TO: The Academic Senate

FROM: The Committee on Instruction and Curriculum (CIC)

SUBJECT: 15-16 CIC 49: BIOL 3080: Biology Hands-on Laboratory General Education B6 request

PURPOSE: Approval of the Academic Senate.

ACTION REQUESTED: That the Academic Senate recommend General Education B6 certification for BIOL 3080: Biology Hands-on Laboratory, effective upon the consent of the President.

BACKGROUND INFORMATION:

At the GE Subcommittee’s March 28, 2016 meeting, the subcommittee considered the request for B6 designation for BIOL 3080: Biology Hands-on Laboratory. This course has operated as an approved GE course for a few years now and it is believed that the Subcommittee had approved it previously, but there was no documentation for it. Hence, the Subcommittee believes that 14-15 CIC 5 does not apply. There may be several courses that have been counted towards GE requirements that have not been explicitly approved by CIC. The Subcommittee for the past 2 years is taking and posting minutes for better documentation. Furthermore, Curriculog allows better tracking of course proposals. The reason this course is being documented at this time is that it is unusual in that it is a 2-unit course. Students are informed that, in order to satisfy the (4 unit) B6 requirement, they must take another 3080 B6 course (Chemistry and Earth and Environmental Sciences both offer one, for example).

GE Subcommittee approved the request and recommends Senate approval.

The Subcommittee unanimously recommended the course and, at CIC’s meeting on April 18, 2016, the Committee concurred unanimously.
Application for General Education Credit
for Upper Division Science (B6)

Course title Hands On Biology Laboratory Course number 3080

Courses approved for general education credit must provide students with explicit instruction in the approved student learning outcomes. Please be as specific as possible, describing topics, readings, assignments, activities and assessments that illustrate how the course meets the requirements. Attach the course syllabus and any assignments or assessments needed to support your explanations.

Please use this template as a guide to address ALL of the following learning outcomes.

Goal of upper division science: upper division physical, life, or interdisciplinary science GE courses build upon scientific principles and quantitative skills gained in lower division science and quantitative reasoning courses. Students must complete their lower division B1-5 requirements prior to taking their B6 course. Students are strongly encouraged to take any lab associated with the upper division course. Courses meeting the B6 requirements must support students’ acquisition of advanced numeracy, information literacy, and critical thinking competencies.

1. Students will demonstrate advanced and/or focused science content knowledge in a specific scientific field using appropriate vocabulary and referencing appropriate concepts (such as models, uncertainties, hypotheses, theories, and technologies).

Students will demonstrate science content knowledge in three ways. Firstly and most importantly, students will learn the background information needed to man one of several “science stations” during visits by K-8 classrooms. They will communicate with the children in asking probing questions and answering childrens’ questions. In this, they will need to use appropriate vocabulary and concepts as they help deepen the childrens’ understanding. Secondly, they will maintain a journal in which they will reflect on the connections between their science stations and concepts being taught, alternative ideas on teaching the concepts, and connections to the Next Generation Science Standards. Thirdly, their own understanding of the science content knowledge will be assessed by comparison of a pre-test and post-test. Examples of specific concepts covered in the course include photosynthesis, cellular respiration, digestion, ecosystems, and biodiversity.

2. Students will apply advanced quantitative skills (such as statistics, algebraic solutions, interpretation of graphical data) to scientific problems.

Students will use statistics and interpretation of graphical data in the course. At one of the photosynthesis stations, students will calculate the rate of photosynthesis from data they collect on the number of leaf disks that float over time and will graph these data. They will use group data to determine the average rate of photosynthesis under different light conditions. At one of the digestion stations, students will calculate how many times greater the surface area of the small intestine has because of its special features compared to a straight, smooth tube. At one of the ecosystems & biodiversity stations, students will predict where the various ecosystems belong on graphs of rainfall vs. temperature.

3. Students demonstrate understanding of the nature of science and scientific inquiry and the experimental and empirical methodologies utilized in science to investigate a scientific question or issue.

This laboratory course was intentionally designed to emphasize inquiry-based learning, which more closely matches science practices. As such, students in this course develop an appreciation of the
scientific method through their own practice in using it and in helping children develop their own. In particular, they are asked to estimate, predict, observe, hypothesize, analyze, interpret, and reason at the science stations.

4. Students will critically analyze scientific claims and data.

Students will assist children in writing conclusions for each science station. The format of the conclusions uses the Cl-Ev-eR model: claim, evidence, and reasoning. Students will help children form a claim based on the experiments they conducted at the science station. They will review the evidence they have collected in the course of the experiment that supports their claim as well as any prior knowledge needed. In the reasoning section, the students will assist the children in making a logical interpretation of their evidence. The students will also have the opportunity to listen to the children’s explanations and, when there are logical flaws in their reasoning, guide them to ways that they could test their beliefs.

5. Students will apply science content knowledge to contemporary scientific issues (e.g. global warming) and technologies (e.g. cloning), where appropriate.

Each unit of the course (photosynthesis, digestion, and ecosystems & biodiversity) will have at least one station specifically connected to contemporary scientific issues. During the photosynthesis unit, students will understand the role CO2 plays in global warming and the importance of photosynthetic organisms to reducing global CO2 levels. During the digestion unit, students will understand the consequences of what they eat in relation to their own health and global impacts on water resources and CO2 levels. The issue of climate change and its impacts will be the theme running throughout all the stations within the ecosystems & biodiversity unit.

6. How does your course support students’ acquisition of advanced information literacy skills?

In order to support the acquisition of advanced information literacy skills, students will be challenged to man a science station during classroom visits and to give constructive feedback to their peers in practice sessions. To do this effectively, students will need to increase their chemistry content knowledge and confidence in communicating it. As such, they will need to draw on their own observations, prior knowledge, and outside sources for both science content information and topics such as research-based instructional models. Through their journals and oral communication with their peers and children, they will share the choices they made while mansing the stations, how they fielded questions, and their ideas for teaching the concepts and improving the stations.

7. How does your course support students’ development of advanced critical thinking skills?

This course will support the development of advanced critical thinking skills in three ways. Students must learn science content, but also must be able to plan how they will conduct their station with children, provide constructive feedback to their peers during practice sessions, and reflect on their own growth as both a student and educator in science. At all times, they will be constantly deepening their science content as they are questioned by their peers and children and helping them develop their own understanding and evaluate their own data. In all cases, both students and children will need to follow a deductive path in order to make and support valid claims using the Cl-Ev-eR format.
In addition, courses receiving upper division science approval must support students’ acquisition of advanced numeracy, information literacy, and critical thinking skills. Outcomes are attached.

General Education
Advanced Information Literacy Outcomes for GE Areas

B6 Outcomes for Advanced Information Literacy in Science
D4 Outcomes for Advanced Information Literacy in the Social Sciences
(approved by Academic Senate 2/05)

Information Literacy is a prerequisite for lifelong learning. It enables learners to engage critically with content, extend their knowledge, assume greater control over their own learning and become self-directed learners.¹

Whether taught within a specific discipline or in a multi-disciplinary context, advanced information literacy curricula should encourage students to seek multiple perspectives and use diverse sources of information to inform conclusions. Further, students should develop an understanding that information and knowledge in any discipline is in part a social construction and is subject to change as a result of ongoing dialog and research. Teaching advanced information literacy helps students understand and participate in this scholarly conversation.

Faculty can enhance student information literacy by providing problem- or inquiry-based assignments where learning results from the use of multiple information sources thereby encouraging self-directed learning and critical thinking. The development and evaluation of these types of assignments may require significant commitment and investment of time on the part of students and faculty alike.

In addition to the lower division information literacy outcomes, students who are information literate at the advanced level are able to:

1. identify the main disciplines, fields, and organizations which generate and publish knowledge in their area of research,
2. develop in-depth knowledge of the literature from the above information producers in their area of research,
3. evaluate the significance and validity of information found, both in the context of the disciplines and fields consulted, and also within their own knowledge base and value systems,
4. analyze the implications of research and publishing patterns in their area of research,
5. formulate and reformulate research inquiries based on the objectives above and,
6. demonstrate their ability to perform the above objectives when they communicate the results of their inquiry to others.

¹ This quote and other ideas contained here are drawn from the Council of Australian University Librarians’ Information Literacy Standards, (Canberra, 2001) and from Learning for Life: Information Literacy Framework & Syllabus published by the Queensland University of Technology Library (Brisbane, 2001).
Upper Division Critical Thinking Across the Curriculum

GOALS
Overall, the goals for critical thinking in the upper division would be essentially the same as the goals enumerated for the lower division, but would entail more complex and sophisticated ways of using those same skills. These goals would include:

- The general ability to use reason (both inductive and deductive)
- The ability to identify fallacious reasoning
- The ability to present one’s own original argumentation

These skills will be reflected in the upper division not as specific testing and evaluation on argumentation skills, but argumentation skills in practice within a particular discipline or disciplines. These upper division skills would include:

- The ability to weigh proffered evidence
- The ability to uncover the implicit assumptions of others
- The ability to reconstruct and evaluate complex arguments encountered in the course of reading and discussion within the discipline(s)
- The ability to frame one’s own positions logically and coherently
- The ability to construct one’s own persuasive arguments in support of carefully considered positions
- The ability to defend this position against thoughtful objections
- The practice of thinking and arguing in the mode of a practitioner of a particular discipline or disciplines
- The practice of applying the special concepts and theories developed in the particular discipline or disciplines

The goals of upper division critical thinking should be to develop these abilities.

ASSESSMENT:
Various strategies could be used to measure these goals. Instructors will be able to witness and evaluate these abilities within the proper realm of the discipline(s), and through written, oral, and discussion assignments.
BIOLOGY 3080 Biology Hands-on Laboratory  
Spring 2015
Course Meeting Times: TBD  Location: TBD

DR. CARON INOUYE  
Office: South Science 325, CSU East Bay, Hayward Campus  
Phone: (510) 885-4479  e-mail: caron.inouye@csueastbay.edu  
Campus Office Hours: TBD

REQUIRED RESOURCES

*Biology 3080 Intern Laboratory Manual* – includes background, instructions, and student activity booklets

COURSE POLICIES

Dress Code and Safety  
You will be working with children and their teachers in a public setting. You will be expected to dress at the same level of professionalism as you would at a school site. Closed-toe shoes are required at all times in the laboratory. Safety glasses or goggles must be worn during all laboratory work. Long hair should be tied back. You will be provided with a lab coat. Further details on safety guidelines provided on the first day of lab must also be observed for the duration of the quarter.

Blackboard (Bb) and Course Announcements  
Our course management system is Blackboard (Bb), accessed at [http://bb.csueastbay.edu](http://bb.csueastbay.edu). Check our Bb site frequently and regularly to make sure you are up to date with all important materials, schedules/deadlines, announcements, etc. I may email you through Bb, and these messages will go to the email account you specify in your Bb profile. To make adjustments to your Bb email profile (or to have all campus messages forwarded to your preferred email account), click on “Horizon email Access” under Hot Links (menu on left of your main Bb page—not our course page).

Grading  
The grade you earn will be based on your performance in the following course components:

- Lab Participation: 25%
- Debrief Participation: 25%
- Journal Entries: 25%
- Pre-Survey: 5%
- Pre-Content Test: 5%
- Post-Survey: 5%
- Post-Content Test (Final Exam): 10%

Lab and debrief participation is mandatory. If you are unable to attend either, the instructor should be notified of the absence immediately upon your return to class, if not earlier. If a valid
excuse is discussed with (and verifiable evidence is presented to) the instructor, you may be
given an alternate assignment and granted credit. Journal entries should be completed and
handed in upon the student’s return to class. If the absence is not excused, zero points will be
assigned for participation. **A maximum of one absence can be excused per quarter.** Journal
entries are due at the start of the period. Points will be deducted from late journal entries (10%
per day).

The grading scheme will be based on a straight scale as follows:

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>% Total Points</th>
<th>Letter Grade</th>
<th>% Total Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>93 - 100</td>
<td>C</td>
<td>73 – 76.9</td>
</tr>
<tr>
<td>A-</td>
<td>90 – 92.9</td>
<td>C-</td>
<td>70 – 72.9</td>
</tr>
<tr>
<td>B+</td>
<td>87 – 89.9</td>
<td>D+</td>
<td>67 – 69.9</td>
</tr>
<tr>
<td>B</td>
<td>83 – 86.9</td>
<td>D</td>
<td>60 – 66.9</td>
</tr>
<tr>
<td>B-</td>
<td>80 – 82.9</td>
<td>F</td>
<td>&lt; 60</td>
</tr>
<tr>
<td>C+</td>
<td>77 – 79.9</td>
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</tr>
</tbody>
</table>

A grade of “incomplete” can only be given if a major portion (> 50%) of the course has been
completed at a passing level (“C” or better). If an “I” is assigned, you will have one academic
year to complete only the unfinished portion of the course.

**Academic Dishonesty**

It is imperative you understand what academic dishonesty is and how serious it is. You are
required to review the information at [http://www.csueastbay.edu/ecat/current/i-120grading.html#section12](http://www.csueastbay.edu/ecat/current/i-120grading.html#section12). Included are the details of what comprises academic dishonesty
and the consequences thereof. I do not tolerate cheating, plagiarism, and other forms of
academic dishonesty and you will receive no credit for the test, assignment, or activity on which
you acted dishonestly. This may result in an “F” in the course and a formal Academic
Dishonesty Incident Report filed against you. Further punitive action, e.g., academic record
notation (five years duration), suspension, or expulsion may be taken by the Student
Disciplinary Officer and the Office of the Vice President of Student Affairs.

**Special Academic Accommodations**

It is University policy to provide, on a flexible and individualized basis, reasonable
accommodations to students who have disabilities that may affect their ability to participate in
course activities or to meet course requirements. Students with disabilities are encouraged to
contact their instructors early in the quarter to discuss their individual needs for
accommodations. If you have a documented disability and have registered with SDRC, you will
need to discuss this with and provide your **Determination of Accommodations** form to me.
### SPRING 2014 TENTATIVE SCHEDULE

<table>
<thead>
<tr>
<th>Week</th>
<th>Lab</th>
<th>Debrief</th>
<th>Assignments</th>
<th>Due:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction, safety</td>
<td>Introduction, pre-quiz, survey</td>
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<td>--</td>
</tr>
<tr>
<td>2</td>
<td>Background: Photosynthesis</td>
<td>Practice Photosynthesis</td>
<td>Journal Entry 1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Teach Photosynthesis</td>
<td>Class Visit 1</td>
<td>Journal Entry 2</td>
<td>Journal Entry 1</td>
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<tr>
<td>4</td>
<td>Teach Photosynthesis</td>
<td>Class Visit 2</td>
<td>Journal Entry 3</td>
<td>Journal Entry 2</td>
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<tr>
<td>5</td>
<td>Background: Digestion</td>
<td>Practice Digestion</td>
<td>Journal Entry 4</td>
<td>Journal Entry 3</td>
</tr>
<tr>
<td>6</td>
<td>Teach Digestion</td>
<td>Class Visit 3</td>
<td>Journal Entry 5</td>
<td>Journal Entry 4</td>
</tr>
<tr>
<td>7</td>
<td>Teach Digestion</td>
<td>Class Visit 4</td>
<td>Journal Entry 6</td>
<td>Journal Entry 5</td>
</tr>
<tr>
<td>8</td>
<td>Background: Ecosystems and Biodiversity</td>
<td>Practice Ecosys. &amp; Biodiversity</td>
<td>Journal Entry 7</td>
<td>Journal Entry 6</td>
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<td>9</td>
<td>Teach Ecosystems and Biodiversity</td>
<td>Class Visit 5</td>
<td>Journal Entry 8</td>
<td>Journal Entry 7</td>
</tr>
<tr>
<td>10</td>
<td>Teach Ecosystems and Biodiversity</td>
<td>Class Visit 6</td>
<td>Journal Entry 9</td>
<td>Journal Entry 8</td>
</tr>
<tr>
<td>Final</td>
<td></td>
<td>Final Exam</td>
<td>--</td>
<td>Journal Entry 9</td>
</tr>
</tbody>
</table>

### LEARNING OUTCOMES

**Global Outcomes**
- Gain hands-on experience with biology labs and activities with increased emphasis on inquiry-based learning;
- Improve science practice skills such as observation, questioning, predicting, and communicating;
- Demonstrate understanding of the types of activities that biologists perform, including basic and applied research;
- Develop metacognitive skills and write reflections on knowledge gained during student teaching experience;
- Demonstrate understanding of the K-12 Next Generation Science Standards (NGSS), specifically those related to Life Science.

**Specific Outcomes**
- Explain the key principles and processes involved in photosynthesis and describe various laboratory experiments/activities that can be used to demonstrate these principles and processes to K – 8 students.
- Explain the key properties of digestion and describe various laboratory experiments/activities that can be used to demonstrate these properties to K – 8 students.
- Explain the key characteristics of ecosystems, explain how ecosystem characteristics determine biodiversity, and describe various laboratory activities that can be used to demonstrate these properties to K – 8 students.