Biology Program Assessment

B.S. and B.A. Degrees in Biology

These two degrees are considered together because most data is collected without distinguishing between the two programs. The degrees are primarily differentiated by the number of chemistry courses taken, with B.S. students having a significantly deeper exposure to chemistry.

Academic Year: Spring 2007; 2007-2008 Academic Year

Form Completed by: Julie Estabrooks, Ph.D., Science Department Chair

Sources of Evaluative Information:
1. Assessment of the Major Forms completed by Instructor of BIOL 490
2. Major Field Test results

Analysis of Information:
Our Senior Seminar (BIOL 490) has been taught by the same person since Fall 2007 and the Assessment of the Major forms provide a useful source of information because of the consistent perspective of one instructor. In terms of Measurable Learning Outcomes, it appears our students have become somewhat more proficient at “Conduct a literature search on a specific topic.” and “Integrate activities into an effective written report on an appropriate topic.” There appears to have been a slight decline in the ability to “Interpret data using scientific methodology.”

Program Summary comments from the Assessment of the Major Forms indicate the following strength and weaknesses:

Strengths:
- B.S. students and mature students seem to do best in the course.
- Most students have good computer and presentation skills.

Weaknesses:
- Students have difficulty with practical aspects of doing science including lab work, developing a project and applying statistics.

MFT scores are difficult to interpret because students in Forensic Science as well as the B.A. and B.S. students in Biology take the same MFT and scores are aggregated. However, we have a sufficient number of students taking the exam to make some comparisons between these students. Table 1 presents a simple comparison of average scores of various cohorts on the Biology MFT.
Although total average scores are similar, subscores indicate differences between degrees. Forensic Science students do well in Molecular Biology and Genetics, probably reflecting the emphasis these areas receive within the degree program. These students have lower scores in Organismal, Ecology and Evolution areas which is unsurprising given that many Forensic Science students take few, if any, upper-level courses in these areas. The B.S. Biology students are strongest in Cellular biology and have consistent average scores across the other categories. B.A students are somewhat weaker than B.S students, on average, in every category except Ecology and Evolution.

We have also been concerned about preparation of students coming from other institutions or the evening program. Table 2 provides a simple comparison of average scores for these groups. Total scores are probably not significantly different. One difference of note is that transfer students tend to be stronger in Organismal biology than native Columbia College students. Molecular Biology and Genetics scores are highest among day program students but the source of this difference is unclear since genetics has been inconsistently offered during the evening and molecular biology is offered only during the day.
Among all students taking the Biology MFT, there was a broad range of scores. One student scored in the 96th percentile nationally. Eight students were above the 70th percentile; twelve students were between the 29th and 46th percentiles and eight students were below the 21st percentile.

Assessment Indicators reported through the MFT indicate areas of strengths and weaknesses. Our weakest area was in Organismal-Plants; this is not surprising because we require neither botany nor any plant-focused upper-level courses for any majors. Biochemistry and Cell Energetics was also relatively weak. This weakness is probably due to the diversity of students taking the exam and the fact that Forensic Science and B.A. Biology students have little or no exposure to these topics in upper-level courses. Our students do best in Cell Structure. Organization and Function and Organismal-Animals. However, none of the Assessment Indicators had average scores above the mid-50th percentile so there is obviously much room for improvement.

Use of this information by the Science Department

The issues identified by assessment mechanisms are the source of many discussions among science faculty. Most formally, evidence from the culminating experience and MFT scores were discussed thoroughly during our Program Review last year and during a follow-up workshop in August 2008.

As a result of departmental assessment, the following actions have been taken:

- An applied statistics course (BIOL 324) is now required as a prerequisite for Research Design (BIOL 395).
- Research Design (BIOL 395) and Senior Seminar (BIOL 490) have been realigned so that there is progressive development of skills and less overlap of content.
- Majors are required to participate in a Science Seminar so that they have a better awareness and understanding how science is done and reported.
- A 200-level Cell Biology (BIOL 290) has been added to core requirements to strengthen this area and better prepare students for upper-level courses that require this foundation.
- Forensic Science students now have a degree-specific, separate senior seminar course.

All of the above were recommendations for improvement in the previous (2006) Science Department Assessment Report.

Recommendations for improvement

- Basic skills such as applying statistics and using literature should be introduced in lower-level courses so that students are better prepared for upper-level courses.
- Offer more Topics courses to increase our depth of coverage in chosen areas.
- Develop a list of common themes/skills to be developed throughout the laboratory sequence.
- Expand our offerings in organismal biology to include more-ology (ichthyology, ornithology, etc.) courses rather than just the general zoology course now offered.
• Motivate students to take the MFT exam seriously, perhaps using their score in determining the grade for Senior Seminar. This has not been possible in the past because of delayed reporting.
Chemistry Degree Assessment

B.A. Degree in Chemistry

Academic Year: Spring 2007; 2007-2008 Academic Year

Form Completed by: Julie Estabrooks, Ph.D., Science Department Chair

Sources of Evaluative Information:
1. Assessment of the Major Forms completed by Instructor of CHEM 490
2. Major Field Test results

Analysis of Information:

Chemistry majors take their Senior Seminar in a cross-listed CHEM/BIOL 490 course along with Biology majors. Until spring 2007, this course also included Forensic Science majors. According to Assessment of the Major forms, only one true chemistry major completed the course in the assessment period. This student was exceptional and received 'Strong' ratings for each Measurable Learning Outcome. The instructor commented, "this day program prepared student appears to exceed expectations of all science degrees at CC".

The Chemistry MFT was taken by the above chemistry major and three forensic science students. The sample size was too small for analysis and individual scores were not reported. The mean score for the sample of four students was 143.3, which is in the 30th percentile nationally.

Use of this Information by the Science Department:

Although we have little data from student achievement, the chemistry program was closely examined at a departmental workshop in August 2008. Included in the discussion was whether we should develop a B.S. degree in Chemistry and what steps could be taken to strengthen the overall chemistry program.

Recommendations for Improvement:
- Emphasize development of basic skills such as using calculations, mixing solutions, etc. starting with introductory labs and increasing complexity in upper-level labs.
- Expect upper-level students to work independently.
- Incorporate more sophisticated equipment and technology into courses.
- Add inorganic laboratory.
- Add a chemistry faculty member with expertise in analytical chemistry.