educational opportunities for students by providing courses that transfer to four-year institutions, offering associate degree and certificate courses that meet general education requirements. Maintaining optimal academic standards, ensuring availability of academic and student support services, providing facilities to support teaching and learning, and supporting professional development for faculty are vital to our mission.

The Biological Sciences program includes courses in biology, botany, and zoology that meet the educational needs of our diverse community. Biology major and non-major students as well as those previously degreed students preparing for professional school make up the majority of students served. The courses provide a comprehensive lower division curriculum for science majors preparing to transfer to four year universities. They allow a student to pursue an A.S. Transfer degree in Biology, General Science, Laboratory Technician (Medical), Pre-Dentistry, Pre-Medicine, Pre-Nursing, Pre-Optometry, or Pre-Pharmacy. General education courses are designed to allow students to understand and apply the scientific method, and to understand basic underlying principles of nature and the relevance to their lives. Field courses may be required for career education and also serve as opportunities for lifelong learning. A molecular biology lab and two biotechnology courses have been approved by the College Curriculum committee, with the support coming from a Department of Education STEM grant. This will add a new infusion of techniques and instrumentation to the biology curriculum. A biotechnology certificate program is in development.

Our excellent faculty is well-qualified to teach the courses in the Life Science program, and they maintain rigorous academic standards in their classes. Academic support for students is in the form of open labs and tutoring. The life science classrooms were renovated before the last program review, and provide computer technology and internet access and modernized lab facilities. The faculty and students of the biology program are involved in campus-wide and off-campus activities, such as the Onizuka Science Day and the Alondra Park Project, respectively, which foster a positive campus climate and promote community outreach and service-learning.

Status of Previous Recommendations

In the last program review, the faculty felt that the department was unable to meet the student demand for biology courses because it was limited in staff and facilities. The following was recommended:

- The hiring of at least one additional full-time general biology instructor. Mr. Bryan Carey was hired in 2009, but Mrs. Jane Oyama also retired in that period, so the staff remains at five full-time biology instructors.

- The addition of laboratory classrooms by converting space in the basement of the Natural Science (NS) building. There was no action taken on this recommendation, and the rooms on the basement floor of the NS building are currently being used for other purposes.

- The hiring of additional classified staff. Ms. Linda Ohara was hired in that period, but only to replace Mrs. Donna Avizienses, who retired. The full-time classified staff, then, remains at three for all life science and health science courses combined.

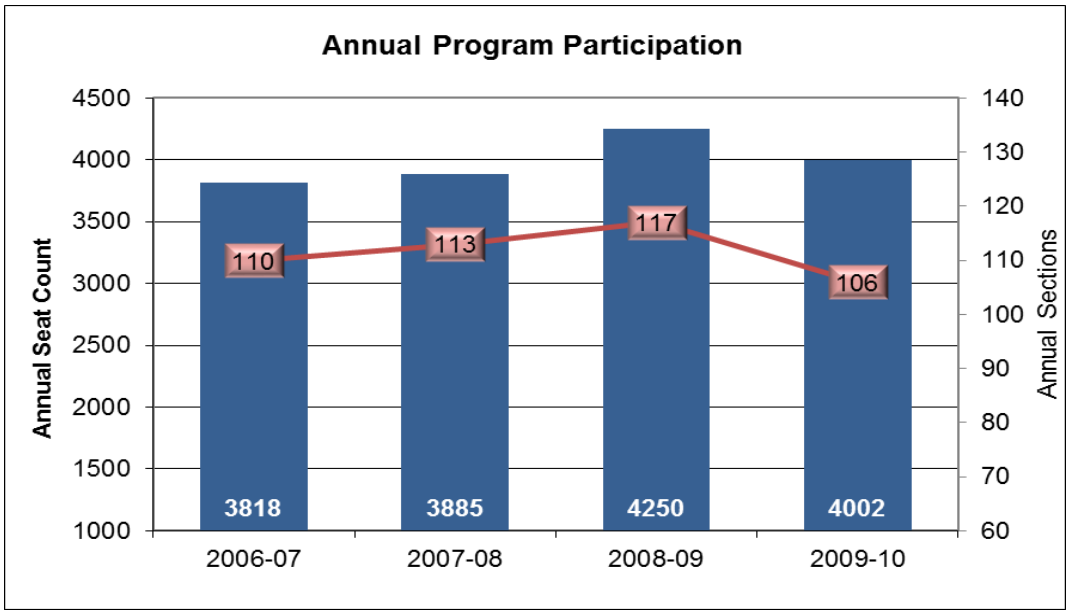
With regards to instructional concerns, the faculty placed priority on lab expenditures that would increase the hands-on experience of students in the laboratory. It was also recommended that the library increase its expenditures for science books and journal subscriptions. These recommendations have been addressed with the purchase of new slides and microscopes, and molecular biology equipment. Most of the funding for the molecular biology equipment was supplied by a Department of Education STEM grant. Additionally, several major pieces of equipment have been donated by the Los Angeles/Orange County Biotechnology Center. The library has increased its expenditures for science books and e-books. New databases have been added that are specific to the needs of science students: Grzimek's Animal Life, Today's Science, Science (online journal), and JSTOR with three Arts and Science collections. Journal subscriptions require on-going monies and are best supported by an increase in library funds. The STEM Grant has also provided funds for the acquisition of biotechnology/molecular biological references. The recommended equipping of the laboratories to incorporate virtual dissection with decreased reliance on preserved specimens has not begun. However, various virtual dissection software programs have been evaluated and determined to be inadequate for our courses.

Program Statistics

Demand:

Total Annual Program Participation
(4-Year Trend)
Years: 2006-07 to 2009-10
Life Sciences

	2006-07	2007-08	2008-09	2009-10	4 Year Avg.
Annual Seat Count	3818	3885	4250	4002	3988.8



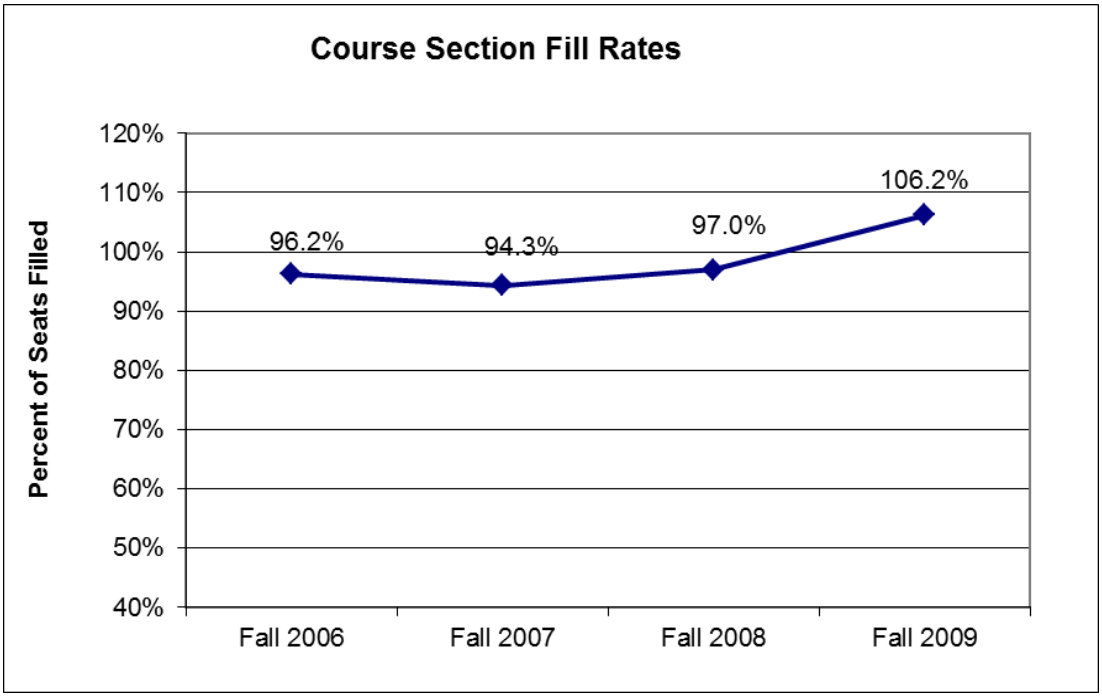
Course, Section, Seat Counts
Years: 2006-07 to 2009-10

	2006-07	2007-08	2008-09	2009-10
Sections	110	113	117	106
Seats	3818	3885	4250	4002
Unduplicated Students	3113	3191	3489	3308
Seats/Unduplicated Students	1.2	1.2	1.2	1.2

- The demand for Life Science courses (biology and health sciences) is high. The reduced college and division budget has resulted in the reduction of sections available to students, yet the seats and number of unduplicated students is higher in the 2009-2010 year than in the 2006-2007 and 2007-2008 academic years. Faculty members have tried to accommodate the excess number of students by increasing their class enrollments. It appears that the trend of declining sections will continue as the state funding continues to decline. This will result in even lower number of seats available.
- Faculty will continue to fill their classes and keep waiting lists for expectant students for which there are no seats.

Offerings: Fill Rate*

	Fall 2006	Fall 2007	Fall 2008	Fall 2009
Course Fill Rates	96.2%	94.3%	97.0%	106.2%



- It would appear that the program is in a growth mode, but the dramatic increase in fill rate in the Fall semester of 2009 is more a reflection of the decrease in the number of sections offered. Students, desperate to complete their life science course requirements, are filling every available seat.

- The fill rate of over 100% for the life science courses is an adjustment made by the faculty to minimize student inconvenience caused by high student demand for the courses and restricted number of course sections offered. Increased section offerings of these courses happen when facilities, instructors, and funding are available. The impact of over-enrollment has been discussed amongst the life science faculty and will be kept in mind when making enrollment decisions.

* Percent of fill of each class at census.

Scheduling

		Fall 2006		**Fall 2007**		**Fall 2008**		**Fall 2009**	
		n	%	n	%	n	%	n	%
	Daytime	1,276	83.7	1,306	82.3	1,455	84.5	1,458	85.7
Time of Classes	**Evening**	248	16.3	280	17.7	266	15.5	226	13.3
	Unknown	0	0.0	0	0.0	0	0.0	18	1.1

- The data show the enrollment pattern for both the biology and health science classes within the Life Science program of the Natural Sciences Division. While there is a steady increase in the enrollment of students into daytime classes, there is also a steady decrease in the evening courses. At minimum, this may simply reflect a shift in a preference for daytime courses. Another possibility is the reduction in section number due to budgetary constraints. Both full-time and part-time faculty members teach evening sections, but when section reductions are made, fewer part-time faculty members teach and students have fewer options.

Retention and Success

Retention Rate: The percentage of students who remain enrolled through the end of a course out of all the students enrolled at census date. It is the percentage of students who did not withdraw.

Fall 2006 to Fall 2009	**Fall 2006**	**Fall 2007**	**Fall 2008**	**Fall 2009**
Biology	76.9%	80.3%	79.0%	80.7%
Natural Sciences	72.4%	74.8%	75.1%	76.6%
State Avg. – Biological Sciences	80.9%	80.2%	80.6%	81.3%

Spring 2007 to Spring 2010	**Spring 2007**	**Spring 2008**	**Spring 2009**	**Spring 2010**
Biology	79.2%	83.8%	84.9%	82.3%
Natural Sciences	75.3%	76.5%	79.0%	77.2%
State Avg. – Biological Sciences	81.4%	81.1%	82.5%	82.3%

- The Biology program's retention is at 79.2% (avg.) in the Fall semesters of 2006-2009. This is well above the 74.7% (avg.) retention of the Natural Science Division during the same period, but

slightly less than the state average of 80.7%. The Biology program's retention increases in the Spring semesters of 2007-2010 to 82.6%, with a high of 84.9% in the Spring semester of 2009. These retention rates are higher than the Natural Science Division courses as a whole, and higher than the state average for biology courses. Spring courses may have higher retention than Fall courses for several reasons. Students coming into technical courses like biology in the Fall sometimes fall behind early due to Summer lay off from classes, and then drop the class if they cannot raise their grade. In the Spring, students are under pressure to complete their course load before transferring to the university in the following semester. Students taking biology in the Spring semester may be more likely to start with a higher performance level, and so are more optimistic about their chance to complete the course.

Success Rate: The percentage of students who receive a grade of A, B, C, or Credit as a final course grade. This percentage is a reflection of the number of successful students out of *all the students* who were enrolled at the census date.

Fall 2006 to Fall 2009	Fall 2006	Fall 2007	Fall 2008	Fall 2009
Biology	60.9%	67.0%	62.7%	64.8%
Natural Sciences	59.5%	61.3%	60.3%	62.0%
State Avg. – Biological Sciences	64.7%	64.1%	64.1%	65.0%

Spring 2007 to Spring 2010	Spring 2007	Spring 2008	Spring 2009	Spring 2010
Biology	65.3%	66.0%	68.2%	69.5%
Natural Sciences	63.3%	62.5%	64.6%	66.1%
State Avg. – Biological Sciences	64.6%	63.9%	65.1%	65.3%

- The Biology program's success rate has shown a steady increase, from 60.9% in the Fall semester of 2006 to 64.8% in the Fall semester of 2009. The favorable success rate of 67.0% in the Fall of 2007 may be influenced by the final offering of the biology major course Biology 1B. Students had an 88.9% success rate and 88.9% retention rate in the course to avoid the consequence of having to take the new Biology Major series courses. The most recent success rate of 64.8% for biology courses in the Fall semester of 2009 is equal to the state average for biology courses. The biology program's success rates also show a steady increase in the Spring semesters from 2007-2010. These Spring semester success rates for all four years are consistently higher than both the Natural Science Division as a whole and the state average for biology courses.

Completer Success Rate: The percentage of students who receive a grade of A, B, C, or Credit as a final course grade. This percentage is a reflection of the number of successful students out of *those that complete the course*. This excludes students who withdrew/received a W.

	Fall 2006	Fall 2007	Fall 2008	Fall 2009	Spring 2007	Spring 2008	Spring 2009	Spring 2010	Avg. n=8
Bio. Courses	79.2%	83.4%	79.4%	80.3%	82.4%	78.8%	80.4%	84.5%	**81.1%**
Division	82.1%	81.9%	80.3%	81.0%	84.1%	81.7%	81.7%	85.6%	**82.3%**
College	81.0%	81.3%	78.9%	81.0%	82.7%	79.8%	79.4%	82.7%	**80.9%**

	Fall 2006	Fall 2007	Fall 2008	Fall 2009	Spring 2007	Spring 2008	Spring 2009	Spring 2010	Avg. n=8
Non-Major	75.3%	82.5%	66.4%	69.2%	77.2%	75.4%	77.8%	83.0%	**75.8%**
Major	94.2%	90.1%	91.4%	90.6%	91.3%	88.8%	88.5%	89.0%	**90.5%**

- In general, students that complete their biology classes at ECC do so successfully. Over the period from Fall 2006 to Spring 2010, the average success rate for students completing their biology courses was 81.1%. The striking discrepancy between success rates of students completing the course (81.1%) and that of all students that enrolled in those courses (65.5%) is due to the large number of students that drop with a W. A number of the Biology major students drop courses when they realize that an A is not within their reach. For a number of them, a B or C is akin to failure. Other students drop due to medical/familial/employment obligations. Yet others do so because the material is simply too challenging. This is seen most dramatically in the non-major courses where the completer success rate is on average 75.8%. This completer success is less than biology as a whole (81.1%), the division (82.3%), and the college (80.9%). This is may be a reflection of student preparation before enrolling in biology courses. All biology courses recommend that students be able to read and write at the college level. This is because the biology subject employs a technical vocabulary that the student must master during the course. Students that are remedial in language skills may find comprehension of the textbook and the course information too difficult and drop the course. The biology major courses also have a chemistry prerequisite. Therefore, students taking the biology major courses have previous exposure to both math and science courses which is lacking in the experience of the student typically enrolled in the non-major courses. The non-major vs. Biology major disaggregated data supports this conclusion (75.8% vs. 90.5%, respectively).

- Recommendations:

  -Encourage students to seek tutoring to a greater extent. Funding for Supplemental Instruction is being explored.

  -Adapt instructional techniques/methods from non-majors courses that have the highest success rates for completers to those non-majors courses that have the lowest success rates for completers. Brown bag discussions to discuss instructional techniques/methods that would enhance success have been proposed.

  -All courses in the program have either a prerequisite or recommended preparation regarding the English preparation of the students. Yet, despite this, a number of students enroll in biology courses unable to read and/or write at the college level. These skills are critical to the success of students. The department members need to work with Institutional Research to examine whether or not students' English placement actually determines their success in the Biology courses.

Curriculum

Courses and Content

There are 16 courses offered in the 2010-2011 Catalog for this program and all are listed as Active on CurricuNET. Listed below are the courses with the curriculum review timeline (6 year cycles) included.

	Curriculum Review: Academic Yr. Scheduled
Biology 8 - Biology of Plants	2012 – 2013
Biology 10 - Fundamentals of Biology for Non Majors	2015 – 2016
Biology 11 - Fundamentals of Zoology	2012 – 2013
Biology 12 - Field Zoology	2011 – 2012
Biology 15 - Environmental Biology	2015 – 2016
Biology 16 - Field Entomology	2015 – 2016
Biology 17 - Marine Biology	2013 – 2014
Biology 18 - Marine Biology Laboratory	2013 – 2014
Biology 50 - Special Topics in Biology	2014 – 2015
Biology 101 - Principles of Biology I	2012 – 2013
Biology 102 - Principles of Biology II	2012 – 2013
Biology 103 - Fundamentals of Molecular Biology	2013 – 2014
Biology 104 - Fundamentals of Molecular Biology Laboratory	2015 – 2016
Biology 99abc - Independent Study in Life Sciences	2015 – 2016
Biotechnology 1 - Basic Techniques of Biological Technology	2015 – 2016
Biotechnology 2 - Advanced Techniques of Biological Technology	2015 – 2016

- While all courses are listed as active, budget cuts have forced a decrease in course offerings. For example, Biology 8 was not offered 2010-2011 and Biology 103 was only offered Spring of 2011. A formal course offering cycle has not been developed but will be explored in discussions amongst the faculty and the division dean. Budget cuts notwithstanding, every effort has been made to strike a balance between major and non-major course offerings.

Course Additions and Deletions

- Biology 104, Biotechnology 1 and 2 were offered for the first time during the 2010-2011 academic year. Biotechnology 104 was cancelled due to low enrollment. Biotechnology 1 and 2 were offered with the former offered in the Fall and the latter in the Spring. Initial funding for the courses under a pilot project was provided by the STEM grant alluded to in a previous section. The grant ended September 30th of 2011. Future offerings are dependent on State funding. These courses are laboratory intensive and they are not inconsistent with current practice in the field.

- With the last Program Review, the life science faculty proposed a lower division genetics course that would satisfy the 4th quarter component of the UCLA biology sequence. Such a course would require students that are carrying fairly heavy loads their last year to remain at ECC longer. It is highly unlikely that students would remain an additional semester. Because of this, the development of the course is an unrealistic aim and it has been dropped. A field botany course (currently inactivated) was another consideration with the last review and it is still a desired course. A field biologist that can teach it was hired in 2009. A date for re-activation has not been set.

- The only courses inactivated were Biology 1A, 1B, and 1C. These were replaced by the revised biology sequence of 101, 102, and 103.

- Biology 50 and Biology 99abc are highly dependent on faculty and student interest. Biology 99abc has been taken by students 4 out of 8 semesters between Fall 2006 and Spring 2010. Biology 50 has not appeared on the schedule in any of the 8 semesters between Fall 2006 and Spring 2010.

- Recommendations:

  -Although Biology 50 is active and has not been on the schedule, it should remain active because it allows an instructor to offer a seminar-like course on a topic that is significant at that time. An example of this might be a course exploring the science involved with global warming or AIDS or antibiotic resistant disease pathogens.

  -A re-evaluation of the Biology 104 prerequisite is required. While students in the major courses have expressed an interest in a molecular biology techniques course, two reasons for the low enrollment numbers (leading to the cancellation Spring of 2011) are 1) students' schedules are heavy with science courses their last semester (often the advanced courses in a sequence) and 2) most UCs and CSUs have yet to offer transfer credit for the course. Only the University of California, Santa Barbara offers transfer credit thus far and at the CSU, only Cal State Dominguez Hills and Cal State Fullerton have done so. Transfer credit is attractive to the high achieving students interested in the course. The granting of transfer credit is still under consideration at various universities. A re-consideration of the prerequisite from Biology 103 completion or concurrent enrollment to completion of Biology 102 may offer an improvement in enrollment.

Degrees and Certificates

- The impact of SB 1440, Associate Degrees for Transfer, signed into law September of 2010 enabling the California Community Colleges and the California State University to collaborate on the development of Associate Degrees is unknown. A Biology Transfer Model Curriculum (TMC) is being worked on statewide and campus-based guidelines for implementation are in development. Currently, an A.S. Transfer degree is offered in Biology, General Science, Laboratory Technician (Medical), Pre-Dentistry, Pre-Medicine, Pre-Nursing, Pre-Optometry, or Pre-Pharmacy. There is ongoing discussion on offering an A.S. degree in Biology only as this reflects a major that is seen at the four year institutions. This offering would be consistent with the TMC. Pre-Dentistry, Pre-Medicine, Pre-Pharmacy, and the other majors listed are typically not formal majors at transfer universities. These terms reflect students' career aspirations. The biology major is suggestive of preparation that is the foundation for training in dentistry, medicine, pharmacy and other professional ambitions and separate pre-professional majors is unnecessary.

- A certificate program in biotechnology should be developed. Based on the report "California's Biotechnology Workforce Training Needs for the 21st Century" (2006), it is projected that by 2015, the biotechnology industry will employ as many as a quarter of a million or more individuals than what were employed in 2006. The Labor Market Information Division of the California Employment Development Department has projected growth in a variety of biotechnology based occupations. Assay analyst (a cell culture technician, essentially),

microbiologist, and bioinformatics specialist are examples. According to the Southern California Biomedical Council, it represents more than 250 of the Los Angeles region's biotechnology and medical device/diagnostics companies, and research institutions. A survey conducted by BayBio and BIOCOM (two other industry associations) shows a 632 percent increase over the past five years in employment within the industrial biotechnology sector in California alone (BayBio, 10/5/11). We are well positioned within the biological sciences to develop curriculum for a biotechnology certificate program that will allow our students to take advantage of current job opportunities and those that present themselves in the future. The first two courses of a program, Biotechnology 1 and 2 are active; a third is in development (Cell Culture); and existing courses within and outside of Natural Sciences would complete a program. Existing laboratory space and STEM grant funded equipment are available and are essential to this endeavor.

Articulation

- Non-Major Courses: Biology 8, 10, 11, 15, 16, 17, 18 have been approved for CSU GE in areas B2 and/or B3 (Life Science and Lab Requirement, respectively) as well as IGETC in area 5B (Biological Sciences). Biology 12 has been approved for CSU GE only.

- Major Courses: Biology 101, 102, 103 have been approved for CSU GE in areas B2 and/or B3 (Life Science and Lab Requirement, respectively) as well as IGETC in area 5B (Biological Sciences). Biology 104 is pending.

- The acceptance of a number of courses by individual schools is variable. Biology 103, for example, is accepted by CSU, Dominguez Hills (CSUDH) and CSU, Los Angeles as they have comparable courses (for Biology 220 and Biology 100C, respectively), while CSU, Long Beach does not. For the UC, students must complete the full majors Biology sequence (101, 102, and 103) for biology transfer credit at UC Berkeley and UC Santa Barbara (UCSB) while at UCLA, Biology 103 is not necessary. At UC Irvine, students receive credit for Biological Science 99. Biology 104 is currently accepted for credit at CSUDH, Cal State Fullerton, and UCSB only. Given such variability across both university systems, students are highly encouraged to check ASSIST.org for requirements at individual institutions.

Student Learning Outcomes

Course and Program Level SLOs

The Biology Program has identified three Program – Level SLOs.

- Scientific Method (SM) – The student will understand and apply principles of the scientific method; recognizing an idea based on reproducible evidence.
- Biological Tools (BT) – The student will master the use of appropriate biological tools and evaluate evidence gathered to explain biological principles.
- Content Knowledge (CK) – The students will have a working knowledge of biological principles and a mastery of a broad set of factual biological knowledge concerning ecology, evolution and cells.

Each Biology course has identified a specific set of SLOs that support the Biology Program-level SLOs.

	Proficiency with a Microscope (BT)	Scientific Method (SM)	Mitosis (CK)	Energy Flow (CK)	Materials Cycling (CK)	Dichotomous Keying (BT)	Central Dogma (CK)	Control of Gene Expression (CK)	Lab Skills Assessment (BT)
Bio 8	√	√		√					
Bio 10	√	√	√						
Bio 11	√	√	√						
Bio 12	√	√							
Bio 15		√		√	√				
Bio 16	√	√				√			
Bio 17		√		√	√				
Bio 18	√	√							
Bio 101	√	√		√					
Bio 102	√	√	√						
Bio 103		√					√	√	
Bio 104									√
Biotech 1									√
Biotech 2									√

SLO Statements for Courses

- Proficiency with the Microscope – The student will be able to use the compound and dissecting microscope to observe cells and microorganisms.
- Scientific Method – The student will understand and apply principles of the scientific method; recognizing an idea based on reproducible evidence.
- Mitosis – The student will be able to describe key activities at each stage of mitosis.

- Energy Flow through Living Things - Students will use basic energy principles to explain the flow of energy in living systems, such as those that occur in the cellular metabolic pathways of photosynthesis and cell respiration, or the relationships observed between autotrophs and heterotrophs in ecosystems.

- Materials Cycling - Students can use the principles of conservation of matter to describe how biologically significant atoms and molecules move between the biotic and abiotic components of an ecosystem and the role living things play in the cycling of these nutrients.

- Dichotomous Keying – The student will be able to determine the identity of common insects to order by applying knowledge of insect anatomy and using a dichotomous key.

- Central Dogma – The student will be able to provide a detailed explanation of how the unit-by-unit transfer of genetic information occurs from DNA to RNA to Protein.

- Control of Gene Expression – The student will be able to explain various prokaryotic and eukaryotic gene expression control mechanisms.

- Lab Skills Assessment – The student will be able to perform a standard molecular biological procedure involving DNA or protein.

Timeline for Four Year Cycle – Based on the annual calendar year (January – December). The SLOs stated below are program as well as course level SLOs.

- Jan. 2011 – Program Review
- Jan. 2012 – Biological Tools
- Jan. 2013 – Content Knowledge
- Jan. 2014 – Scientific Method

Assessment Results

- The first full implementation of a Program Level SLO Assessment took place during Fall 2010 and Spring 2011. Every Biology course participated in the Scientific Method SLO assessment and review. In total, 627 students were given the assessment representing each course taught during the Fall (2010) or Spring (2011) semester and the data were examined. 49% of students were able to identify all key components of the scientific method and 51% were able to identify all but one of the key components. Lack of clarity with one of the questions could explain why more students did not identify every component of the scientific process. The assessment needs to be revised to improve clarity before it is administered again. Another possibility is students' inability to infer key elements of the process in a written work. Articles do not explicitly state "this is the hypothesis" or "this is the prediction" and the reader must extract those elements from what is written. Problems with reading comprehension may be an issue (and previously mentioned in a prior part of this review). In order to improve student success in this area, the biology faculty decided that more attention should be given to the components of the scientific process during laboratory investigations. Some changes have already been made to lab design in some courses so

that students are participating in the scientific process during laboratory exercises. Specifically, they are being asked to hypothesize, analyze data, and even plan and carry out student designed laboratory investigations. For example, Biology 101 requires students to design and perform an investigation, analyze the results, and present their findings. The Biology 10 Laboratory Manual has been rewritten to include investigations that ask students to participate in the scientific process in a variety of ways. More specific instruction regarding experimental design could be included using exercises already a part of the laboratory sequence. Asking students to identify the experimental variable and controls in experiments such as the enzyme lab would give students more practice with the important aspects of experimental design.

- Recommendations:

  -Students could be given more opportunity to read scientific articles that pertain to each of the disciplines within Biology. In this way, they are learning to identify and practice the scientific process and recognize how it is used to understand and explain the world around them.

  -Individual courses have assessed course level SLOs over the last few years and the results have been used to implement changes within those specific courses. This practice should continue.

  -Continued lab expenditures that allow hands-on experience for students in the lab. These expenditures should include equipment and technology needs, and also expendable items that must be replenished each semester (costs included in #3 of prioritized recommendations).

Assessment of Biology Department Implementation of SLO Process

- The Biology Department is currently at the Proficiency Level of implementation of SLOs. We have established Program Level SLOs that reflect core ideas of Biology and each course has determined specific SLOs that support and reinforce student learning of those core ideas. All the program and course level SLOs work to support the Core Competencies of El Camino College. We have collectively assessed first at the course level and now at the program level. Each time assessments have been performed, we find ways to improve the assessment to more authentically obtain the information we need about our students' level of success. We are getting better at developing assessment tools that will give us the information we need to inform our instructional practice.

- The Biology Department faculty organized responsibility for implementation of SLOs. There is a great variety of biology courses and this challenged us to determine core ideas that are consistent across all fields of biology. Now that a review cycle has been established, we will be able to regularly assess our students' level of success and determine if the changes that we make to instruction, curriculum, or resource use will have the intended effect on student achievement. Faculty members are now clear about their own individual roles in the implementation of SLOs and a structure is in place for collecting assessment data and discussing the implications of the outcomes.

- Students are informed of the SLOs for each course and the program through course syllabi, and the division web sites as well as the college catalogue. Time is needed to move to the Sustainable Continuous Quality Improvement level of implementation, but the structure is in place to allow the Biology Department to do this.

Program/Department Requirements

Instructional Support

Key instructional support areas used by the program.

Libraries, Programs, and Other:

√	Library	√	Special Resource Center		Basic Skills Study Center		Library Orientation
	Music Library		Puente Program	√	Honors Transfer Program	√	Other (Please list.) STEM Grant
√	Learning Resource Center Media Materials Collection		Assessment/Testing Office	√	Counseling	√	MESA
√	EOP&S/CalWORKS	√	Transfer Center		First Year Experience		
	Learning Communities		Project Success				

Computer Labs & Tutoring:

√	LMTC Computer Commons		SRC High Technology Center		Other Computer Lab: Please list.		Writing Center
	CAI MAC Lab	√	Writing Lab				LRC Tutorial Program
	CAI Windows Lab	√	Math & Science Lab			√	Math Tutoring
	TOP Lab		Keyboarding Center				SRC Tutorial Program
	Hawthorne BTC					√	EOP&S Tutoring
	Inglewood Center						

Faculty Support Services:

√	Graphic Arts	√	Copy Center		Distance Education		Other (Please list.)
	Media Services AV Production	√	Tech Services Help Desk		Teleconferences		
√	Media Services AV Equipment Distribution	√	Support Staff		Web conferences		
√	ECC Vehicles	√	ECC hosted Websites	√	Staff Development		
√	ECC E-mail						

- Recommendations:

  -More money allocated for tutoring.

  -Continued library expenditures for research tools (science books and print /online journal subscriptions) to keep updated in the various disciplines within biology.

Facilities:

- The program makes very effective use of its facilities and equipment. Every available laboratory room is scheduled. Until section reductions were implemented (due to budget cuts), the laboratory rooms were scheduled mornings, afternoons, evenings, and weekends.

- The growth and quality of the program is most impacted by the lack of laboratory (instructional and preparatory) and storage space. The introduction of new techniques requires the utilization of recently acquired equipment that is constantly moved from cart-to-counter-to-storage. This is impractical for the large and heavy instruments. A number of smaller instruments should not be moved (e.g. precision balances) as measurements may not be accurately made. Students often push these aside to work on the counter space. This is not an ideal working environment.

- The combined efforts of faculty, classified technicians, janitors, and maintenance personnel adequately maintain the facilities.

- Recommendation:

  -Eventually, additional laboratory classrooms will have to be constructed to meet the demand for biology courses (made even more acute by the budget influenced reduction in course sections), and to reach the optimum student/teacher ratio that improves the quality of the program. Discussions between biology and health science faculty along with the Dean of Natural Sciences need to take place to determine the number of additional laboratory classrooms and amount of storage space required.

Equipment and Technology

- Essentially all of these courses require the fundamental tools of science and equipment for the teaching of biology. These include compound and dissecting light microscopes, which are on average arranged as 36 pairs of microscopes in four of the principle laboratory instruction rooms. A set of new compound microscopes was purchased Spring of 2011 to replace a number of aging microscopes in the majors biology lab. Not all the microscopes were replaced, however, and subsequent funds would need to be procured for the replacement of additional microscopes. All classrooms have equipment for instruction such as computers, audio-visual projectors, internet access, and licenses for software.

- Depending on the focus of the courses, some utilize laboratory techniques that require chemicals, preparatory or preserving materials, and other equipment. Even in field biology courses, a large number of live and preserved specimens, models, posters, and electronic means of presenting and testing material are a regular part of biology instruction at ECC. Several grants have been submitted and/or awarded to facilitate newer teaching methods and materials for study.

- Recently, a few other ideas regarding sourcing materials for biology courses at ECC have been proposed.

  - First, for several courses we see a greater emphasis on electronic means of studying specimens (*e.g.* a virtual dissection of an earthworm, cat, pig, frog or other animal) and to alleviate costs, biohazard processing, and other challenges currently associated with

traditional processing, storing, and studying means. This was proposed with the prior program review and is still being explored.

- Second, for several courses, there has been an effort to direct students to off-site field trips at museums, botanic gardens, city or county parks, and other locations. These allow students to recognize and associate field trips with live animals, plants, fungi, and evaluate species morphology, behavior, and ecological interactions in their environment.

- Third, since plant biology and study of plant specimens is 3-12 weeks of several general biology and/or major courses, several potential solutions are being explored to acquire more plants without having to rely on costly plant orders from scientific supply companies. One request currently in discussion is for a small area near the Natural Sciences Building to be turned into a small gardening area to grow and maintain a number of study specimens. An alternative to this is the purchase of a greenhouse and ancillary supplies. In addition to other plants already a part of the ECC landscape, and resources from laboratory technicians and instructors, this move is viewed as a cost-reducing and space-freeing action (the initial cost of the greenhouse notwithstanding) so that the laboratory preparatory room areas are not covered in plants for one-third to two thirds of a given semester.

- Another area of consideration for equipment and materials concerns recently approved or planned courses, and a look ahead to the prospect of a return to a larger number of courses and course section offerings. First, courses such as the Biotechnology series introduce new technologies and equipment such as PCR machines, polyacrylamide and agarose gels, a laminar flow hood, -80°C freezer, and ancillary tools. Additionally, to continue providing lab and field biology courses, maintenance of a deionized water source, fresh water and saltwater tanks for zoology and marine biology, and other equipment need to be purchased, maintained, and when appropriate, repaired by the ECC laboratory technicians and/or service technicians with knowledge of the technical devices used in instruction and student hands-on learning activities.

- Recommendations:

  -The microscopes are heavily used and they take quite a beating by the end of the academic year. A dedicated pool of money for maintenance and repair would facilitate long-term use of these instruments. Replacement of a number of compound microscopes in NATS 127 and 129, and LS 105 will be required in the next several years. A replacement cycle of ten microscopes a year will be proposed in our yearly planning document. The current cost per microscope is approximately $1500 plus shipping and handling. The price cited will likely change as the cost of raw materials, production, and transport increase over the next couple of years. The maintenance and repair costs for the microscope inventory are $2000 per year.

  -The computers and projectors in the lecture and laboratory rooms are increasingly problematic functionally as they have been used heavily since the renovation of the facilities was completed in 2005. This equipment needs to be replaced. The replacement of computers in the Natural Sciences Division began the Summer of 2011. The replacement timeline for projectors has not been set. At a cost of $1500 per room (equipment plus installation), the cost for 8 lecture/laboratory rooms (for the Life Science and Natural Science buildings) is $12,000.

Staffing

	FTEF	FTEF Full-Time	FTEF Adjunct	FT/PT Load Ratio	FT/PT % Ratio
Fall 2010	7.68	5.58	2.10	2.66:1	73% / 27%
Fall 2009	8.78	5.43	3.35	1.62:1	62% / 38%
Fall 2008	9.33	5.43	3.90	1.39:1	58% / 42%

- With the previous program review, the biology and health science faculty were combined. Two separate reviews cover the biology and allied health programs this current cycle. The numbers are therefore not comparable between reviews.

- The data show a decline in the biology adjunct faculty FTEF from the Fall 2008 to the Fall 2010 (3.90 vs. 2.10, respectively). This is a reflection of the decrease in course sections taught. The adjunct faculty members are the first casualties when section reductions are implemented. Once funding improves, there is an expectation that the adjunct FTEF will increase.

- A marked decline in course offerings does not suggest a decline in the strength and importance of the program. These reductions were mandatory due to budget cuts. As a consequence of the impact on the adjunct FTEF, the FT/PT ratio increased from 1.39:1 to 2.66:1. The hiring of Bryan Carey in 2009 would suggest a contribution to the increase but it is not so as the retirement of Jane Oyama at the end of the 2008-2009 academic year suggests a replacement of one faculty member for another. The FT/PT ratio for the previous program review was 2:1 which is in the mid-range of the current three year analysis of Fall semesters.

- As of Fall 2010, we have five full time and six adjunct faculty teaching biology classes. The FT/PT ratio of 2.66:1 (73% to 27%) suggests a benefit to the program as full time faculty members are able to maintain regular office hours and are more accessible to the students. Also, the full time faculty members are involved in department, division, and campus-wide responsibilities. That said, adjunct faculty members are also an important part of the Biology program and are often hired because of their expertise in certain areas.

- The Biology program does not have an official mentoring program but new faculty members are informally mentored by colleagues. This mentoring includes on-campus activities, field trips, conferences, and help with ECC policy and procedure. A formal mentoring program through Staff Development is available to new faculty members.

- Faculty members maintain currency in their fields by conference attendance and scientific journal/magazine subscriptions. Several faculty members actively participate and hold office in scientific societies.

The following full-time faculty members teach the Biology courses with the Life Sciences.

Name	Reassigned time (how much in %)	Currently on leave (check)	Retired in last 2 years (check)	FT hired last 3 years (check)	Anticipated to retire in next 3 years (check)
Jeanne Bellemin					√
Bryan Carey				√	
Nancy Freeman					
Steve Leonelli					
Jane Oyama			√		
Teresa Palos					

- The faculty status data shown above indicate that the full-time faculty member Jane Oyama, who retired, has been replaced by new faculty member Bryan Carey. With the eventual retirement of Jeanne Bellemin, who teaches the Field classes and Marine Biology, Bryan Carey will shift over to cover those courses. This will require hiring an additional full-time faculty member to cover other non-major courses and some of the major biology courses in order to keep the present FT/PT faculty ratio.

- Prevailing budget trends suggest uncertainty in addressing the funding of future staffing needs.

- Recommendation:
  -It is recommended that priority be given to the hiring of a full-time instructor to address the retirement of Jeanne Bellemin within the next three years.

Direction and Vision

- The program faculty and other personnel are well aware of the present state of the program. Every semester, instructors must turn away students desiring non-major courses such as Biology 10 and Biology 17. The faculty and technicians are constantly faced with updating their courses, and assessing the costs associated with purchasing the needed supplies. Budget concerns are presented to the teaching and technical staff in order to solicit input for ways to best utilize existing supplies, budget and staff to accommodate program needs. This notwithstanding, data showing the itemized money spent on supplies and staffing would allow the faculty and staff to better understand the issues involved with the implementation of program activities and program development. Division council meetings and Life Science department meetings are regularly held in order to communicate to both teaching and classified personnel a clear idea of the current state of the program. These meetings are venues that allow the program staff to participate in planning the future of the program. It must be stated that the biology faculty members are a cohesive group that works well together and communicates effectively. This coupled with effective communication (e.g. gentle reminders of deadlines and tasks at hand) from the Natural Sciences Dean (Jean Shankweiler) contributes to program success.

- Over the last three years, the biology faculty members have been teaching a realigned program for majors to reflect the changing requirements of the four year institutions our students attend. Included in the program is Biology 103 (Fundamentals of Molecular Biology) that addresses the shift toward the molecular study of biology. Biology 104 was developed to provide students with a hand-on, laboratory based approach that support molecular biological themes presented in the

majors courses. Biotechnology 1 and 2 (Basic and Advanced Techniques of Biological Technology) are courses designed to provide the student with employment ready skills and serve as a foundation by which to build a comprehensive certificate program.

- While the shift toward molecular biology is significant, the biology program must not lose sight of the continued importance and demand for instruction in organismal biology. The Biology 16 course (Field Entomology) has been and will continue to address the critical need of the Los Angeles County Department of Weights and Measures. Employees of this county department are required to take an entomology course and our course is the only one taught at a community college in Los Angeles County. Other courses like Biology 8, 12, and 17 (Biology of Plants, Field Zoology, and Marine Biology, respectively) are important offerings that maintain the broad scope of our biology program and better prepare our students for careers in nature interpretation in museums, aquaria, and botanical gardens. Students with such preparation can also work with the US Fish and Wildlife Service and other government agencies. Ensuring that courses like Biology 8, 12, 16, and 17 are offered is a priority. A course offering cycle would work towards this aim.

- Over the next four years, funding mechanisms (State and otherwise) and administrative support must be explored for molecular biological supplies, virtual dissection, the acquisition of a small gardening area or greenhouse near the Natural Sciences building, and the development and implementation of a biotechnology certificate program.

    - A growing portion of the program budget must be devoted to the supplies needed to perform molecular biological experiments/exercises in the laboratory. Failure to do so could compromise the articulation agreements that our program has with a number of universities.

    - The cost of dissection specimens such as frogs, fetal pigs, and cats has become prohibitive. It is becoming increasingly difficult for the program budget to absorb the cost of buying these specimens at the volume of past years. Instructors will have to shift to a greater reliance on virtual dissections with a limited number of preserved specimens for demonstration. The classrooms have the infrastructure to incorporate computer terminals within the laboratory space, and the program needs to move in the direction of utilizing this infrastructure and equipping the laboratories so that instructors can shift their emphasis from the dissection specimens to the virtual dissection.

    - A small gardening area or greenhouse would allow for the growth and maintenance of botanical specimens. The greenhouse would also provide a controlled environment for the introduction of plant based experiments/studies in our courses.

    - The biotechnology field has experienced and will continue to experience growth in employment opportunities. We are ideally set to continue the endeavor begun with the STEM grant monies. The development of a biotechnology certificate program should continue with implementation to follow soon thereafter.

- The program fulfills the college's mission very well and aligns with the following strategic initiatives:
    - **Strategic Initiative A**: Enhance teaching to support student learning using a variety of instructional methods and services.

- **Strategic Initiative B**: Strengthen quality educational and support services to promote student success.
- **Strategic Initiative C**: Foster a positive learning environment and sense of community and cooperation through an effective process of collaboration and collegial consultation.
- **Strategic Initiative D**: Develop and enhance partnerships with schools, colleges, universities, businesses, and community-based organizations to respond to the workforce training and economic development needs of the community.
- **Strategic Initiative E**: Improve processes, programs, and services through the effective use of assessment, program review, planning, and resource allocation.
- **Strategic Initiative F**: Support facility and technology improvements to meet the needs of students, employees, and the community.

Prioritized Recommendations

1. Hire at least one general biology instructor to prepare for the eventual retirement of at least one faculty member within the next three years. Approximate Cost: $90,000/year

2. Construction of additional instructional laboratories, along with preparatory and storage space. Approximate Cost: Appropriate campus departments/personnel will need to be consulted to determine the cost of adding additional laboratory classroom and storage space.

3. Give priority to lab expenditures for equipment, technology and consumables to maximize students' hands-on experience. Included in this are monies for molecular biological instruction, equipping of labs for virtual dissections, the purchase of a greenhouse and ancillary equipment, and replacement of microscopes in NATS 127 and 129, and LS 105. Approximate Cost: $210,000

4. Increased monies for tutoring. For Supplemental Instruction, the approximate cost is $1500/course.

5. More library purchases of science books and journal/magazine subscriptions to keep current in the biological sciences. Approximate Cost: Increased funding for library acquisitions is a part of the library budget and would need to be determined by the library.

Strategies

1. Ensure that program needs and requests are clearly articulated in Plan Builder to effectively connect planning with budgeting.

2. Seek extramural support to enhance student success.

3. Continue to implement changes to curriculum as a result of SLO assessment and analysis.

4. Adapt instructional techniques/methods from non-majors courses that have the highest success rates for completers to those non-majors courses that have the lowest success rates for completers.

5. Work with Institutional Research to establish an English prerequisite for targeted courses to increase student success.