

# Snow College

## Life Science (Biology) Program Review

submitted to the Snow College Board of Trustees  
October 2015

**Reviewed spring semester 2015 with a rating of recommended.**

### Reviewers:

- Dr. Donald P. Breakwell, PhD, Professor of Microbiology and Molecular Biology, Brigham Young University
- Erick Faatz, Associate Professor of English, Snow College.

### Program Description and Mission Statement:

Biology is the study of life. It is a very broad discipline which includes key aspects of all the fields in the life sciences. Cell biology studies the function, ultrastructure and internal processes on the molecular level of proteins, DNA, RNA, etc. Animal biology or zoology includes more specialized fields of study. Some examples are anatomy (structures), morphology (internal processes and functions and their coordination), genetics (heritability of the information that ultimately directs all life functions and responses to the environment), systematics and taxonomy (ordering, classifying and naming of species), evolution (origin and development of species), and ecology (interrelationships of living organisms with each other and the environment). Human biology is an intensively studied area of animal biology. Plant biology or botany is like-wise divided into the same specialized fields of study found in zoology. Microbiology includes the study of bacterial, viruses (virology), fungi (mycology) and protists, although many of the latter are studied in plant and animal biology. These component areas of microbiology may be further subdivided into the fields of study mentioned above.

### *Mission Statement:*

1. To expose all students at Snow College to the basic principles of the science of biology
2. To give students majoring in Biology or biology related fields a solid background in the science of biology, and biological laboratory techniques that will allow them to seamlessly transfer to a university at the junior level.
3. To give students majoring in pre-professional health or allied health fields a solid background in cell biology and human biology classes that will allow them to transfer into a professional program, or seamlessly into a university at the junior level.
4. To help less-prepared students or students needing a second chance to get the necessary preparation to move onto four-year programs.

### Faculty and Staff:

There are six full-time, tenured faculty, three full-time non-tenured faculty, and four part-time faculty teaching in the Biology program. Nine of these faculty members possess doctorate degrees and four have master's degrees in biology or a biology-related field. Instructional quality is maintained by requiring all biology faculty to have a master's degree or higher in biology or a related field (see Data Form). In addition, most biology faculty have been observed by the department chair and received feedback on their teaching.

Student Learning Outcomes: There are distinct learning outcomes associated with how a student approaches the study of biology at Snow College. They are listed as follows:

**Students who complete the Life Science GE requirement at Snow College will be expected to:**

- know the essential qualities and key processes commonly found in life forms
- have begun to understand the diversity of living organisms and their myriad interrelationships in the biological world
- know how to apply systematic methods to understand complexities of individual organism or to distinguish among diverse species
- can use microscopes, computers, other commonly available lab equipment and supplies
- can read the literature of the life sciences flexibly, analytically and imaginatively
- appreciate that they have been exposed to an unfortunately small number of the myriad beauties and marvels of the living world, extant or extinct
- understanding of the role that biology plays in modern life as well as past history

**Students who complete the courses required for a major in Biology or related field will be expected to:**

- know the essential qualities and key processes commonly found in life forms
- have begun to understand the diversity of living organisms and their myriad interrelationships in the biological world
- know how to apply systematic methods to understand complexities of individual organism or to distinguish among diverse species
- can use microscopes, computers, other commonly available lab equipment and supplies
- can read the literature of the life sciences flexibly, analytically and imaginatively
- appreciate that they have been exposed to an unfortunately small number of the myriad beauties and marvels of the living world, extant or extinct
- understanding of the role that biology plays in modern life as well as past history
- can use the knowledge and experience they have gained to transfer to a university successfully at the junior level
- can use the knowledge and experience they have gained to be successful in a university or graduate program.
- can use their knowledge and expertise to get employment.
- can apply their knowledge of different lab skills to the appropriate scientific setting.

**Students who complete the courses required for pre-professional programs and allied health programs will be expected to:**

- know the essential qualities and key processes commonly found in life forms
- have begun to understand the diversity of living organisms and their myriad interrelationships in the biological world
- know how to apply systematic methods to understand complexities of individual organism or to distinguish among diverse species
- can use microscopes, computers, other commonly available lab equipment and supplies

- can read the literature of the life sciences flexibly, analytically and imaginatively
- appreciate that they have been exposed to an unfortunately small number of the myriad beauties and marvels of the living world, extant or extinct
- understanding of the role that biology plays in modern life as well as past history
- can use the knowledge and experience they have gained to get admitted into a professional or allied health program
- can use the knowledge and experience they have gained to be successful in a professional or allied health program.
- can use their knowledge and expertise to get employment.
- can apply their knowledge of different lab skills to the appropriate scientific setting.

**Students who come to Snow College less prepared or are in need of a second chance will be able to:**

- have the study skills and confidence to succeed in a college setting.
- have the knowledge and the skills in the laboratory to allow them to be successful in a biological field in a college setting.
- Can use the knowledge and experience to get employment.

The general advising of students attending Snow College is conducted through the Student Success Center. The Center employs many advisors who are trained to help with schedules, consult about major and career options, and find financial aid resources to pay for school. However, faculty members and part-time instructors in the Biology Department often meet with students to discuss their current academic needs as well as their future goals.

**Data Form:**

<b>Faculty Headcount (Academic Year)</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>
<b>With Doctoral Degrees</b>					
Full-Time Tenured	5	5	6	6	6
Full-Time Non-Tenured	0	0	0	1	2
Part-Time	3	2	2	1	1
<b>With Master's Degrees</b>					
Full-Time Tenured	0	0	0	0	0
Full-Time Non-Tenured	3	3	2	1	1
Part-Time	4	3	4	3	3
<b>With Bachelor's Degrees</b>					
Full-Time Tenured	0	0	0	0	0
Full-Time Non-Tenured	0	0	0	0	0
Part-Time	0	1	1	1	0
<b>Other</b>					
Full-Time Tenured	0	0	0	0	0
Full-Time Non-Tenured	0	0	0	0	0
Part-Time	0	0	0	0	0

<b>Total Headcount Faculty</b>	15	14	15	13	13
<b>Full-Time Tenured</b>	5	5	6	6	6
<b>Full-Time Non-Tenured</b>	3	3	2	2	3
<b>Part-Time</b>	7	6	7	5	4
<b>FTE</b>					
Full Time	6.9	7.2	6.6	7	8.3
Teaching Assistants	NA	NA	NA	NA	NA
Part-Time	1.1	1.4	0.9	0.7	0.7
<b>Total Faculty FTE (Academic Year)</b>	8.00	8.60	8.10	7.70	9.00
<b>Graduating Class</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>
<b>Number of Graduates</b>	36	33	40	42	25
Certificates	0	0	0	0	0
Associate Degrees	36	33	40	34	21
Bachelor's Degrees	NA	NA	NA	NA	NA
Master's Degrees	NA	NA	NA	NA	NA
Doctoral Degrees	NA	NA	NA	NA	NA
<b>Number of Students (Academic Year)</b>	1716	1926	1837	1784	1769
Total Declared Majors	147	99	44	25	22
Total Department FTE	228.80	256.80	244.93	237.87	235.87
Total Department SCH	6864	7704	7348	7136	7076
Student FTE/Faculty FTE	14	15.5	14.3	14.7	12.3
<b>Cost (based on Fiscal Year-Cost Study)</b>	<b>FY10</b>	<b>FY11</b>	<b>FY12</b>	<b>FY13</b>	<b>FY14</b>
Direct Institutional Expenditures	\$637,273	\$735,163	\$662,711	\$671,310	\$723,094
Cost per Student FTE	\$3,492	\$3,266	\$2,675	\$3,171	\$3,659
<b>Funding:</b>					
Appropriated Fund	NA	NA	NA	NA	NA
<b>Other:</b>					
Special Legislative Appropriation	NA	NA	NA	NA	NA
Grants of Contracts	NA	NA	NA	NA	NA
Special Fees/Differential Tuition	NA	NA	NA	NA	NA

## Conclusion

The outcomes of the mission of the Biology Department advance the mission and core themes of Snow College in the following ways:

- *Core Theme 1 Tradition of Excellence* goals are advanced by helping students complete their degree at Snow College and allowing them to be successful when they transfer, and eventually find employment. All students completing courses in biology should have been exposed to a rigorous and excellent program in the biological sciences.

- *Core Theme 2 Culture of Innovation* goals are advanced by giving students the opportunity to work with current technology and laboratory equipment in the biological field. In addition students will be able to read the literature of life science and be able to analyze it to understand current biological advancements. Students taking a number of biology classes at Snow College should be able to understand what is known in biology and should be able to start to understand how to conduct research that would allow them to answer complex questions about life.
- *Core Theme 3 Atmosphere of Engagement* goals are advanced through student centered activities especially in the laboratory that allow students to not just learn the facts of biology but allow them to ask questions and have a deeper understanding of biology. Students who desire an experience in undergraduate research and/or student mentoring are given the opportunity to have those experiences. Students are given the opportunity to interact with the community by teaching K-12 students. In addition students are able to be involved with the general and scientific community through service learning projects.

The work that the faculty members of the Biology Department are doing to advance the strategic plan of Snow College is as follows:

- **Quality Instruction and Student Services:** The Biology Department has many learning communities in the laboratories. The learning community is also encouraged by providing students with the opportunity to be student mentors in many courses. Students are encouraged to have experiential learning experiences in the laboratory as well as undergraduate research projects. Service learning is required or encouraged in many courses. Some service learning projects allow students to have experiential learning as well as to contribute knowledge to the greater scientific community. Students are encouraged to take courses from other areas on the college campus that will help them better understand biology.
- **General Education:** The Biology Department faculty encourage students to become lifelong learners. Hopefully students will get excited about and understand how they can become lifelong learners through different projects that they complete for general education courses.
- **2-- Year/4-- Year:** The Biology Department has proposed a new four-year degree. In addition faculty members have been very active in establishing transfer agreements with universities and using those agreements to expand and strengthen major guides.
- **Economic Development and Workforce Preparation:** The Biology Department works individually as well as with the Natural Resources Department to help students enter the workforce successfully. In addition the departments work to help students find summer employment that will allow them to gain critical experience that will allow them to build their resumes.
- **Cost and Affordability:** The Biology Department has provided many students with employment opportunities. The department could use more funding to increase the number of student employees that would help to decrease the demands on faculty.

In the last 15 years we have had approximately 350 alumni self-report that they are working in biologically related fields. There are obviously some additional students that have not kept in contact with the department. Many of these former students hold graduate or professional degrees. We have a list of all of these students if needed by the committee. The Biology Department maintains the animal and insect collections. These collections as well as some

of the programs within the department such as the cadaver lab, are constantly being used as recruiting tools by those trying to attract students to Snow College.

The Biology Department also serves the community by teaching community groups by using resources of the department. Last year there were over 100 different groups that faculty taught by using the collections and resources of the department.

### **Comprehensive Program Assessment:**

In accordance with Utah State Board of Regents' policy R411 on the periodic review of educational programs, an on-site visit of Snow College's Biology program was conducted on April 24<sup>th</sup> 2015. This visit considered the self-study document (submitted prior to the visit) and included a comprehensive tour of educational facilities, conversations with students, class visits, and faculty interviews.

### **Program Strengths:**

- By their own admission and from our observation, the faculty members are most congenial. Although disagreements occur from time to time, they are met with collegiality. There is strong camaraderie among them. They are a hardworking and committed group of educators.
- The faculty shares a common regard for the success of the students in the program and it is able to provide them with the personal attention that is a trait of Snow College. The faculty also desires to provide students with up to date materials and current information. This is vital in the biological sciences where change is occurring almost daily. Further, the faculty members have paired with the library, and of their own volition and resources, subscribed to societies and journal in order to stay abreast of new developments in the discipline. With heavy teaching loads this is particular commendable.
- Per faculty member, biology has taught a remarkably heavy load of general education courses often with enrollments greater than 48 students per class. They have also provided a variety of specialty courses such as Introductory Genetics (BIOL 2030), General Microbiology (BIOL 2200), General Ecology of Life Science Majors (BIOL 2220), Human Anatomy for Artists (BIOL 2150), Plant Taxonomy (BIOL 2300), and Introduction to Soil Science (BIOL 2580). While specialized courses seem to be resource consuming because of low enrollment, they allow students the opportunity for personal tutoring with faculty that saves them time in completing the major when they transfer.
- The faculty continues donating royalties from the sale of lab manuals, which they have authored, to support the laboratory course in the program. Modern biology has long moved past the curation of pressed plants and taxidermic animals, and this is very expensive. Molecular biology requires specialized equipment and supplies. The biology faculty has made consistent efforts to move the program into present day largely due to the donation of faculty royalties to the program. This has made the Biology program technologically advanced.
- Additionally, faculty have used time and energy to mentor students. While some students work as teaching assistants in laboratory classes, others are conducting legitimate scientific investigation. The College is most fortunate to have careful and competent faculty that are willing to share their expertise with interested undergraduate students. This is a service at the forefront of modern biology education.

- Biology faculty demonstrates professionalism by attending professional meetings. These meetings support not on their research interests but are also focused on improving pedagogy. Every effort to continue this practice should be maintained.
- Strides have been made to make biology general education courses more uniform by offering a common final examination. This has alleviated (to some degree) faculty concerns to teach and design curricular materials matching their strengths within the constraints of the program's course requirements.

#### **Program Weaknesses/Recommendations:**

- **Faculty attrition:** The ability of the program to attract and retain full-time and adjunct faculty is an area of concern. In the past decade, several faculty high-quality faculty members have left to take more lucrative positions at other institutions. It is recommended that the institution continue to address salary equity as it relates to academia. It is further recommended that faculty and administration address the needs to hire qualified adjunct faculty to address the teaching of additional courses and lab preparation. This must take into account the fact that life science laboratory preparation (particularly microbiology lab preparation) is more time-consuming than other science-related lab prep/instruction. It is further recommended that internship opportunities for students at UVU and/or BYU, who are interested in college biology education, be explored as the means by which to remedy the need for qualified lab adjuncts.
- **Teaching Space:** It is recommended that the Division seriously consider or re-consider the space for both biology laboratory and didactic courses that will be taught in the new building. For example, Microbiology laboratories require special consideration because BSL 2 category organisms are required for teaching that discipline. Preparation for these labs requires a lot of time. With increasing enrollment in these courses, it will be difficult to house those students if the current space allocation and unique lab preparation situation is ignored.
- **Faculty Workload:** Faculty are concerned about the increasing administrative load they are required to take. Tasks previously performed by administrative staff have been given to faculty without compensatory increases. This is a problem across academia and it is recommended that the program work with administration to address these workload concerns with recommendations for program administrative support. Regarding laboratory workload, the department chair is best suited to make that assignment. If this is not possible, it is recommended that the Dean or administration should seek the advice of the chair to make truly equitable workload assignments.
- **Course Scheduling:** Course scheduling for the entire Natural Science and Mathematics Division has become challenging, including failures to communicate changes in course scheduling within the Division. It is recommended that greater communication be developed among all programs in the division in order to reduce the number of "bottlenecks" that occur for students who must take a heavy load in another program (i.e. Chemistry) in order to fulfill biology program requirements.
- **Computers:** Computers in the program's laboratories have not been upgraded for at least 15 years. This is a serious problem with a remedy that is long overdue. It is recommended that dialog occur between the Division and the Biology program regarding a consistent replacement cycle of computers in the Biology program's laboratories. Computers that have passed their usefulness in other departments could be considered for use in the Biology program; thus, economically upgrading the outdated computers currently used there.

- **Human versus General Biology:** Students choosing to take Human Biology over General Biology is of universal concern. There is a mixed perspective as to whether this is due to bias from central advising or concerns about Biology 1010 pedagogy. One group supports the argument that a general education biology course should allow students to learn how biologists think and see their discipline; the other group proposes a broad view of the discipline should be made fascinating to the students. It is recommended that serious discussion occur regarding the teaching of Biology 1010. There are strong philosophical differences among the faculty. The faculty of the department is a seasoned group; however, peer evaluation of teaching should be a continued effort among them. Using peer evaluation and the common departmental exam, faculty can learn among themselves and perhaps establish a new common curricular ground for the course.
- **Student Scholarships:** In the 2010 review, it was recommended that scholarships, particularly for sophomore students, be placed under program control. This is now a strong recommendation to Biology faculty and college administration. Biology faculty has a close view of student promise and performance and they are a good resource for determining the best use of these earmarked scholarship monies.
- **Learning Assessment:** In the 2010 review, it was recommended that the program be more active in assessing and archiving students learning. Specific learning outcomes are located on the college webpage; however, how these are to be measures is not included. It is again recommended that the program provide transparency and evidence as to how program learning outcomes are measured. This will strengthen the view of the department to outside accrediting bodies.

#### **Institutional Response:**

- **Faculty attrition, Teaching Space, and Faculty Workload:** Many of the concerns listed by the reviewers require that the administration of Snow College provide the Biology Department funding and personnel to educate students appropriately and efficiently. The department continues to work with administration to encourage Snow College to at least offer somewhat competitive salaries for faculty and to hire additional faculty to meet increasing enrolment at the college. The Biology Department is working with the administration to determine appropriate workload to biology faculty. In addition some of these concerns were addressed in the strategic planning of the college where the Biology Department was rated in the top quartile. A laboratory coordinator position was budgeted in the strategic planning process. However, at this time the department has not been given permission to hire a laboratory coordinator. The department will continue to work with administration to get those funds released to hire a laboratory coordinator. If the department can get a laboratory coordinator, some of the concerns about workload may be alleviated. The Biology Department will also continue to work with administration to track students in an efficient manner and to replace computers in the laboratories.
- **Course Scheduling:** The Biology Department is committed to continue to work with the Division to alleviate bottlenecks with scheduling. Some of the things that the department has done to alleviate this problem is to teach two sections of Biology I so that different major's students with the biological sciences can complete their appropriate tracks. The department will also continue to work with the division and the administration to make sure that the new science building has the appropriate infrastructure for the Biology Department to function.



- **Human versus General Biology:** The Biology Department has worked and continues to work with the faculty members within the department to address philosophical differences in general education. The department will make a concerted effort this year to address those philosophical differences. The department is also making a concerted effort this year to ensure that Human Biology has common outcomes in all sections of the class.
- **Learning Assessment:** The Biology Department has already begun to archive student assessment and measuring learning outcomes in Biology 1010 courses. This year the department will continue the effort to use the Biology 1010 courses as a model to archive and measure learning outcomes.