Biology Departmental Assessment Meeting: Report
Biology Major

Summary of past decisions

Please summarize up to three departmental changes made since the last HLC visit (08-09) the impetus for those changes and any changes to information gathering about student development.

1. Improving biological communication skills has been one of our top goals for many years. We want to improve our student's ability to read and report on the current research while also improving their scientific writing skills. Although many individual courses in the Department work on these skills, we would like to have a more systematic way of insuring that all of our students have comparable preparation on these skills before graduation. Our initial attempt in this direction was a required Sophomore-level seminar in biological communications. Unfortunately, our assessment of these skills when students reached their senior year did not show any appreciable improvement related to the seminar. We therefore have dropped the Sophomore seminar and will be implementing a two-pronged approach in its place. First, students in BIOL 150 Cell Biology will be part of small teams that develop and carry out a small, independent research project and each student will write a formal report of the project. This will require our first year students to learn the basics of science writing in their first course, giving us a better platform to build on in subsequent courses. Second, in the future we will expand our current non-credit bearing Senior Seminar into a full-credit course wherein strong emphases will be placed on reading and discussing the current research literature, writing formal reviews of this literature and making an oral presentation based on these reviews. Having these experiences in Senior Seminar will allow us to assess the progress students have made from that initial writing assignment in Cell Biology.

2. All Biology students need a basic competency level in using statistics. We attempted to provide this by requiring students to take a Sophomore-level biometry seminar. However, when comparing tests taken by Seniors, we could see no improvement between those who had taken biometry and those who had not. We therefore decided to drop the biometry seminar and simply require our students to take a full course in statistics. Statistics will be a pre-requisite for BIOL 365 Ecology and Evolution and BIOL 300 Animal Behavior allowing us to assess student improvement in these statics-heavy courses. The ability to use statistics properly will also be a part of our revised Senior Seminar course and will also be reflected in the students Capstone experience.

3. The Biology Department has long placed a premium on developing research skills among our students. Several upper-level courses now have research-based lab experiences, but all the pedagogy literature in the sciences indicates that introducing students to research early in their academic careers is crucial for maintaining student interest in the sciences. Therefore we have replaced our old, regimented BIOL 150 Cell Biology laboratory with an open-ended, research based curriculum. In this new lab, students begin collecting research data on the first day of laboratory and the semester ends with students conducting their own research project. Our lab evaluations show a marked increased in student enthusiasm for this new laboratory experience.

We now have a progressive series of research experiences for our students. After this first, short (2-3 weeks) project in Cell Biology, student do longer (4-6 week) projects in the other required Biology courses, BIOL 190 Botany , BIOL 220 Zoology, BIOL 250 Genetics, and BIOL 365 Ecology and Evolution.

In several of the upper level elective courses, (for example, Animal Behavior, Advanced Cell Biology, Molecular Evolution, Field Ecology, Algae and Fungi, Molecular Genetics) the entire laboratory experience is a single, semester long research project.

Looking forward

Over the next year (and beyond) we will be collecting data to determine the effectiveness of adding statistics to our required courses. We will compare student performance in 3 courses, Ecology and Evolution, Animal Behavior and Senior Seminar. Since this new requirement does not apply to students already at Hendrix (unless they switch to the new catalog for graduation requirements) we will have a couple years to collect pre-requirement data. Although the majority of our students already take statistics, there is a fair number who do not. We hope to see improved performance when next year's Freshman get to these courses.

In addition to the new statistics requirement, Mario Muscedere and Mark Goadrich are collaborating on a project to prepare tutorial modules for using statistics software. We are hopeful these modules will contribute to student success in this area of their preparation.

Achieving departmental goals for students

Please explain how your departmental curriculum achieves your student learning goals, being sure to include the Capstone. Feel free to attach a curricular map or other supporting documents. Summarize the ways your department provides guidance in the effective use of research and information resources.

Biology Department Student Learning Goals

1 *Appreciate what biological science is and how the scientific method is used to increase our understanding of the natural world.*

Using the scientific methods is at the heart of most Biology courses, especially our required core courses. We also emphasize from the first day of their first class that biological science is the way we go about investigating how organisms function, not a collection of facts about organisms.

2 *Use observations and experimental protocols to make and test hypotheses.*

Students begin this process in the first day of their introductory biology course and continue to do so in most subsequent courses.

3 *Apply appropriate analytical and statistical tools for the analysis of data used in the testing of hypotheses and for scientific writing and presentations.*

We have added statistics to our list of required courses. Students will be expected to use statistics extensively in BIOL365 Ecology and Evolution, and it will also be emphasized in Senior Seminar and the Capstone experience.

4 *Appreciate the breadth of biological science and understand the key principles of the major sub-disciplines.*

All Biology majors are required to take 5 core courses that cover the breadth of biological science. Our curriculum requires students to take individual Cell Biology, Botany and Zoology courses rather than the Biology I and II sequence found in many schools, ensuring that students are thoroughly exposed to the key principles of these subdivision of the discipline. They complete their survey of biology with Genetics and the Ecology and Evolution course.

5 *Study one or more biological sub-disciplines in depth.*

All Biology majors are required to take 4 upper level elective courses which provide them with the in-depth coverage of specific sub-disciplines of their choice

6 *Be conversant with the major paradigms of biology and understand current debates over poorly understood biological principles.*

Taking 9 biology coursed provides students with a thorough understanding of biology as a science. During the Senior Seminar and Capstone experiences (and in several other courses) students have the opportunity to wrestle with cutting edge science and gain an appreciation for how much we have yet to learn about biology.

7 *Be able to read, understand and summarize articles from the current biological literature.*

Most of our upper level courses make at least some use of the current research literature and require students to write summaries of their readings. In addition, our future implementation of Senior Seminar will be focuses on these skills, and students will need to demonstrate them for successful completion of the Capstone.

8 *Appreciate the place of biological science in the liberal arts curriculum and the roles of scientist within society.*

We address these issues in several of our core and elective courses, and again during Senior Seminar.

- Many of our courses, including Cell Biology, place a strong emphasis on the biological basis of social issues including the privacy issues surrounding human genetics and other medical issues, the use of genetically modified foods, human genetic engineering and other issues.
- Most of our general education courses have a strong social /ethical component
- Several of our courses include a strong historical perspective (e.g., Evolution, Botany, Microbiology)
- Field ecology includes socio-cultural components and carries a GA Odyssey credit. Students can also earn an GA in our Marine Biology course.
- We have a new course in Conservation that will look carefully at issues such as climate change, but will also study the environment from ethical and esthetic perspectives.

9 *Develop intellectual curiosity and a life-long love of learning.*

We feel that student engagement in research, which begins in the introductory course, is the best way for students to develop their scientific curiosity and desire to learn more about the natural world.

10 *Have developed the intellectual and practical skills to be successful in graduate school, professional school or their chosen field of employment.*

Our strong emphases on research skills, ability to read and use the current research literature and the communication skills to explain what they know to others are the crucial skills needed by our students to be successful in their future careers.

Your department's role in achieving the college's shared goals for students

Please explain how your departmental learning goals contribute to the Vision for Student Learning Goals. Feel free to attach a map or other supporting documents.

We have included a spreadsheet to map the convergence of our Departmental goals with the Vision for Student Learning.