



**COMMITTEE ON ACADEMIC PLANNING AND REVIEW  
ANNUAL PROGRAM REPORT**

|                             |                     |
|-----------------------------|---------------------|
| College                     | CoS                 |
| Department                  | Biological Sciences |
| Program Unit                | Biological Sciences |
| Reporting for Academic Year | 2015-2016           |
| Department Chair            | Donald A. Gailey    |
| Date Submitted              | 7/22/2016           |

**1. SELF-STUDY (about 1 page)**

**A. Five-year Review Planning Goals**

1. Increasing the number of non-tired graduate courses for students pursuing a Master's Degree
2. Increasing the number of upper division laboratory courses offered in each of the options
3. Offering hybrid courses that can be utilized in STEM education
4. Reinvigorating the Marine Science Degree and our relationship with Moss Landing Marine Laboratories
5. Foster and maintain interest among students for the science field
6. Increase the number of students applying and gaining acceptance into post-baccalaureate programs
7. Faculty projections: one or two new physiologists, projected retirement of FRPr Dixon losing 0.5 FTE in microbiology
8. Stability of Chair position with Hedrick taking leave of absence in 2011
9. Stability of office management with 4 office managers in 4 years
10. Need for replacement/new equipment

**B. Five-year Review Planning Goals Progress**

As might be expected with the department's next scheduled five-year program review due in 2016-17, the previous planning goals are either completed or outdated. Responses align with numbered points in "A" above.

1. With semester conversion, the Master's program has been completely transformed. The M.A. program will be discontinued. The M.S. will continue as a thesis-research-based degree program. The historic research areas will now be known as Cell and Molecular, Ecology and Evolution, Microbiology, and now with the important addition of Research in Education. A cohesive introductory course has been added for all M.S. students and there will be formal, course provision for TA training. The department voted unanimously to halt the offering of tiered courses with the beginning of semesters, allowing the department to strengthen its catalog of 600-level courses.

2. With the transformation of our B.S. program in semester conversion, the focus became improved student performance in our introductory year course. The new “twist” in the series will be (the expected) one lab meeting a week, but now the addition of a 2-hr activity section each week. The focus will be on development of writing and quantitative skills relative to the lab experience, and assessing understanding of lecture material. The concentration plan will be simplified, getting rid of the confusing “general biology” option. This should lead to increased student subscription to the Ecology and Evolution track.
3. No new development beyond the 2014-15 report
4. Active participation by faculty members in MLML governance has led to increased student awareness. Our transition to semesters now aligns us with the semester programs at MLML, but geographical separation remains the major barrier to increased participation.
5. Nothing to report beyond the 2014-15 assessment
6. No specific move this year on this goal
7. We have moved significantly beyond the projection of faculty hires in our last five-year report. We have now hired a new microbiologist who started Fall '15, and we have now hired a cell & molecular biologist who will start Fall '17. Primarily through increased numbers of majors and FTEs we are undertaking a search for another microbiologist this current 15-16 AY. Two senior physiologists have accepted full-time faculty appointments in administrative positions. This returns priority to the hiring of a physiologist, to be proposed this coming 16-17 AY.
8. The current chair (writer of this document) has announced retirement in October 2017. This necessitates formulation of a Chair Selection Committee for the coming 2016-17 AY.
9. Granera is still captain of the Office.
10. The department continues to add significant amounts of new equipment through A2E2.

### **C. Program Changes and Needs**

Program Changes and Needs have been addressed (as stated in Section B above) in semester conversion activities.

## **2. SUMMARY OF ASSESSMENT (about 1 page)**

### **2015-2016 CSCI EETF Assessment Year End Report, June, 2016**

| <b>Program Name(s)</b>                   | <b>EETF Faculty Rep</b> | <b>Department Chair</b> |
|--|-------------------------|-------------------------|
| <b>B.A. and B.S. Biological Sciences</b> | <b>Caron Inouye</b>     | <b>Donald Gailey</b>    |

#### **A. Program Student Learning Outcomes**

Students graduating with a B.S. or B.A. in Biological Sciences from Cal State East Bay will be able to

1. explain core biological concepts, including evolutionary processes, structure-function relationships across all levels of biological organization, homeostasis, information flow, matter and energy transformations, and the interactions and interconnectedness of living systems;
2. apply quantitative reasoning to explain biological phenomena and to address biological problems;
3. clearly communicate biological information in a variety of formats (written, oral, visual) using a style appropriate for the intended audience;
4. apply methods of scientific inquiry by formulating testable hypotheses, collecting and analyzing data, and reporting conclusions;
5. gather, interpret, and evaluate published scientific information.

#### **B. Program Student Learning Outcome(s) Assessed**

6. apply quantitative reasoning to explain biological phenomena and to address biological problems.

#### **C. Summary of Assessment Process**

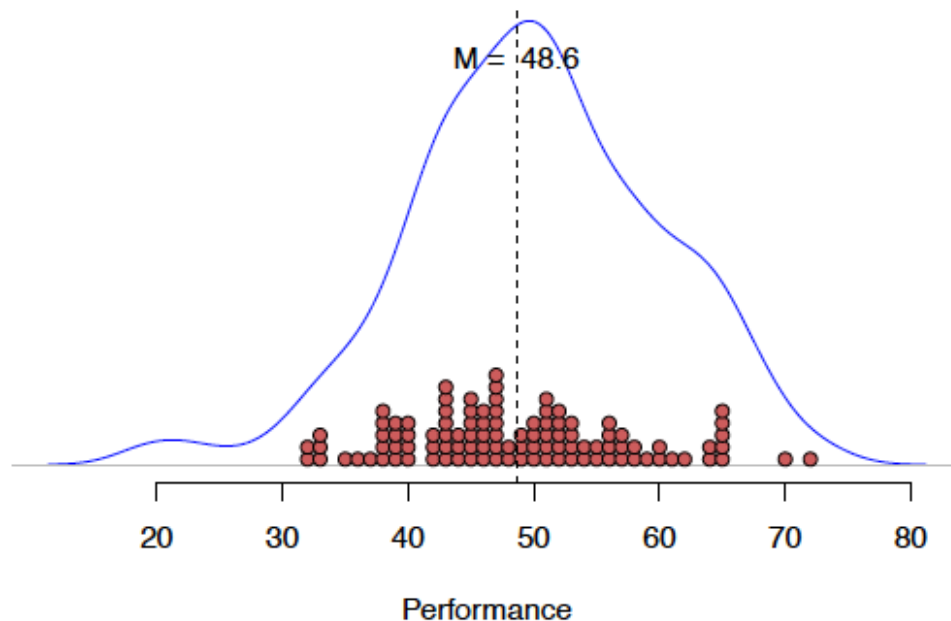
We identified an established, nationally validated, and fully online assessment instrument, the Biology Science Quantitative Reasoning Exam ([BioSQuaRE](#)), developed by a collaborative of six universities and sponsored by a grant from the Howard Hughes Medical Institute. Composed of 29 multiple choice questions, BioSQuaRE is designed for biology majors and assesses students' understanding of quantitative content in three main content areas: (1) algebra, functions, and modeling (9 questions); (2) probability and statistics (8 questions); and (3) data visualization (12 questions). We selected four courses, composed primarily of seniors, in which to administer the test during the last week of classes of Spring 2016. These courses were BIOL 4430 Immunology, BIOL 4455 Cell Molecular Biology, BIOL 4512 Applied Neurobiology, and BIOL 4518 Animal Behavior. The faculty members teaching these courses all agreed to offer extra credit points to students completing the exam. Although 114 students attempted the exam, a total of 104 students

completed BioSQuaRE. Students in BIOL 4455 took the exam in person during class, while students in the other courses took the exam outside of class time. The exam had to be completed in one sitting. BioSQuaRE administrators at the University of Minnesota provided a comprehensive report of our students' performance. A synopsis of the results is provided in Section D below.

## D. Summary of Assessment Results

### Overall Student Performance

BioSQuaRE scores are scaled so that the mean for all students completing BioSQuaRE is 50 and the standard deviation is 10. Of the 104 CSU East Bay biology majors completing BioSQuaRE, the mean score was 48.6 with a standard deviation of 8.8. The density plot below shows the distribution of scores for all students who have completed BioSQuaRE (blue curve) and for CSUEB biology majors (dot plot). Our students' scores were similar to the national average and range.



### Content Profile of Students

Item analyses of student performance within the three content strands provided a finer grain look into the relative strengths and weaknesses in the quantitative skills of our students.

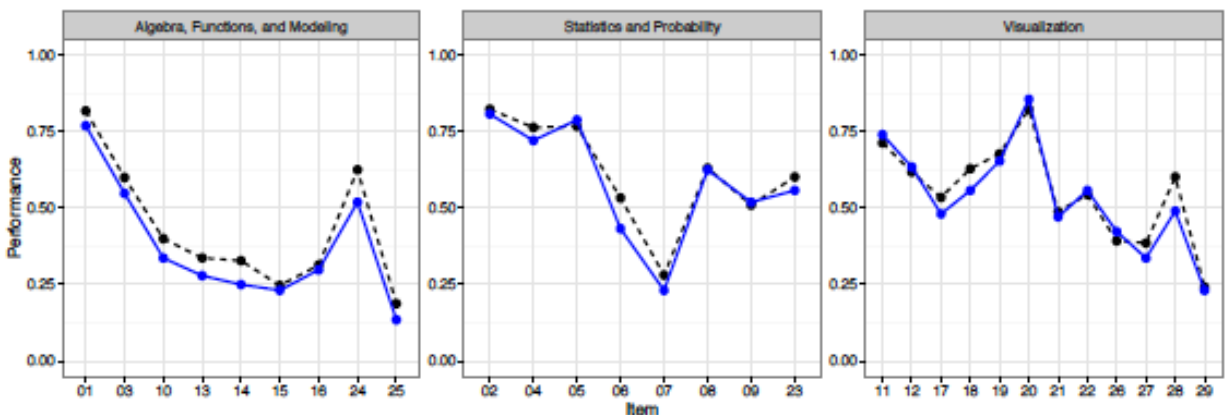
*(1) Algebra, Functions, and Modeling.* The mean proportion of students answering each of the nine questions in this content strand correctly was very low at 0.37 and ranged from 0.13 to 0.77. Fewer than 50% of the students completing the assessment answered six of the nine questions correctly. These areas of weakness included interpreting plots of logarithms, graphing a non-linear function, and predicting from a recursive model of population growth. Students showed adequate performance in three content areas, with more than half the students correctly predicting from a genetic model (0.52), understanding variation in log-transformed measurements (0.55), and

computing probability from a two-way table (0.77).

(2) *Probability and Statistics.* The mean proportion of students answering each of the eight questions in this area was adequate at 0.59 and ranged from 0.23 to 0.81. Students demonstrated competency (i.e., the proportion of students answering a content question correctly was greater than 0.50) on six of the eight questions, e.g., understanding variation in measurements (0.81), translating summary statistics to a distribution (0.79), and relating sample size to uncertainty (0.72). Students showed particular weakness in their understanding of p-value (0.23) and in translating content to a statistical hypothesis (0.43).

(3) *Visualization.* The mean proportion of students answering each of the twelve questions in this area was mediocre at 0.54 and ranged from 0.23 to 0.86. Students demonstrated competency on six of the twelve questions, e.g., interpreting relationships between variables from a lineplot (0.86), interpreting variation on a heatmap (0.74), and interpreting interaction effects from a plot (0.56). Students showed particular weakness in the ability to understand the relationship between data, relative quantification, and the plot (0.23 to 0.42).

The three plots below (one for each content strand) show the proportion of CSUEB biology students answering each question correctly (blue, solid line) relative to the population of students from all schools who took BioSQuARE (black, dashed line). Again, these results suggest that our students perform similarly to all other students across the U.S. who have completed BioSQuARE.



## E. Suggestions and Recommendations for the CSCI EETF in the Future

The BioSQuARE assessment tool has allowed the department to recognize areas of strengths and weaknesses in the quantitative reasoning skills of our biology majors. The overarching goal of the department is to help students develop and master their ability to apply quantitative reasoning to

explain biological phenomena and to address biological problems. The assessment results informs biology faculty discussions of how to effectively integrate more deliberate/explicit teaching of and activities that support specific aspects of quantitative reasoning in our courses. In the future, we plan to administer this assessment to incoming freshmen to establish a baseline performance index, so that we can distinguish any significant shifts/improvements in QR skills in students upon completing the biology major.

### **3. STATISTICAL DATA** (about 1 page)

**California State University, East Bay**  
**APR Summary Data**  
**Fall 2011 - 2015**

| <b>Biological Science</b>               | <b>Fall Quarter</b> |              |              |              |              |
|---|---------------------|--------------|--------------|--------------|--------------|
|   | <b>2011</b>         | <b>2012</b>  | <b>2013</b>  | <b>2014</b>  | <b>2015</b>  |
| <b>A. Students Headcount</b>            |                     |              |              |              |              |
| 1. Undergraduate                        | 574                 | 658          | 680          | 768          | 809          |
| 2. Postbaccalaureate                    | 9                   | 5            | 2            | 1            | 0            |
| 3. Graduate                             | 35                  | 41           | 44           | 32           | 28           |
| 4. Total Number of Majors               | 618                 | 704          | 726          | 801          | 837          |
| <b>College Years</b>                    |                     |              |              |              |              |
| <b>B. Degrees Awarded</b>               |                     |              |              |              |              |
|   | <b>10-11</b>        | <b>11-12</b> | <b>12-13</b> | <b>13-14</b> | <b>14-15</b> |
| 1. Undergraduate                        | 91                  | 91           | 133          | 103          | 131          |
| 2. Graduate                             | 20                  | 16           | 15           | 21           | 10           |
| 3. Total                                | 111                 | 107          | 148          | 124          | 141          |
| <b>Fall Quarter</b>                     |                     |              |              |              |              |
| <b>C. Faculty</b>                       |                     |              |              |              |              |
| <b>Tenured/Track Headcount</b>          |                     |              |              |              |              |
|   | <b>2011</b>         | <b>2012</b>  | <b>2013</b>  | <b>2014</b>  | <b>2015</b>  |
| 1. Full-Time                            | 13                  | 13           | 14           | 14           | 15           |
| 2. Part-Time                            | 1                   | 0            | 0            | 0            | 0            |
| 3a. Total Tenure Track                  | 14                  | 13           | 14           | 14           | 15           |
| 3b. % Tenure Track                      | 77.8%               | 72.2%        | 77.8%        | 77.8%        | 71.4%        |
| <b>Lecturer Headcount</b>               |                     |              |              |              |              |
| 4. Full-Time                            | 0                   | 0            | 1            | 2            | 0            |
| 5. Part-Time                            | 4                   | 5            | 3            | 2            | 6            |
| 6a. Total Non-Tenure Track              | 4                   | 5            | 4            | 4            | 6            |
| 6b. % Non-Tenure Track                  | 22.2%               | 27.8%        | 22.2%        | 22.2%        | 28.6%        |
| 7. Grand Total All Faculty              | 18                  | 18           | 18           | 18           | 21           |
| <b>Instructional FTE Faculty (FTEF)</b> |                     |              |              |              |              |
| 8. Tenured/Track FTEF                   | 10.7                | 11.0         | 11.7         | 11.0         | 10.0         |
| 9. Lecturer FTEF                        | 4.1                 | 6.4          | 6.2          | 7.1          | 7.2          |
| 10. Total Instructional FTEF            | 14.8                | 17.4         | 17.9         | 18.1         | 17.2         |

| <b>Lecturer Teaching</b>              |        |        |        |        |        |
|---------------------------------------|--------|--------|--------|--------|--------|
| 11a. FTES Taught by Tenure/Track      | 327.6  | 315.1  | 322.2  | 317.1  | 304.7  |
| 11b. % of FTES Taught by Tenure/Track | 74.8%  | 63.6%  | 57.5%  | 57.3%  | 53.5%  |
| 12a. FTES Taught by Lecturer          | 110.5  | 180.6  | 237.7  | 235.8  | 264.6  |
| 12b. % of FTES Taught by Lecturer     | 25.2%  | 36.4%  | 42.5%  | 42.7%  | 46.5%  |
| 13. Total FTES taught                 | 438.1  | 495.7  | 559.9  | 552.9  | 569.3  |
| 14. Total SCU taught                  | 6571.0 | 7435.0 | 8398.0 | 8293.0 | 8539.0 |
| <b>D. Student Faculty Ratios</b>      |        |        |        |        |        |
| 1. Tenured/Track                      | 30.6   | 28.6   | 27.6   | 28.8   | 30.5   |
| 2. Lecturer                           | 26.9   | 28.4   | 38.2   | 33.4   | 36.7   |
| 3. SFR By Level (All Faculty)         | 29.6   | 28.6   | 31.3   | 30.6   | 33.1   |
| 4. Lower Division                     | 37.9   | 35.4   | 38.7   | 38.3   | 41.4   |
| 5. Upper Division                     | 24.5   | 24.4   | 30.6   | 27.8   | 27.3   |
| 6. Graduate                           | 12.5   | 13.7   | 10.3   | 7.5    | 11.5   |
| <b>E. Section Size</b>                |        |        |        |        |        |
| 1. Number of Sections Offered         | 97.0   | 103.0  | 108.0  | 109.0  | 99.0   |
| 2. Average Section Size               | 34.3   | 35.3   | 39.5   | 36.2   | 38.9   |
| 3. Average Section Size for LD        | 39.6   | 39.1   | 42.2   | 39.7   | 42.1   |
| 4. Average Section Size for UD        | 29.4   | 31.3   | 37.4   | 31.6   | 35.2   |
| 5. Average Section Size for GD        | 13.0   | 18.0   | 15.3   | 20.0   | 14.0   |
| 6. LD Section taught by Tenured/Track | 13     | 8      | 15     | 14     | 13     |
| 7. UD Section taught by Tenured/Track | 36     | 32     | 29     | 38     | 28     |
| 8. GD Section taught by Tenured/Track | 22     | 24     | 29     | 18     | 17     |
| 9. LD Section taught by Lecturer      | 26     | 35     | 32     | 34     | 35     |
| 10. UD Section taught by Lecturer     | 1      | 5      | 5      | 7      | 8      |
| 11. GD Section taught by Lecturer     | 0      | 0      | 0      | 0      | 0      |

Source and definitions available at:

<http://www.csueastbay.edu/ira/apr/summary/definitions.pdf>

**Important notes:**

1. We are out of room for more majors. Up another 5% over 2015, and a monstrous 33% since 2011.
2. Our total degrees issued remains relatively depressed. This underscores the requirement to initiate an assessment of major retention.
3. Our SFR values continue to rise with the LD value now at 41, significantly above the systemwide Biology number.
4. Our %FTES taught by lecturers remains high at 46.5% even in the face of hiring a new microbiologist.