

**Review of the Biology Department
Keene State College
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Introduction

After completing a comprehensive self-study, the Biology Department at Keene State College invited us to critically examine the self-study and supporting materials, conduct a site visit, and provide an independent and unbiased written review of the department. The site visit included a comprehensive facilities tour, meetings with the Dean, full-time faculty members, students, professional staff, and members of the Academic Overview Committee. We were also able to visit classes to observe teaching in the integrated lab/lecture format. We had access to hard copies of the self-study and its appendices (including course syllabi and detailed information about course loads and scheduling), as well as other materials.

1. Analysis of the Self Study –

The significance of the program to the mission of the college:

The Biology Department's program goals support the Keene State College's Mission and Values Statement. They "prepare promising students to think critically and creatively" by integrating a challenging variety of problem-solving activities into all of their courses and offering opportunities to engage in scientific research both in and out of the classroom setting. They assess student performance in a variety of meaningful ways and have moved beyond standardized multiple choice testing and cookbook laboratory "experiments". They "prepare students to engage in active citizenship" by helping them understand how and why science is relevant to our society and their future and exposing them to a variety of ways in which they can contribute as future scientists. They "prepare students to pursue meaningful work" by offering a broad curriculum, teaching valuable scientific skills, and actively mentoring students. And lastly, the department supports the College's liberal arts mission through the cultivation of an appreciation of natural science and its relevance in society for all Keene State College students including non-Biology majors.

Program goals and structure:

The Biology Department offers three programs: the B.S. in Biology, the B.A. in Biology, and the Biology minor. These programs have undergone significant revisions over the past ten years, including the addition of sophomore level core courses in 2002 and the transition to the 4-credit model in 2007. With the transition to the 4-credit model came the introduction of several courses in which the laboratory is integrated into the lecture component.

The B.S. program in Biology is designed to stimulate intellectual and personal growth through the examination of the fundamental properties of living systems, the application of experimental and descriptive methods of discovery, and the consideration of the social, ethical, and aesthetic aspects of biological knowledge. The B.S. program also provides undergraduate preparation for technical employment or post baccalaureate study in graduate school, or professions such as medicine, dentistry, veterinary medicine, teaching, and natural resource management.

The B.A. in Biology provides an introduction to the discipline and an opportunity to integrate the study of Biology with another field. In contrast to the B.S. program, the B.A. requires fewer credits in both Biology and related sciences permitting a student to complete a second major or additional courses in another discipline. Thus it satisfies the needs of students with a combination of interests.

The Biology minor allows students majoring in another field to pursue a program of study in the life sciences. This minor includes a 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.

Faculty qualifications:

The Biology Department is currently comprised of seven FTTT faculty all of whom hold a Ph.D. degree. In addition, the department relies on the following adjunct and non-tenure track faculty: one Professional and Technical Staff (Ph.D.), one Contract Lecturer (Ph.D.), one adjunct (Ph.D./DVM), one adjunct (Ph.D.), one adjunct (M.S.), one adjunct (M.A.), and two adjuncts (no terminal degree listed). Of the 74 sections of Biology courses taught in the 2008 – 2009 academic year, 36 of 74 (49%) were taught by non FTTT faculty. While the faculty as a whole is well qualified academically, there is a heavy reliance on adjunct and non-tenure track faculty which we view as a concern.

Learning outcomes and assessment:

The mission of the Biology Department states that “through our programs, students will develop an understanding of all forms of life, their evolutionary histories and relationships, and their interactions at levels of integration ranging from the molecular to the biospheric.” Learning outcome I directly addresses this aspect of their programmatic mission by stating students will be able to demonstrate understanding in the following fundamental areas of Biology: biological diversity, evolution, sub-organismal biology, organismal biology, and supra-organismal biology. Learning outcome II states that students understand the many aspects of the scientific process which relates directly to our mission to “teach students the scientific method, a mode of inquiry involving rational observation, experimentation, and critical analysis.” The communication of scientific knowledge, included in outcome II as well as outcome III, is important to the scientific process and preparation of their students for “graduate programs in Biology and for a broad-range of Biology related careers.” Finally, learning outcome IV which states that students will develop intellectual independence, scientific literacy, and an appreciation for the connections between biological science and society directly supports the liberal arts mission of Keene State College and the Biology Department “through the cultivation of an appreciation of natural science and its relevance for all Keene State College students including non-Biology majors.”

The Biology Department currently employs three different methods for assessing their student learning outcomes. Learning outcome I is assessed using their own exam designed to demonstrate whether students understand the five fundamental content areas listed in the outcome plus the ability to develop and test hypotheses mentioned in outcome II. This exam is administered as part of BIO 495 – Senior Seminar. Other aspects of learning outcome II and learning outcome III are assessed through a review of scientific lab reports generated in a number of upper-level courses using a common rubric. Learning outcome IV is assessed through successful participation in BIO 495 – Senior Seminar. As noted in the self study, and confirmed by the faculty, the department is currently struggling with its assessment process.

Allocation of resources:

The Biology Department located in the Science Center includes five lecture/lab rooms fully equipped for laboratory and lecture style teaching. Additional facilities include three shared research spaces, two common prep rooms, a greenhouse, and a herbarium. Space issues identified in the self study included office space for adjunct faculty, no IACUC approved animal facility, and the use of some of their laboratory classrooms for non-laboratory classes offered by other departments.

The typical annual Biology Department budget allocates \$30,000 for program support, \$12,000 for equipment purchases, and \$2000 for equipment maintenance. Other monies are allocated for printing, telecommunications, and minor routine costs. In recent years the department has had to solicit increased money for course supplies. The department would also like money to pay for student field trips, for additional equipment maintenance, and continued education/training on some of the newer state of the art equipment.

2. Results of Site Visit –

The evaluators visited the campus of Keene State College on October 26 and 27, 2009. The purpose of the visit was to serve as peer evaluators of the Biology program. Meetings were scheduled and held with the following:

Tom O'Brien, Chair – Academic Overview Committee,
Karen Cangialosi, Chair – Biology Department,
Scott Strong, Biology faculty member and Assistant Dean of Sciences,
Susan Whittemore, Biology faculty member,
Loren Launen, Biology faculty member,
Pat Eggleston, Biology faculty member,
Kristen Porter-Utley, Biology faculty member,
Ken Bergman, Biology faculty member,
Gordon Lerversee, Dean of Sciences,
Katie Featherston, Biology lab technician,
Kathie Beltz, Biology lab technician, and
Undergraduate Biology students (freshmen through seniors).

In addition, a telephone interview with Richard Blatchley, Chair of the Chemistry Department was held on November 6, 2009 by William J. Pietraface.

An overview of the renovations to the Science Center was provided by Scott Strong. The Biology Department has been located in this building since 2004. During the visit the evaluators toured the Biology Department areas located on the third floor of the Science Center. These areas included laboratory classrooms, prep rooms, research laboratories, herbarium, greenhouse, and lecture room. Various laboratory instruments and equipment items were also available for inspection.

The site visit confirmed the impression from the self study that the Biology Department is housed in a state of the art facility with modern, high tech equipment. Biology faculty had input into the configuration of their laboratory classrooms and research spaces allowing them to implement their novel integrated lab/lecture model begun in the 2007 – 2008 academic year. This coincided with the College-wide transition from a 3-credit to a 4-credit model which they embraced.

The Biology department has embraced the 4-credit model by integrating laboratory and lecture into 330 minutes per week. This integration has had pedagogical consequences.

In the four credit integrated lab/lecture model each course has a total of 330 minutes per week. The national norm for a four credit science course is 4-credit courses that are composed of three hours of lecture and three hours of lab each week. Thus in this 3+3 structure the course meets for 360 minutes per week. Keene State College Biology faculty have compensated for this by reducing coverage in the courses, or by adding additional non compensated class meetings. This creates a difficult situation in that the faculty is striving to provide course content coverage that is comparable to peer institutions which have more total contact time in four credit science courses.

At most institutions this “3+3 structure” is standard throughout the Biology and science curriculum. A survey of Biology curricula at many public and private institutions, shows that the 4-credit, “3+3” structure is as close to being an “industry standard” as anything in Biology curricula. At those public institutions with the greatest reputations for

undergraduate research (Truman State University in Missouri, SUNY-Geneseo, The College of New Jersey, and James Madison University in Virginia), virtually all Biology courses, both in the core and electives, meet for 3 hours of lecture plus 3 hours of lab each week for 4 credits.

Also confirmed was the increased level of research occurring within the department. This is primarily a result of the improved physical space and updated equipment but also of the faculty's strong desire to create opportunities for more students to participate in undergraduate research projects. In addition, this has facilitated the obtainment of grants by the faculty. The downside as stated by the faculty is that their workloads have increased to almost unsustainable levels because research with undergraduates is not well supported and completely uncompensated at this time by the college.

The heavy reliance on adjuncts is a direct result of course reassignments and personal circumstances. In the past two years course reassignments for serving as department Chair (2 courses per year), Assistant Dean (2 courses per year), and for writing grants (1 course per year) have reduced the FTTT availability to teach as they are performing other vital departmental and college functions. In addition, a faculty member who was hired in 2007, passed away after only one year of teaching and another half-time member was permanently reassigned to another program. The above was stated in the self study and reiterated by the Biology faculty during our visit.

Another consequence of the course reassignments has been the inability to offer a broader range of electives. This has impacted the students in the program who stated that there are limited seats available in upper level courses. The strong commitment to ISP courses also contributes to this. Students would prefer to keep the Biology faculty teaching the Biology majors, if possible.

The Biology programs currently consist of the B.S. in Biology, the B.A. in Biology, and the Biology minor. Many significant revisions have been made since the last evaluation in 1999. In addition to serving students who major or minor in Biology, the program serves students who major in Chemistry, Environmental Studies, Health Sciences, Education and General Science, Individualized Majors, and fulfills an important role of providing courses for the ISP required by all students at Keene State College. This contributes significantly to the workload issues raised by the faculty and the availability of seats and courses raised by the students.

The Biology Department is currently staffed by two lab technicians, one of which is at 75% full time with the other working about 35 hours per week during the academic year. The positions as indicated in the self study are responsible for a variety of duties including purchasing, budget management, set up and clean up of labs, student supervision, chemical and supply inventories, and greenhouse management. The lab technicians are happy with their jobs and feel that the Biology Department personnel and facilities are in good shape. Since the technicians only work through the academic year, there is a problem with coverage over the months of July and August. This lack of technical support during the summer 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 as discussed above.

In a telephone interview with Richard Blatchley, Chair of the Chemistry Department, it was noted that there is a tight interrelationship between the Biology and Chemistry Departments. Biology students are dependent upon the Chemistry Department for their general chemistry and organic chemistry requirements. In addition, there is an optional biochemistry course that is not consistent for the students as it rotates between being offered by a chemist and a biologist. The students referred to this in our meetings with them indicating that there is not always a lab associated with the biochemistry course. The Chair felt that there is an increasingly more cordial and collaborative relationship between the Chemistry and Biology Departments at this time.

3. Strengths of the Program –

The following were identified as the major strengths of the Biology Department:

- 1 Well qualified, devoted faculty
- 2 Collegial working relationships between faculty and between faculty and support staff
- 3 Commitment by the faculty toward the well being of their students
- 4 Support and constructive mentoring of junior faculty
- 5 Small class size
- 6 Modern facilities and equipment
- 7 Commitment to undergraduate research

4. Challenges Facing the Program –

The following challenges facing the Biology Department were noted:

- 1 Heavy reliance on adjunct faculty
- 2 Heavy work load expectations for faculty
- 3 Poor recognition and no compensation for undergraduate research
- 4 No technical support during July and August
- 5 No technical support for equipment maintenance
- 6 Significant pieces of equipment in need of technical repair
- 7 Limited amount of supply money
- 8 Need to offer more upper level courses
- 9 Need for better assessment methods
- 10 Need to increase laboratory experiences for their students
- 11 Need to develop time parity with national norm for 4 credit lab science courses

5. Recommendations –

The evaluators strongly feel that the Biology Department is understaffed. This is due to the substantial course reassignments currently in place and the permanent loss of a half-time member to another program. Therefore, we recommend the allocation of two new FTTT faculty members to the department. This would serve to help reduce the heavy reliance on adjuncts and potentially broaden the course availability for the students.

While we recognize and appreciate the Biology Department's general philosophy of providing their majors with a broad diversity of coursework, the addition of tracks within the major could serve to attract more students into it. In our discussions with students, two potential tracks emerged, medical and ecological. The addition of more faculty could help to facilitate development of these tracks.

We would recommend that four credit science courses at Keene State College be redesigned to bring the total hours per week to 360 while retaining the integrated lecture / lab model. We found that both faculty and student opinions on the effectiveness of the lecture/lab format varied. However, both students and faculty commented that the new format without uncompensated supplemental time resulted in less coverage in the course resulting in total time that is insufficient to fully address student development and learning.

Students will benefit from more formal contact time with their instructors. With additional time per week to devote to lectures, presentations will not be rushed, and additional (perhaps more recently discovered, or more controversial, or more in-depth) material can be introduced. Faculty will have sufficient time to more fully engage students and attend to skill development. Additional time will allow for students to gain better understanding. Most importantly, most of the individuals with whom Keene State College graduates will be competing for jobs and spots in graduate and professional schools will have taken courses with 3 hour lectures and 3 hour labs, and they are likely to be better prepared for having done so. Thus, Keene State College students may be at a competitive disadvantage given the current arrangement.

In an effort to reduce faculty work load, the two lab technician positions need to be upgraded. We would recommend that the 75% FT position be converted to a FT position. This would provide support and coverage during July and August when currently there is no coverage. The other lab technician should be upgraded to at least a 75% FT position. Perhaps this position could also provide some equipment maintenance for the department. Currently many expensive, state of the art equipment items are not functional or underutilized due to maintenance issues.

The College needs to develop a means to recognize and/or compensate for faculty involvement with undergraduate research. Undergraduate research is a vital means to enhance student – faculty interactions and better prepare students for graduate school or their career. A low enrollment, regularly scheduled research course should be developed and implemented by the Biology Department and recognized as part of their normal teaching load.

A robust undergraduate research program has many benefits to both students and faculty and needs to be recognized and aggressively supported by the college. We recommend the development of an undergraduate research course or courses with the department and the development of additional programs to support and encourage undergraduate research.

There was a strong consensus on the part of the faculty that undergraduate research should be a critical element of departmental culture, that they are actively searching for ways to sustain and enhance undergraduate research, and that there is a commitment from the faculty to engage students in research. By establishing an undergraduate research course the department could establish a regular rotation so that all faculty members have an opportunity to teach this course in load. While this is not a perfect resolution to the department's concerns about sustaining scholarly work with students while carrying heavy loads, faculty would get to teach this course once every 2-3 years. The courses should be provided with adequate budgets, and there should be an expectation of a public presentation by the students (as individuals or as a group) at the end of the semester.

Given the current number of faculty, faculty load, and the configuration of space it is impossible to require an undergraduate research experience for every student majoring in Biology. Moreover, not every student will want such an experience, and for these students (as well as others), alternative experiences such as internships and even well-planned library research may be effective mechanisms for engagement outside the classroom.

The department might consider some additional ways to sustain and build an undergraduate research culture. We recommend that the department consider adopting the following actions:

- Consider morphing some of the upper-level electives from a survey of the topic into problem-based courses that are centered on a well-articulated research question that may be addressed by a group of students over the course of a semester with available equipment.

- In addition to the upper level departmental undergraduate research course consider developing a 1 to 3 credit course called "Biology Research". Each faculty member would have his or her section of this course. The faculty member would get one credit of load for each student enrolled in the course up to three credits. The maximum enrollment in each section of the course would be limited to no more than five students. (This is a model the actual course structure would be a matter of negotiation between the department and the administration). Perhaps there would be a limited number of sections at first, so that faculty could only receive one per academic year, or even less to get started. Systems similar to this are in place at Ithaca College and Bridgewater State College.

- Faculty should be more strongly encouraged (via an appropriate reward system) to apply for grants from external funding sources that will fund summer undergraduate research at Keene State College. While it is difficult to obtain grants from major funders like NSF and NIH and NCUR/Lancy, there are several funding sources that entertain more modest proposals such as the Merck/AAAS Undergraduate Science Research Program (USRP), which funds grant proposals submitted jointly by Biology and Chemistry programs. In order to run faculty mentored undergraduate research in the summer technical support must be made available during the summer. Please see our comments under technical support.

- Establish a regular weekly research seminar series at which research scientists from beyond and within Keene State College (as well as senior Honors thesis students) present talks about their research. There are plenty of other

institutions of higher education as well as major research institutions within a few hours' drive of Keene State College, and scientists from graduate programs often will visit without expectation of compensation because they use the visit to recruit graduate students.

- Pro-actively make students aware of, and help them prepare applications to, summer research programs at other academic and research institutions and agencies such as the Student Conservation Association (SCA).

In science, mentored undergraduate research is the most difficult and time demanding research configuration. It is more demanding than working with graduate students or working with colleagues or working alone because of the intensity of the mentoring required at the undergraduate level. Thus this commitment on the part of the Keene State biology department needs recognition and full institutional support.

As reported in the self study, there is an overall heavy use of adjunct faculty to support the Biology Department's course offerings. As of fall 2008, non FTTT faculty including adjuncts and contract lecturers, taught 59% of the student credit hours for all Biology courses. Of the 74 sections of Biology courses taught in the 2008 – 2009 academic year, 36 of 74 (49%) were taught by non FTTT faculty. It was noted that 35 of these sections (97%) were lower-division courses.

As a means to better assess the Biology Department student learning outcomes, an outside assessment expert should be brought in to provide a workshop. This expert should be paid for by the College Administration and could provide information to support multiple departments on campus.

Better exposure of the Biology Department and their activities could be provided by a more visible, user friendly web page developed in conjunction with the Keene State College webmaster. Perhaps a standard template to be used by all departments and programs on campus could be developed.

During our visit to the Biology facilities it was noted that several of the lecture/lab spaces were experiencing temperature and/or air flow problems. Some spaces were extremely cold and others had "white noise" from the air flow system. This situation is not conducive to a proper learning environment and should be remedied by the College's maintenance personnel or outside professionals if necessary.

Finally, we would recommend periodic review of departmental budgets on campus, particularly focusing on enrollment in courses, number of faculty, and supply costs. With their emphasis on undergraduate research, offering of lecture/lab courses, and dependence on high priced equipment to support their work, the Biology Department is in need of additional funding.

6. Other Relevant Commentary –

Both reviewers greatly appreciate and recognize the work ethic and sincere dedication of the Biology Department faculty to their students and to the Keene State College mission and values. They are true professionals in every sense of the word.

In addition, we would like to thank the entire Biology community (students, faculty, and staff) and the Dean for their receptiveness and warm hospitality during our visit. In particular we note the time, effort, and energy expended by Professor Tom O'Brien, Chair of the Academic Overview Committee in attending to our needs prior to and during the visit. We enjoyed our time at Keene State College and wish only the best for the Biology Department and the College. We hope that our recommendations are productive and lead to enhanced learning experiences for the students of the Biology Department.