

AOC Subcommittee Report on the Biology Department

Introduction to the Biology Department

This summary of the Biology Department at Keene State College is written as part of the Academic Review Process administered by the College Senate through its Academic Overview Committee (AOC). The summary draws from the Biology Department's Self Study, submitted to AOC in September 2009. For a more detailed account of the Biology Department's structure and its function within the College, consult "Self Study for the Biology Department," written by Susan Whittemore and Loren Launen.

Biology Department's Relation to the Mission of the College

Keene State College identifies itself as "the public liberal arts college of New Hampshire" in its Mission and Values Statement. Toward this end, the College "offer[s] an enriching campus community and achieve[s] academic excellence through the integration of teaching, learning, scholarship and service." The Statement goes on to list the institution's values, including: "strong relationships among students, faculty and staff;" "civic engagement and service to the community;" and "environmental stewardship and sustainability (Whittemore and Launen 8)."

The Keene State College Biology Department supports the College's liberal arts mission "through the cultivation of an appreciation of natural sciences and its relevance in society for all Keene State College students including non-Biology majors." The Department's stated goals include "teach[ing] students the scientific method," while developing an "understanding of all forms of life" and recognition of biology not as a compilation of unchanging facts but as a way of thinking, always subject to revision based on new insights and observations (8)."

The Department supports the College's mission and values by preparing students to think critically and creatively, engage in active citizenship and pursue meaningful work. It works toward these ends by offering courses that "integrat[e] a challenging variety of problem-solving activities," as well as "helping [students] to understand how and why science is relevant to our society" and "offering a broad curriculum...teaching valuable scientific skills and actively mentoring our students (9)."

Program Goals and Structure

The Biology Department has designed a program of study that teaches students the scientific method and promotes an understanding of the evolutionary histories and relationships between life forms, at various levels of integration, from the molecular to the biospheric. This program prepares students for "graduate programs in biology and for a broad range of biology-related careers including those in the fields of biotechnology, environment, medicine and teaching (8)."

The Self Study, citing the college catalog, lists the departmental goals as the following:

- 1) *Biology majors will be able to demonstrate understanding in the following fundamental areas of the biological sciences: Biological Diversity... Evolution...Suborganismal Biology...Organismal Biology...Supra-Organismal Biology.*
- 2) *Biology majors will be able to develop testable hypotheses, design experiments to test hypotheses and conduct experiments including data collection, analysis, interpretations and presentation. They will also be able to effectively search computer databases for relevant literature (primary and secondary) on scientific topics.*
- 3) *Biology majors will demonstrate critical thinking and communication skills, both oral and written for the purposes of conveying biological information to professional scientists and the lay public.*
- 4) *Biology majors will develop intellectual independence, scientific literacy and an appreciation for the connections between biological science activities. (6-7)*

The Department offers three programs: the B.S. in Biology, the B.A. in Biology and the Biology minor. The structure of

these degree programs have undergone significant changes since the previous Self Study was written at the time of the Department's last Academic Review in 2002. Some of these changes have been necessitated by the College's adoption of the 4-credit model in 2007 and the creation of the Integrative Studies Program (ISP) in 2006 as a means of delivering the General Education program. Other changes include additional "sophomore-level" courses as part of the core courses and a senior capstone course --both changes were implemented in 2002.

One feature of the Department's B.S. program is it does not employ specialized tracks. This broad approach to the field of study reflects the Biology faculty's intention for majors to "stimulate intellectual and personal growth through an examination of the fundamental properties of living systems, the application of experimental and descriptive methods of discovery...[presented through] biological knowledge (10)." In this way the Department seeks to expose its students to the field's breadth and depth while fostering a direct working relationship between student and advisor.

The B.A. in Biology "provides an introduction to the discipline and an opportunity to integrate the study of biology with another field (11)." This degree program requires fewer credits in Biology as well as related science programs, thereby "satisfying the needs of students with a combination of interests" by allowing them to "to complete a second major or additional courses in other [departments] such as Chemistry, Psychology, Elementary Education, Journalism, Art, Management or Computer Science (9)."

The minor in Biology "permit[s] students majoring in another field to pursue a program of study in the life sciences" and "includes as set of core courses that introduce the most important concepts in biology as well as upper-level electives dictated by the personal interests of the student (9)."

Faculty Qualifications

Section 12 of the Biology Department Self Study includes a series of tables listing the qualifications and activities of its seven full-time tenure-track (FTTT) faculty members. All members hold a Ph.D. in various areas of biological study. Self Study Appendix A includes a collection of all department members' CVs, including contingent faculty members (non-FTTT faculty).

Qualifications of FTTT faculty in the Department are further supported in the Self Study with evidence of the Department members' success within the KSC promotion and tenure process during the last decade. This record of achievement has made Biology "a campus-wide model of efficiency and effectiveness with regard to the tenure and promotion process (29)."

The Biology Department delivers a program to its majors, students enrolled in other programs that require studies in the life sciences (Heath Science, Chemistry, Environmental Studies and General Sciences and Education), and the College's ISP program. In order to do so, the Biology Department "typically relies upon the work" of six contingent faculty members (five adjuncts and one contract lecturer) and on one professional administrative and technical staff member (PAT). Their qualifications are given in the CVs included in Appendix A.

Learning Outcomes and Assessment

In section 3 of the Self Study the Department states its four "programmable goals" are listed in the Catalog (refer to Program Goals and Structure). For the purposes of this Academic Review, the Department understands these goals to be its "Learning Outcomes (22)."

The Department employs three distinct methods to assess student-learning outcomes. For Outcome I, Biology has developed an assessment exam that is administered as part of the BIO 495 Senior Seminar. Outcomes II and III are assessed through a review of lab reports generated in upper-level courses, using a common rubric. Outcome IV is assessed through the BIO 495 senior seminar (23).

Allocation of Resources

Section 15 of the Self Study addresses the Department's needs, including those related to equipment and technological support, in addition to addressing specific questions regarding these resource issues and budgetary concerns.

The allocation of space in the Science Center is presented as a concern of the Department in the Self Study. A request for additional space is made for contingent faculty members. Additionally, the Department requests space for an IACUC-approved facility for housing vertebrates (adult frogs).

While the Department is grateful to the College for its support, providing almost \$250,000 in Strategic Initiative funds toward the purchase of equipment for developing a hands-on science education program, it finds itself in need of funds to support technical support staff that this sort of teaching approach requires (42).

The Department reports, “typically the Biology budget allocates approximately \$30,000 per year to support direct laboratory costs.... In addition, approximately \$12,000 per year is allocated for equipment purchased and \$2000 per year for equipment maintenance (43).” The Self Study goes on to suggest that these funds and the additional monies the Department requests reflect “the cost of running a high quality program.” As reported by the Biology Department, they remain committed to pursuing and expanding their budget so that they can better educate students and fully utilize the state-of-the-art facility and equipment (42).

Comparison of the Self Study and External Review

There was substantial agreement between the External Review, submitted Dr. Pietraface & Dr. Jahoda, and the Biology Self Study, written by Dr. Whittemore and Dr. Launen.

Both the External Review and the Biology Self Study recognize that the Biology department supports the Mission and Values Statement of Keene State College. As the documents noted, “they ‘prepare promising students to think critically and creatively’ and as the reviewers recognized, ‘by integrating a challenging variety of problem-solving activities into all of their courses and offering a opportunities to engage in scientific research both in and out of the classroom setting (Pietraface & Jahoda 1).’ ”

Additionally, they reported that the Biology Department prepares both biology and non-biology students for active citizenship by understanding and exploring the relevance of science to society --and offer biology students preparation for meaningful work through their “broad curriculum, teaching valuable scientific skills, and actively mentor[ing] students (1).” Further, both documents recognize that the Biology Department is an active contributor to the ISP program.

Both documents indicate that the Biology faculty is academically qualified. Both documents also state there is a heavy reliance on adjunct and contract lecturers. In particular, the Biology Self Study reports that between 49%-59% of its classes are taught by non FTTT faculty during the academic year (Whittemore and Launen 34). The External Review Report explains that one of the reasons for the heavy reliance on non FTTT faculty is the result of “course reassignments and personal circumstances” which include FTTT faculty serving as Chair, Assistant Dean, and grant writers. Additionally, the Biology Department lost one staff member due to death and another half-time member was reassigned to another program. The Biology Self Study report also recognizes that their participation in the ISP program has also resulted in the reliance on adjuncts and contract lecturers because of the “insufficient number of Biology FTTT (33).”

The Department proudly claims its place among the first departments on campus to develop and implement an assessment exam (in 2003). However, both documents recognize that the Biology Department’s assessment process is challenging. While the External Review offers a one-line summary stating that the department is “struggling” with the assessment process, the Biology Self Study explains these challenges in detail. Areas of struggle include: 1) the assessment exam—described as “lengthy” and “a chore to develop, administer and grade”; 2) difficulty in developing a rubric for assessing traditional lab reports as well other written work produced in Biology courses; 3) the Department is “unsure of how to use” participation in the Senior Seminar as an “effective assessment tool (24).” The Self Study openly seeks to gain “insight and suggestions about assessment methods and strategies from the outside reviewers (24).”

While both documents agree that the Biology Department is housed in a state-of- the-art facility with modern, high-tech equipment, laboratory classrooms, and research spaces, they also point out the seriousness of the climate control and air circulation problems.

Both documents argue that faculty workloads are excessive and act to the detriment of research with undergraduates (Pietraface & Jahoda 5). The Biology Self Study claims that faculty workloads have increased for a number of factors, including the 4-credit revision, implementation of the ISP program, and assessment. This situation was compounded by the passing of a Biology Professor and shifts in faculty responsibilities. Additionally, the Self Study explains that the considerable time spent with students, working on Independent Studies, which fosters research with their students, is uncompensated by the College.

Both documents recognize that there is the need for lab technicians during the summer months. Currently, there are two lab technicians, working less than 40 hours per week during the academic year. Their responsibilities include purchasing, budget management, preparation and cleaning of labs, student supervision, inventory and management of chemicals and supplies, and greenhouse management. The Reviewers recognize that there is a problem with the lack of “technical support during the summer...” which places ... “a severe constraint on faculty research during the summer and presents an additional obstacle to the development of a summer undergraduate research program supported by outside funding (6).”

Substantial Disagreement between the Self Study and the External Review

1) The External Reviewers recognized that the integrated lab/lecture model used in the new 4- credit model has unfavorable “pedagogical consequences.” The reviewers recognized that the integrated 4-credit model offers 330 hours of class time per week, while the typical Biology curriculum of most schools follow a 3 hour lecture, 3 hour lab, which meets for 360 hours per week. The Reviewers stated that the 3+3 (3 hours lecture, 3 hours lab) is the standard structure among most Biology science curricula, and therefore the current 4- credit model does not support students at “industry standard. (4)”

2) The External Reviewers identified that the Biology Department cannot offer a “broader range of electives” in its curriculum because of several staffing limitations. These matters of staffing are related to course reassignments (Chair, Assistant Dean, grant writers), heavy reliance on adjuncts, and the loss of 1.5 FTTT faculty members in the academic year of 2008-2009.

3) The External Reviewers identified enrollment capacity as an issue for students, both within the major and those who draw upon courses in Biology.

Assessment of the 2009-2010 Biology Department Review

After reading the Review Report and Self Study, the AOC Biology subcommittee understands the Biology Department as having the following strengths and facing the following challenges.

Program Strengths

- 1 The Biology Department’s program goals are consistent with, and supportive of, the Keene State College’s Mission and Values Statement.
- 2 The Biology faculty members are committed, qualified and accomplished scholars who are dedicated to student learning.
- 3 Undergraduate research is pursued and executed as a high priority.
- 4 The Biology faculty members are committed to campus wide curricular needs as evidenced by their participation in the ISP program and by the courses they provide to students majoring in other disciplines.
- 5 The faculty members are invested in developing a strong assessment process and are receptive to feedback and support from outside the department in their efforts to improve their assessment process.
- 6 The Biology faculty members are willing to make changes to their program in order to remain current, supportive of student needs and responsive to changing employment and graduate school priorities.
- 7 The Biology Department is housed in a state of the art facility with modern, hi-tech equipment.

Limitations and Challenges

Human Resources

- 1 Workload is a major issue. The demands of undergraduate research, laboratory supervision and scholarship exceed what faculty can provide in any sort of sustained, reasonable way.
- 2 Undergraduate research opportunities cannot be made available to all interested students. While this is a particularly high priority, it significantly and consistently drains faculty resources. This situation creates hardships for faculty and limits student engagement.
- 3 While the adjunct faculty is qualified instructors and dedicated teachers, given their limited availability for out-of-classroom contact with students, too much of the program is delivered by adjunct faculty.
- 4 The limited availability of technical support assistants, particularly during the summer months, places a constraint on faculty research, grant work and student research. The lack of staffing also compromises the ability to protect fully laboratory equipment and the facility on a year-round basis.
- 5 There is considerable discontent with certain administrative assistants. As a result, the bulk of departmental administrative work falls to the administrative assistant for the Dean of Sciences.

Curriculum

- 1 Limited seating availability poses a challenge to majors and non-majors seeking to enroll in their seriesed or required courses in a timely fashion. This situation interferes with their progress to degree. There is a particular shortage of upper-level courses.
- 2 The current lab/lecture model provides students with only 330 classroom minutes per week, which is 30 minutes less than both the industry standard and the amount provided at peer institutions.
- 3 The department is currently struggling with its assessment process.

Recommendations

Given the preceding list of strengths and limitations/challenges, the AOC Biology Subcommittee makes the following recommendations in the areas of human resources and curriculum.

Human Resources

In addition to the current search, as per the recommendation of the External Review, the AOC Biology Subcommittee endorses the hiring of an additional FTTT faculty member, for the following reasons:

- 1 The Biology department is understaffed given:
 - o the importance of undergraduate research within the Biology discipline
 - o the numbers of students majoring in Biology or who are required to take Biology courses for their non-Biology major
 - o the current reliance on adjuncts to deliver significant portions of the Biology program
 - o the need for biology majors to have more opportunities to spend time with their Biology faculty members
- 1 The current recognition system for faculty should be increased so as to provide adequate incentives for faculty to (a) support fully undergraduate research and (b) seek grants from external sources.
- 2 Both lab technician positions should be upgraded. The 75% position should be increased to 100% to provide coverage throughout the entire calendar year and the 50% position should be increased to at least 75% to ensure safety of students, the facility and the equipment.

Curriculum

- 1 Given the industry standard for laboratory and classroom experiences for a competitive preparation in Biology, we recommend that the Biology faculty be supported in redesigning the integrated lecture/lab model to bring the total hours per week to 360.
- 1 More support should be provided for the Department's commitment to undergraduate research. An initial step toward this goal is for the faculty to receive increased compensation for their involvement in undergraduate

research. A second strategy would be for the department to develop and offer a research course. The External Review offered numerous suggestions for Biology faculty to better support student research initiatives. We recommend that these be carefully reviewed and selectively implemented.

- 1 The hurdles encountered with assessment should be addressed within the next academic year. The information that can be gained from this process will be instrumental in the department's efforts to respond effectively to the stated outcomes of this program review process.
- 1 The department web page should be redesigned. This is one avenue that would promote visibility and recognition of faculty and students involved in undergraduate research.
- 1 The climate control and air circulation problems in the science center should be addressed before the start of the 2010-11 academic year.

Biology Department Response to AOC Subcommittee Report on the Biology Department

The Biology Department appreciated the strong endorsement of our program and faculty provided by our external reviewers, and supported by the report from the AOC subcommittee. As stated in the report from the AOC the self study process has demonstrated that the Biology Program is supporting the mission of the College by offering a high quality BA, BA and Biology minor, and through our support of the ISP program and other programs on campus (such as Chemistry). The self study and review process identified important challenges for our Program, specifically lack of adequate numbers of full time tenure track faculty in our department (and thus excessive workloads), insufficient support for our undergraduate research program (in the manner of technical support staff, budget for equipment and projects, compensation for faculty involved and other areas) and challenges with devising an effective assessment process. These findings were reported on in our self study, as well as by our external reviewers and we are already actively engaged in solving these challenges. For example, our assessment process which included a cumbersome in-house written exam was revised in Fall of 09 to include a standardized test tool which facilitates a broader and less biased testing of knowledge in the biological sciences and eliminates in-house biases to a greater degree. This test tool was easier to deliver, easier for students to complete in the context of the class it is offered in, and more reproducible so should better serve our program.

While the Biology Department appreciated the generally positive nature of the review provided by our external reviewers, we wish to specifically address and rebut some of the criticisms of our external reviewers, and the accompanying recommendation made by the AOC subcommittee. Most importantly, we disagree with the recommendation that we revise all of our four credit courses to fit into a 360 minute contact time per week model (currently many are at 330 minutes of contact time per week). Our external reviewers argue that our new model does not reflect "industry standard" and that reducing in-class contact hours will result in a competitive disadvantage for our students. We argue that there is no data to support this claim that our current model is ineffective. We base this argument on data from our graduating classes. Firstly, this year's graduating class conducted the standardized test described above and obtained a mean on the test identical to a nation-wide comparator data set. In fact, in 6 of 9 areas of biological science our students outperformed their peers (from 425 schools). Secondly, and more importantly, in the past four years (the time window in which we have implemented the revised scheduling model) we have seen a significant proportion of our graduating seniors succeed in highly competitive processes post graduation. For example, in the past four years we have graduated 65 students. In this four year group 12 have successfully gained entrance to graduate programs including a MD/PhD program (1), PhD programs in the natural sciences (5), masters programs in the natural sciences (2), entrance to pharmacy programs (3) and physician's assistants programs (1). One went on to complete her teaching certification process here at Keene State College. Almost all of these students (excepting one) are doing well in their programs (based on personal correspondence with Biology faculty). We also have several students who have gone on to obtain competitive jobs in areas related to biological sciences (at least 7). Furthermore three of our students (still enrolled in the program) have recently gained entrance to highly competitive summer internships. This data is empirical and underreports the success of our students as we have no systematic way of surveying our alum (as noted in our self study) and rely on personal notes from the students themselves. Nonetheless, we feel it is important to say that our program is obviously successful in producing competitive graduates. We respectfully submit that the fact that our scheduling model differs from most schools does not logically mean that it is inferior, and that our empirical and collected data disprove this assumption.