

**Program Review
Biology SAC
Draft 04/11/2003**

I. Introduction:

A. Overview of the Biology SAC

The Biology SAC is comprised of 14 full-time and many (~70) part-time faculty who teach general biology, majors' biology, microbiology, human anatomy & physiology, forest biology, marine biology, freshwater biology, coastal field biology, botany, pathophysiology, human genetics, and Malheur field biology at PCC. Biology faculty from Tillamook Bay CC and Columbia Gorge CC also fall under the auspices of the PCC Biology SAC.

During Fall term 2002, the Biology SAC taught 45 sections of biology (BI 101-102-103), six sections of majors' biology (BI 211-212-213), 45 sections of human anatomy & physiology (BI 55, BI 121-122 or BI 231-232-233), ten sections of microbiology (BI 234), one section of Pathophysiology (BI 241), and one section of Forest Biology (BI 141). Fall term 2002 enrollment in these classes was approximately 2,840 students. In addition, the Biology SAC oversees PAVTEC courses at three area high schools.

B. Synopsis of Program Review

The first part of this report will highlight the strengths and weaknesses of Biology at PCC, emphasizing how the SAC complements and enhances the College's core outcomes which are found at: <http://www.pcc.edu/edserv/academic/core.htm>. The second part of this report will describe how the Biology SAC focused on a particular weakness and how to improve in that area.

II. Program Strengths

PCC Biology is strong in several key areas: meeting the high demand for biology classes, successfully providing prerequisites for health professional training programs, and providing biology classes to satisfy AAOT and other college transfer requirements. Faculty are well-trained and have strong, diverse backgrounds. In addition, innovative faculty obtain grants and facilitate student involvement in the community.

A. High Demand for Biology Classes

The demand for biology classes has exceeded capacity for several years. High enrollment is characteristic of biology classes at PCC with student demand increasing each year as shown in Figure 1.

Figure 1: Enrollment in PCC Biology 2002 Academic Year

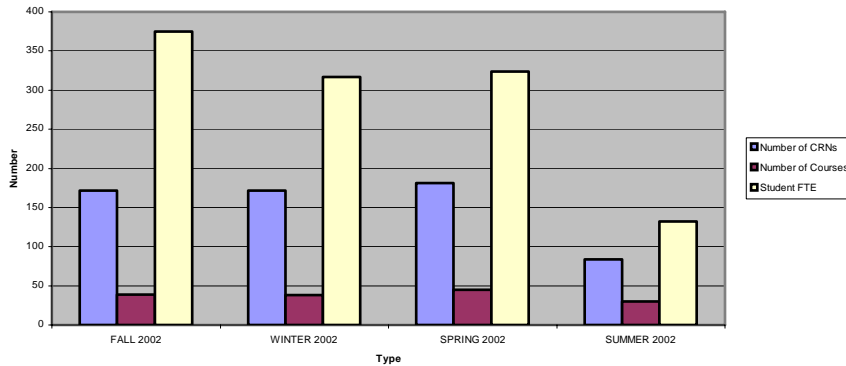
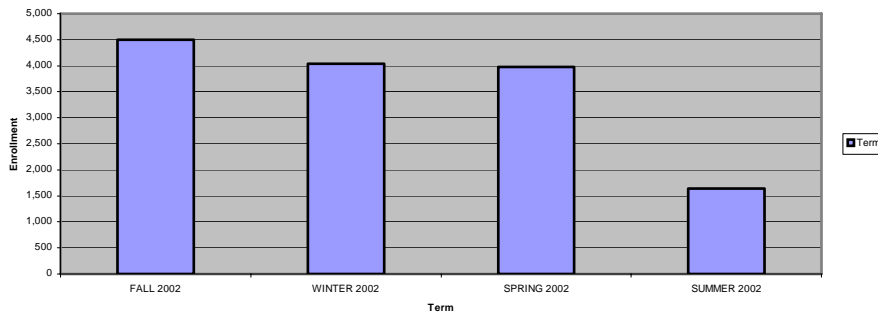


Figure 2: Total Student Enrollment in PCC Biology for 2002 Academic Year



B. Provision of Prerequisites for Health Professional and Other Programs

Currently, biology classes are required for students seeking admission into PCC programs for Nursing, Dental Hygiene, Emergency Medical Services, Medical Assistant, Ophthalmic Medical Technology, Health Information Systems, Medical Laboratory Technology, Veterinary Technology, Biotechnology, Medical Imaging, Fitness Technology, Dental Assistant, Environmental Science & Resources, and many other transfer programs. Administrators of these programs report our biology classes have contributed to the professional competence of students in their field of study. Moreover, successful completion of core biology classes offered through PCC Biology allows other programs to focus student training on specific content related to the degree area.

The Biology SAC has created a version of BI 101, called BI 101b, which is tailored to the specific needs of students going into allied health fields. Additionally, some campuses hold open labs for Anatomy & Physiology to provide students with increased access to limited laboratory resources.

Also, many biology students transfer to other institutions or programs for degrees in biology, medicine, dentistry, physician assistant, physical therapy, occupational therapy, veterinary medicine, pharmacy, chiropractic medicine, etc.

In addition to supporting the needs of professional training programs, PCC Biology also provides high quality classes that are used to fulfill science requirements for general education, transfer students, and students seeking the AAOT degree.

C. Grants

PCC Biology faculty have sought and obtained numerous grants, primarily to support curriculum improvement in science education. Specific grants obtained and their amounts are summarized below:

- \$50,000 IMS/PEW Grant: Interactive Electronic Course Enhancements for Students in Anatomy and Physiology, 2003
- ~\$14,000 Oregon Collaboration for Excellence in the Preparation of Teachers (OCEPT), 1998 to present.
- \$100,000 National Science Foundation (NSF) CCLI Grants for Curriculum Development of General Biology, 1997-2001.
- ~\$19,000 Peer Led Team Learning, 2000 to present.
- \$7,000 Instructional Improvement Program (IIP) grants, 1998 to present.
- \$85,000 Habitat Restoration (1998 – 1999) – PCC Rock Creek Environmental Studies Center –
 - Tualatin Valley Water Quality Endowment Fund
 - US Fish and Wildlife Service
 - Washington County – Clean Water Services
 - Crater Lake Foundation
 - ARCO Foundation
- \$3,000 PCC District Wide Staff Development Grants, 1998 to present.
- \$1,500 Staff Development Grant from Sylvania Campus Executive Dean, 1998 & 2001.
- \$2,500 Instructional Media Services (IMS), 1999.

Grants Pending

- \$100,000 US Department of Education
- \$500,000 Meyer Memorial Foundation
- \$200,000 National Science Foundation
- \$5,000 Community Watershed Grant City of Portland

Total Value of Grants:

Outside of PCC \$268,000 + additional \$805,000 pending

Within PCC

\$ 14,000

D. Community Involvement

The Biology SAC works with community partners to improve programs that foster cooperation between PCC and the citizens that it serves. Examples of this community involvement include participating in: SOLV work parties for habitat restoration, overseeing PAVTEC programs that provide college credit to high schools, Saturday Academy courses for middle school students, and the Children's Water Festival involving 1200-1500 elementary students and teachers in environmental education. Faculty have served as judges at local science fairs. The PCC Rock Creek Environmental Studies Center is used to educate students throughout the metropolitan area.

Faculty have been involved in a grant-funded project aimed at educating minority community groups on health issues. This project takes education directly into the community through informal education at community gatherings and businesses.

Another project encourages Hispanic high school students to pursue science careers through early training in writing, science methods, art, and political science, all with an environmental science focus. These address the college's core outcome on cultural awareness.

In many courses, biology students participate in service learning projects in clinics, health care sites, environmental organizations, and other agencies. Service learning projects by nature strongly support the college's core outcomes of self-reflection, communication, environmental awareness, and professional development.

E. Faculty Qualifications

Biology faculty (both part-time and full-time) bring with them a wealth of diversity in their backgrounds and experience. Faculty members have excellent educational backgrounds. Collectively, our faculty have Ph.D.'s with specializations in Ecology, Microbiology, Vertebrate Physiology, Education, and Immunology; Master's Degrees with specializations in Entomology, Molecular Evolution, Zoology, Botany, Public Policy, and Science Teaching; and Doctorates in Medicine.

The collective work experience of our faculty includes: private, academic and government research, environmental science and government policy, land management, clinical medicine, international studies, consulting, writing and editing textbooks, curriculum development, and software development.

III. Program Weaknesses

The primary weaknesses of the program that need to be addressed include the following: lack of space and other resources, high ratio of part-time to full-time instructors, inadequate student preparation upon entry into classes, lack of equivalency in work load for lecture and lab, lack of follow up on student success, lack of professional development funds, and high attrition/low retention in some classes.

A. Lack of Space and Other Resources

On all campuses, space is at a premium for classes offered by the biology departments. Classes are at capacity, storage space is inadequate, and office space allocation is frequently well below the standards set forth by the college for both part time and full time faculty. This situation is further compounded by the high enrollments of the department and increasing demands for biology courses by other programs such as allied health. Programs for which biology courses are prerequisites depend on the biology departments to offer sufficient numbers of sections to allow their students to complete these prerequisites in a timely manner so as to enter or continue in their program of study. An inability to provide these courses results in frustrated students who may decide to attend other institutions to fulfill the requirements of their programs of study or who may drop out altogether.

As discussed under program strengths, the biology departments have added sections; however, these sections have been added without adequate funding for additional equipment, supplies and technical support. Our equipment and resources are over-stretched, which compromises the students' learning experience.

Laboratory preparation space is insufficient and poses safety risks for laboratory technicians, other staff, and faculty.

Inadequate ventilation systems, storage facilities, and workspaces limit the safe use of dissection materials and may pose an increased health risk to students and faculty involved in these laboratory activities.

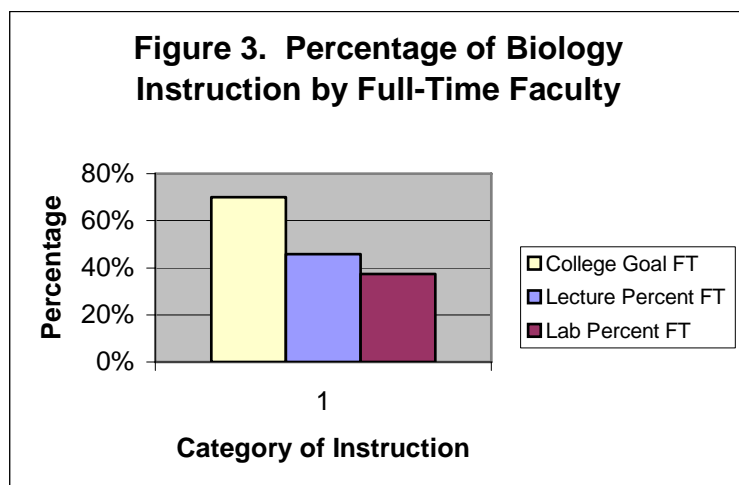
Faculty preparatory and office spaces are also inadequate. Currently, part-time faculty do not have adequate access to a computer, phone, or desk. Likewise, full-time faculty facilities are outdated and cramped [Note: Office furniture at Sylvania and Cascade are being updated as a result of the bond measure during Summer 2003]. The college standard is 75 square feet of office space for each full time instructor and 64 square feet for each part time instructor. Biology departments do not meet this standard, with offices for most full-time instructors at 64 square feet. Increasing numbers of part time faculty exacerbate this problem.

Development of new curricula or instructional methods is also hampered. Biology education is increasingly using multimedia and web-based instruction to complement classroom instruction. Without adequate access to computers and other technology in

the classroom and preparatory areas, instructors are not able to incorporate some pedagogical changes occurring in science education. Thus, students may not become familiar with the technology that they will see at transfer institutions or in the workplace.

B. High Ratio of Part-time to Full-time Instructors

The college has established a goal of 70:30 as the ratio of sections taught by full-time versus part-time faculty. Figure 2 below (based upon the data found in the Appendix, Table 1 & 2) illustrates that the ratio for biology classes falls markedly short of the college's goal.



Relying heavily on part-time instruction creates problems in several areas. First, quality control becomes an issue. Full time instructors do not have the time to supervise every part-time instructor and ensure that the quality of instruction, content, and class dynamics meet desired standards. Second, coordination between sections becomes more complicated as more part-time instructors are hired. Third, increasing the number of part-time instructors places additional pressure on the office and prep spaces available (outlined in Part III, Section A), as well as taxing administrative resources. Finally, having a large cadre of part time instructors results in a high turnover among staff. This high turnover results in a higher demand on full time faculty to mentor new instructors and increased demand on human resources, payroll and departmental administrative staff.

In spite of adding a new full-time faculty position at Sylvania in Fall 2002, the full-time to part-time ratio is still woefully short of the College's stated goal.

C. Inadequate Student Preparation Upon Entry into Classes

Biology faculty report that many students are deficient in the area of mathematics and general science preparation as well as basic college skills. Anecdotal evidence from instructors indicates that students enter biology classes with a general lack of study skills, communication skills, and the ability to be an active learner in the college setting.

Poor student preparation creates a neo-vicious cycle where students drop out of classes (leading to poor retention) and then re-enroll in the class at a later date, often several times before becoming successful. This slows the progress of the student's education

and results in increased stress and financial burdens. Repetition of courses reduces the overall productivity of the biology departments. This problem also aggravates the existing space problem and the end result is a bottleneck.

D. Lack of Equivalency in Workload for Lecture and Lab

The lack of equivalency in workload for lecture and lab creates a greater workload for biology instructors. Lack of equivalency is mainly due to two problems: class size and workload determination. Lecture sizes are large, up to 80 students in some biology class lectures. These large class sizes make quality instruction in sciences difficult, considering our desire to improve students' ability to communicate and to think critically--two College core outcomes. The Biology SAC strongly recommends maximum lecture sizes of 48 students and lab sections of 20-24 students.

Biology lab and lecture should be equivalent in workload determination. Currently biology labs are considered "labs", defined in the contract as requiring minimal outside instructor time for prep and evaluation and no in class lecture or guidance. In reality, biology labs require a significant input of time outside of class for prep and evaluation, as well as lectures, demonstrations, and guided student activities in order to meet stated course outcomes. This format is defined as a "lec/lab" in the contract, which is a more appropriate way to determine an instructor's workload than the "lab" contractual definition.

E. Lack of Follow Up on Student Success

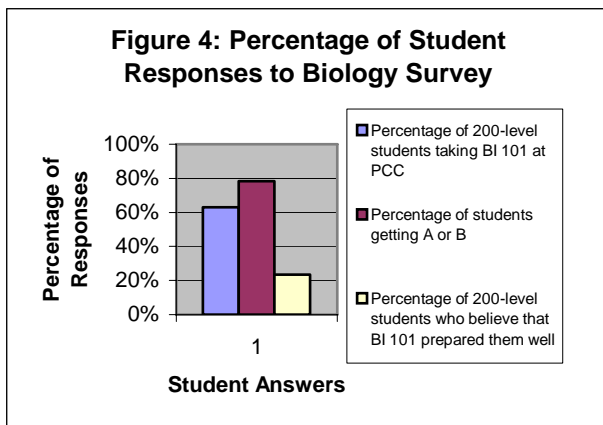
We currently do not have a mechanism to measure the success of our students who have departed PCC. Such an instrument would be important to evaluate the effectiveness of our courses in transfer programs.

F. Lack of Professional Development Funds

The previously inadequate level of funding for professional development is now woefully inadequate due to budget cuts. This hampers faculty from staying current in their field. Money available for attending conferences is often below the registration cost of most professional meetings. Coupled with the cost of travel, lack of adequate funds for professional development prevents faculty for growing in their field.

G. High Attrition/Low Retention in Some Classes

Low retention of students and high attrition--as reflected in our data (see Table 1) on anatomy and physiology and microbiology--has concerned the Biology SAC. Data showing student retention are shown in Part IV. Overall, class retention is approximately 75%. To help us understand this problem, we created and administered an exit survey for these courses (Appendix, Table 5). Essentially, the data suggests that students are taking the required prerequisite courses (BI 101 or equivalent), yet do not feel that the course is preparing them for the upper level courses (BI 231, 232, 233, or 234).



IV. Recommendations to Improve Student Learning

- Add equipment/supplies to support simultaneous laboratory sections.
- Maintain student face-to-face contact with faculty rather than diminish it. This can be achieved by limiting class size
- Increase the number of full-time faculty compared to part-time faculty.
- The faculty recognizes that certain disciplines lend themselves to distance learning. It is our strong belief that distance learning can not effectively be used in laboratories.
- Provide funding and support to schedule more open labs.
- Provide funding and support to schedule more field-based courses and labs.
- Provide more internships and service-learning opportunities for students.
- Ensure current information technology for individual faculty for course development.
- Increase college-supported tutoring for students in all biology classes on all campuses.
- Support faculty who maintain high academic standards.
- Increase consistency in grading and student expectations across instructors, sections of a class, and campuses.
- Further develop mentoring of part-time and new full-time instructors.
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V. Data Collection and Analyses

In response to the perceived weaknesses of the program, the Biology SAC conducted surveys concerning full-time/part-time ratios, student retention, and student preparedness during the Spring and Fall 2002 terms.

Appendix

A. Comparison of Anatomy and Physiology 231 Retention Rates across campuses.

Table 1—Comparison of Anatomy and Physiology (Biology 231) Across PCC Campuses (Fall, 2001)

Campus	Number of	% of students	% of students	% of students
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	Students	who were unsuccessful	with no prereq uisite or a waived prerequisite	w/no prereq who were unsuccessful
Rock Creek	93	16.13	40.86	53.33
Sylvania	214	33.18	47.2	49.30
Cascade + SE Center	191	17.28	46.07	45.45
Total	498	23.9	45.58	48.74

B. Comparison of FT and PT across campuses.

Table 2—Comparison of FT:PT Ratios in Biology Classes Across PCC Campuses (Spring, 2002)

Campus	Biology Lecture Sections (FT:PT)	Lecture (%FT:%PT)	Biology Lab Sections (FT:PT)	Lab (%FT:%PT)
Rock Creek	10:18	36:64	13:21	38:62
Sylvania	17:15	53:47	18:35	34:66
Cascade	12:6	67:33	12:6	67:33
SE-Center	0:4	0:100	0:6	0:100
Columbia Gorge CC				
Tillamook Bay CC	0:3*	0:100	0:4*	0:100
<i>Average</i>	<i>8:9</i>	<i>31:69</i>	<i>9:14</i>	<i>28:72</i>
<i>Sum</i>	<i>39:46</i>	<i>46:54</i>	<i>43:72</i>	<i>37:63</i>

* At TBCC, Sandy Neps is classified as “regular” faculty but her contract is for 0.5-08 FTE

Table 3—Comparison of FT:PT Ratios in Biology Classes Across PCC Campuses (Fall, 2002)

Campus	Biology Lecture Sections (FT:PT)	Lecture (%FT:%PT)	Biology Lab Sections (FT:PT)	Lab (%FT:%PT)
Rock Creek				
Sylvania	17:15	53:47		
Cascade	12:6	67:33	7:7	50:50
SE-Center	0:4	0:100	0:8	0:100
Columbia Gorge CC	2:6	33:66	4:5	
Tillamook Bay CC	0:1*	0:100	0:1*	0:100
<i>Average</i>	<i>10:7</i>	<i>40:60</i>	<i>0:1</i>	<i>0:100</i>
<i>Sum</i>	<i>29:22</i>		<i>0:1</i>	<i>0:100</i>

* At TBCC, Sandy Neps is classified as “regular” faculty but her contract is for 0.5-08 FTE

Table 4—Comparison of Lab Sections: Classified Staff Ratios in Biology Classes Across PCC Campuses (Through Spring, 2002)

Campus	Summer, 2001	Fall, 2001	Winter, 2002	Spring, 2002
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	(Labs:FTE Staff)	(Labs:FTE Staff)	(Labs:FTE Staff)	(Labs:FTE Staff)
Rock Creek	20:1.5 (1 non-biology)	30:1.5 + 16 hrs/wk (4 non-biology)	33:1.5 + 16 hrs/wk (2 non-biology)	36:1.5 + 16 hrs/wk (3 non-biology)
Sylvania	18:2.0 + 16 hrs/wk	47:2.0 + 16 hrs/wk	55:2.0 + 16 hrs/wk	55:2.0 + 16 hrs/wk
Cascade	5:1.75	8:1.75	8:1.75	8:1.75
SE-Center	6:0.25	6:0.25	6:0.25	6:0.25
Columbia Gorge CC	:0	:0	:0	:0
Tillamook Bay CC	1:0	2:0	2:0	3:0
<i>Average</i>	<i>12:1.375</i>	<i>22.75:1.375</i>	<i>25:1.375</i>	<i>21.4:0.8</i>

C. Student Perception of Preparedness Based Upon Student Surveys.

Table 5: Anonymous Survey of Students' Perception of Preparedness (Combined data from Spring, 2002 and Fall, 2003)

1. Where did you take BI 101 or the equivalent?		
a. PCC—Sylvania	121	% taking at PCC= 63%
b. PCC—Cascade	47	
c. PCC--Rock Creek	23	
d. PCC—not specific	4	
e. Another Place	73	
f. Did Not Take	41	
2. What grade did you earn in BI 101?		
a. A	129	% getting A or B= 78%
b. B	106	
c. C or P	27	
d. D	0	
e. F or NP	0	
f. No Response	38	
3. How well did BI 101 prepare you for Biology 231, 232, 233, or 234?		
a. Not at all	48	% indicating BI 101 helped prepare them fairly well or better= 23%
b. Somewhat	157	
c. Fairly Well	44	
d. Very Well	25	
e. No Response	18	
4. Which Single Topic Best Prepared you for Biology 231, 232, 233, or 234?		
a. Scientific Method	25	Topic most cited= Cells (46%)
b. Ecology	12	
c. Cell Structure/Function	182	
e. General Chemistry	58	
f. Biological Molecules	93	
g. No Response	26	
5. Which single skill best prepared you for Biology 231, 232, 233, or 234?		
a. Study Skills	163	Skill most cited= Study Skills (51%)
b. Microscope	45	
c. Team/Group Work	46	
d. Measurement/Graphin g	1	

e. Laboratory Skills	45	
f. No Response	18	