

**CALIFORNIA STATE UNIVERSITY, EAST BAY**

DESIGNATION CODE: 2011-12 CAPR 17

DATE SUBMITTED: April 19, 2012

**TO:** The Academic Senate

**FROM:** The Committee on Academic Planning and Review (CAPR)

**SUBJECT:** Five-Year Program Review for Biology

**PURPOSE:** For Action by the Academic Senate

**ACTION**

**REQUESTED:** Acceptance of the Five-Year Program Review of the Biological Sciences (BA, BS, MA, MS) and Marine Sciences (MS) programs in the College of Science at California State University East Bay and the recommendation that they continue without modification. The date of the next Five-Year review is 2016-2017.

**BACKGROUND**

At its meeting on March 15, 2012, CAPR invited members of the Department of Biological Sciences to orally present the outcome of their five-year review process completed in 2010-11 and submitted to CAPR for review in 2011-12 as prescribed in the Academic Program Review Procedures (08-09 CAPR 23 (revised)). Department of Biological Sciences Chair, Dr. Donald Gailey, had previously supplied the Senate Office with a full version of the program self-study, five-year plan, external reviewer's report and program response to the external reviewer's report. Prior to this meeting, the CAPR liaison to the Biological and Marine Sciences program reviews, Dr. Jiming Wu, examined the five-year review documentation in detail, applying a review matrix derived from the Academic Program Review Procedures that suggest content for five-year review documentation, and using this as a basis for asking questions of the program Chair (see attached Appendix A). At this meeting, Dr. Gailey presented a summary of first the Biological Sciences and then the Marine Sciences five-year review to CAPR, and participated in a question and answer session that resulted in a short follow-up email from Dr. Gailey to the CAPR liaison on March 22, 2012 with some information that CAPR suggested would be useful for its report on the program, and which was not contained in the review documentation. The information provided in this email is integrated into this document. Chair Gailey noted that the review was largely produced by former Chair Michael Hedrick who is currently on leave and will likely not return to the campus. Given the intertwined nature of the Biological and Marine Sciences programs and the minimal number of CSU East Bay students availing themselves of the latter, they were all included in a single five-year review document and external reviewer report. There is no CSU East Bay Department of Marine Sciences per se, with the program of instruction largely carried out at the Moss Landing Marine Science Laboratory that serves a consortium of CSU campuses and their students seeking instruction in this discipline.

**Overview Description of the Program**

The Department of Biological Sciences has both undergraduate and graduate programs. The undergraduate program offers a BA degree in Biological Sciences and a BS degree in Biological Sciences with six different options: Ecology and Conservation Biology, Physiology, Forensic

Science, General Biology, Microbiology/Biomedical Science, and Cell and Molecular Biology. The graduate program offers an MA and an MS degree in Biological Sciences. The department also offers a Minor in Biological Sciences and a Certificate in Pre-Physical Therapy. Note that the Department of Biological Sciences is also responsible for administering the MS degree in Marine Science which is largely delivered through the CSU Marine Science Laboratories at Moss Landing; faculty there also deliver a series of undergraduate courses on Marine Science with one such course; BIOL 3215 Marine Biology, delivered at CSU East Bay according to the current catalog. Students pursuing a graduate degree in Marine Sciences can plan their academic schedules to provide for one or more terms at Moss Landing but are considered as in-residence at Cal State East Bay.

According to fall enrollment data compiled by PEMSA, as of 2009 there were 553 undergraduate majors and 97 graduate majors in the biological sciences who were served by a tenure-track full-time equivalent faculty of 16, generating a full-time equivalent student (FTES) level of 496.7. In 2009, the proportion of FTES taught by lecturers was 15.9% and the average Student-Faculty Ratio was 29.6. No separate statistical template is provided for the Marine Science program (it is assumed that these numbers are included in the Biological Sciences data). The BA degree in Biological Sciences requires 98 units for graduation, the BS degree in Biological Sciences requires 99-119 units, and each of the three Masters degrees require 45 units. Thus, with the 72 units of GE, all of the undergraduate programs fall within the 180-unit requirement of the CSU. The majority of undergraduate students elect to complete the BS program.

### **Overview of the Documents Submitted to CAPR**

A short summary of the five-year review provided by the Department of Biological Sciences for its undergraduate and graduate degrees precedes the self-study, five-year plan, external reviewer's report, and response to the external reviewer's report. Without including appendices, the summary, self-study and five-year plan totals 28 pages, fourteen of which are devoted to self-study and thirteen are devoted to the five-year plan. The appendices provide a checklist of the Biology department course offerings and describe the Marine Science program. Note that the five-year documentation provided by the Department of Biological Sciences comingles the BA, BS, MA, and MS program information due to the fact that the same faculty and facilities are used to support each of the programs and thus it is not practicable to separate out many of the common components. This is typical of many departments' approaches to their five-year review, because although through this process CAPR approves continuation or discontinuation of programs, not departments, many departments' programs significantly overlap in terms of faculty, resources, recruitment, climate, and the many other program areas required to be reported on as part of the five-year review process. As such, it has not proven possible for CAPR to distinguish between the various degree programs with respect to their specific health or separate the general department needs for the next five years from any program-specific needs. Not that within the materials authored by the Department of Biological Sciences, there information concerning the Marine Sciences program at Moss Landing is provided as an Appendix, rather than in the main body of the report. However, there are recommendations in the main body, namely that the program at CSU East Bay and relationship with Moss Landing be reinvigorated as discussed below.

### **Program's Self-Study (2006/07-2010/11)**

#### Summary of Specific Areas of the Self-Study

The Biology program self-study follows well the outline and content required by the Academic

Program Review Procedures and begins with a reflection on the previous five-year review indicating that it instituted most of the planned changes in the programs developed in the previous planning period:

- The department has successfully developed options within the BS undergraduate major.
- The department has successfully hired three new faculty members.
- Enrollment in the department continues to grow despite recent budget cuts.
- The department has developed a Comprehensive Examination track for Master's students in the MA program.
- The current chair developed a plan to implement laboratory course fees and spent two years working with the administration to bring the plan to the Course Fee Advisory Committee (CFAC) to vote on it.
- Travel funds have been reinstated as a result of increased budgets at the College level and an increase in funds to the department through Biology extension courses.

The one aspect not completed has been the purchase of new equipment although it was noted that with recent funding by the Provost's Office and A2E2 funding, this will be addressed in the current five-year review period.

With respect to curriculum, the department has redesigned Student Learning Outcomes (SLOs) to better reflect its mission while simplifying assessment. Two assessment plans are detailed in the five-year review report: one for BA and BS and the other for MS in the Biological Science. The department has broken down its SLOs into 14 categories and then "mapped" its courses against each of these 14 SLOs. This enables the department to identify which courses are intended to address which student learning outcomes, and to what degree they address each SLO. The ETS Major Field Test in Biology was employed to assess the effectiveness of the program in regard to SLOs 1 (ability to describe living organisms) and 2 (integrate knowledge of unifying biological principles) of the BA and BS in Biological Sciences. The results show that CSUEB students received high total scores, and did about equally well in all subscores. These results thus indicate the effectiveness of the Biological Sciences program in regard to SLO 1 and SLO 2. The department then developed a plan to assess SLO 3 (ability to apply methods of scientific inquiry) and collected data for both introductory and upper division classes. The results indicate that the majority of students are mastering SLO 3 adequately, both at the introductory level (BIOL 1402, "Plant Biology", a course that also covers Evolution) and at the mastery level (BIOL 4455, "Molecular Cell Biology, and BIOL 4485 "PCR DNA Sequencing and Fragment Analysis"). Meanwhile, the department is aware that it is difficult to interpret trends in performance from the introductory level to the mastery level due to the subjective nature of scoring student performances.

During the discussion of assessment possibilities for the SLOs for the MS programs, the department realized that the combination of a proposal, thesis, and oral defense already provided assessment of all 4 SLOs. Specifically, SLO1 (use of scientific method) and SLO4 (evaluate scientific literature) are assessed by both the proposal and the thesis. The thesis further provides assessment for SLO2 (written presentation of design and results of experiments), while the thesis defense assesses student mastery of SLO3 (orally communicate design and results of experiments). In other words, successful completion of the proposal, research thesis, and thesis defense indicate mastery of SLO1-4. The department plans to continue assessment of SLOs 1-4 in this way.

In the future, the department will implement a pre-test/ post-test protocol to assess its revised

SLOs (1 – 3) for biology undergraduates. For the pre-test, the department will request all incoming biology majors (both new and transfer students) to take an on-line summative assessment exam within the first two weeks of their first quarter at CSUEB. The post-test will be a same or similar (“isomorphic”) on-line exam given to all graduating seniors during their last quarter at CSUEB.

Seven new undergraduate courses and six new graduate courses have been created during 2005/06—2009/10. New undergraduate courses were created mainly in the area of Microbiology. These courses were created to support new faculty members and the reorganization of the Biomedical Laboratory Sciences option within the BS degree. The newly reorganized option (Microbiology/Biomedical Laboratory Sciences) provides students with more flexibility within the option and essentially provides two tracks: 1) students seeking a BS degree with an option in Microbiology, and 2) students seeking to enter the Clinical Laboratory Sciences licensing programs who require specific coursework offered within this option.

The academic performance review statistics are summarized for the fall quarters from 2005-2009 showing a significant rise in majors (+50%) and FTES (+35%) and, because of limited faculty resources, a corresponding rise in SFR (+40%). However, the average section size decreased from 29 in 2005 to 27 in 2009. With respect to faculty, it is reported that in the past five years, three faculty members have been hired, two faculty members have entered the FERP program, and the department has had two separations. According to data in the self-study, the department had 14 full-time faculty in 2009. There are 15 faculty members currently listed on the department web-page, 7 full professors, 3 associate professors, and 5 assistant professors. The fall 2009 data lists 9 part-time lecturers giving a total FTEF of 16.8 (12.4 tenure-track and 4.4 lecturer).

With respect to resources, the department states that it has inadequate resources (library, equipment, infrastructure, laboratory supply budget) to maintain a high level of quality instruction and professional research activities. There is a severe problem when faculty need access to a wide variety of journals in order to write articles and grant proposals. Many current and past journals that are needed are unavailable to faculty. The department has not had an infusion of new equipment for teaching and research for many years. Additionally, the College of Science lacks many basic infrastructure necessities that allow faculty to be competitive for external funding. The self-study does not discuss course offerings at the Concord Campus and is not clear what proportion of courses is offered online, if any.

#### Summary of Supporting Data

The Biology programs’ review documentation provides four supporting appendices. They include a tenure track job description, faculty publications and grants 2005-2010, course offerings, and a review of the Marine Science/Moss Landing Marine Labs.

#### **External Reviewer’s Comments & the Department’s Response**

In the five-year review process, programs prepare their self-study and their five-year plan (draft) and submit these to their external reviewer prior to their visit to campus. The program then gets the chance to finalize their five-year plan based on comments made by the external reviewer and the response of their Dean to their document and the external review report. It is thus summarized in this CAPR recommendation prior to its analysis of the final five-year strategic plan. The external review of the CSU East Bay Biology program was conducted by Dr. Richard Whitkus, Professor and Chair in the Department of Biology at Sonoma State University. He visited the campus on April 29<sup>th</sup>, 2011 and met with the Dean of the College of Science, the Chair, ten

faculty members, five staff members, and approximately twenty undergraduate and graduate students in the program.

According to Dr. Whitkus, the Department of Biological Sciences at CSUEB offers a solid curriculum in biology, designed to prepare students for entry into graduate or professional degrees, or for successful careers in the life sciences and related fields. He found that the main pillars of the Department are 1) the dedicated faculty who balance a strong commitment to teaching with maintaining active scholarship and service; and, 2) a professional staff who take their roles very seriously in support of the program. He also found that since the previous Academic Review, the Department has made good progress in diversifying the curriculum, maintain faculty positions, and garnering travel funds for professional development. He noted that all of this was undertaken with continued reductions in budget and setbacks in initiatives to secure laboratory fees. That being said, Dr. Whitkus raised the concern that the quality of the program may be compromised by those continuing challenges, the most significant being budgetary in nature.

The external review provided a number of recommendations for the Department and Administration to consider. However, three main recommendations rise to the top as the most serious:

- Need of at least one full-time faculty position in the next year in the area of physiology, and at least 2 additional positions in the next 2-3 years to match the loss of outgoing faculty.
- The Department needs to reassess the number of options in the B.S. and/or course offerings relative to available faculty expertise.
- The Department, in consultation with the administration, should examine the possibility of declaring impaction in the major.

One point raised by Dr. Whitkus was students' and faculty's dissatisfaction with the use of multiple course substitutions to make up for required courses that cannot be taught for all the options. Dr. Whitkus thought that this may reduce the quality of the overall concentration and the program as a whole. He urged the Department to address these questions: 1) Can the Department continue to offer seven options in the BS? 2) Can new initiatives such as the STEM teaching credential program be adequately covered? 3) Are there ways of combining some options into broader categories as a means of reducing course substitutions and increasing student participation?

The external reviewer noted that the situation for Marine Sciences at CSUEB is unique among the degree options for the Department. While CUSEB has had a long and academically rich relationship with Moss Landing Marine Laboratories, due to the distance Moss Landing and the difference between the quarter system at CSUEB and the semester system at MLML, students find it difficult to take courses their regularly. Additionally, the number of CSUEB faculty that participate with Moss Landing has decreased over the years, while student interests at CSUEB have shifted, to some degree, away from marine science. This situation presents a challenge to the Department in retaining a strong connection to Moss Landing, as well as maintaining the degree option in Marine Science. It was noted in the five-year review appendices that during the review period, East Bay's FTES at Moss Landing has ranged between just 1-2 students each semester.

The Biology department made no amendments to its five-year plan based on the external reviewer's report or the Dean of the College of Science's response, although it did indicate that it had carefully reviewed the suggestions and recommendation made. It concluded from the responses received that its self-study and five-year plan were sufficiently thorough and

appropriate.

### **Program's Five-Year Strategic Plan 2011-2016**

The five-year plan for the Biology program follows closely the outline and content required by the Academic Program Review Procedures and begins with curriculum. It indicates that the department will strengthen its curriculum in four different areas: 1) increasing the number of non-tiered graduate courses for students pursuing a Masters Degree, 2) increasing the number of upper division laboratory courses offered in each of the options leading to a Bachelor of Science or Bachelor of Arts Degree, 3) offering hybrid courses that can be utilized in STEM education, and 4) reinvigorating the Marine Science Degree and CSU East Bay's relationship with the Moss Landing Laboratories.

With respect to students, the coming five-years is expected to yield a wholesale review of program learning objectives and the mapping of desired skills to the current curriculum. It is expected to add an element of training students more for collaborative-based activities; this is especially true for graduate students. The goal for the next five years is to foster and maintain interest among students for the science field and to increase the number of students applying and gaining acceptance into post-baccalaureate programs.

With respect to faculty, the department anticipates continued need for one or two more physiologists to keep pace with the growing enrollment in this area and to replace 1.5 FTEF anticipated separations in physiology. With the University emphasis as a STEM campus and the initiatives surrounding this designation, the department also anticipates new hires to meet further needs in Biotechnology (Cell & Molecular Biology, Forensic Science) instruction and research. With respect to other resources, the department aggressively seeks to have a steady income to support laboratory instruction by trying to implement laboratory course fees. Note that with the implementation of A2E2, this goal will need to be accomplished through successful petitions for allocation of A2E2 funds via the Provost's Office. The department really needs to have two full-time office staff and looks forward to the restoration of the 0.5 position that was previously eliminated. The positive impact of the new equipment should be realized and the department anticipates a significant increase in its ability to deliver high quality courses with the substantial upgrade of new equipment that this initiative will provide. The five-year plan also emphasizes that the most important resource the library can provide for its science faculty is electronic access to journals and thus the faculty need to work with library staff to try and identify improvements in this area.

### **CAPR Analysis of the Program's Five-Year Review**

It is clear from the rising enrollment rates that the Biological Sciences programs are serving a growing demand instruction; the number of majors has been rising even though the faculty resources devoted to their instruction have not been added and SFR levels have increased. Based on the careful self-study, five-year plan, and external review, the following points are offered by CAPR with respect to strategic planning that can be the basis for future annual reporting until the next five-year review. We hope that these will be helpful in the drafting of a memorandum of understanding with the Provost's office for the coming five years in terms of resource needs/allocations and objectives for the program.

#### **a. Program**

Based on the strategic plan provided to CAPR by the Biology department, the following program-related recommendations are offered:

- The department should follow through on its stated goal to increase the number of non-tiered graduate courses for students pursuing a Masters Degree. In doing so, the program will provide a more appropriate experience for their Masters candidates, including more mature and in-depth readings and discussions of current scientific literature and the development of analytical and presentation skills.
- The department should increase the number of upper division courses that have a laboratory component to better prepare CSU East Bay graduates for entering the local workforce, which is of a highly applied and technical nature, or for pursuing graduate degrees including doctoral degrees at other institutions.
- The department should follow through on the stated goal to reinvigorate CSU East Bay's relationship with the world-renowned Moss Landing Marine Laboratories by encouraging faculty collaborations and promoting the M.S. in Marine Science degree within the department and to incoming and future students, reporting back to CAPR annually on the progress in these areas, including the FTES in Marine Science courses.

b. Resources

The main concern for the coming five-years is to address the need for at least one additional tenure-track faculty member in the area of physiology, and of at least two additional tenure-track faculty members to match the loss of outgoing faculty. Another core concern is the maintenance of laboratory instructional quality through continued investment in adequate equipment and materials. CAPR therefore proposes the following recommendations for the coming five-years:

- The department should seek a minimum of one tenure-track position to meet the growing demand for Biology instruction and permit it to maintain and improve the quality of the programs offered.
- The department should secure external funding for additional research-related equipment (that should, once secured, be more fully leveraged for laboratory instruction) and petition the Provost's office for secure support for laboratory materials and equipment through an appropriate share of A2E2 revenues.
- The department should petition, along with other departments in the College of Science, for an increase of resources (library, equipment, infrastructure, laboratory supply budget) across the college and work with library staff on addressing specific needs with respect to academic journals.

Each of the recommendations above should be reported back to CAPR in one or more annual reports over the coming five years until the next review. It is expected that the next self-study will explicitly review whether these recommendations were or were not achieved and why, along with any additional initiatives that might be developed that were not envisaged as part of this strategic planning process.

### **CAPR Recommendation for Continuation of the Program**

Acceptance of the Five-Year Program Review of the Biology undergraduate and graduate programs in the College of Science at California State University East Bay and the recommendation that it continue without modification. The date of the next Five-Year review is 2016-2017.

