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: 2008-2009

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 - Senior Seminar
2. Major Field Test results

Analysis of Information:
The Senior Seminar (BIOL 490) has been taught by the same person since Fall 2007 and the Assessment of Major forms provide a useful source of information because of the consistent perspective and standards of one instructor. Evaluations of achievement of Measurable Learning Outcomes continue to indicate a range of performance. Typically, a third to half of the students exceed expectations for each outcome and an additional third meet the expected level of performance. No students were judged as exhibiting unsatisfactory performance during this academic year, although a significant proportion were judged needing improvement in their performance.

Program Summary comments from the Assessment of the Major Forms indicate the following strengths and weaknesses among our biology students and within the program—

Strengths:
- Willingness of other science faculty to assist students with senior projects
- Diversity of students and majors (chemistry majors also take this course)
- B.S. students are better prepared and stronger performers
- Most students have good computer and presentation skills

Weaknesses:
- Equipment and space for student research projects remain limited
- Many students struggle with statistical analysis and standard laboratory skills

This year’s MFT scores provide a truer picture of our biology program because forensic science students on the biology track are no longer included unless they are also receiving a dual degree in biology. MFT scores have also become somewhat more useful with the division of day and evening students. However, interpretation is still difficult because much of the content covered in the MFT is not included in coursework taken by B.A.
Biology students and the scores for B.A. and B.S. students are aggregated. In addition, because the degrees are designed to be flexible in meeting student needs and goals, students do not always have a background in some of the areas tested by the MFT.

The following table attempts to separate performance on the Biology MFT between B.A. and B.S. students. It also separates day and evening students as this may be a confounding factor.

<table>
<thead>
<tr>
<th>Degree/Program</th>
<th>N</th>
<th>Total Score</th>
<th>Cell Subscore</th>
<th>Molecular and Genetics Subscore</th>
<th>Organismal Subscore</th>
<th>Evolution and Ecology Subscore</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.S. Biology</td>
<td>16</td>
<td>152</td>
<td>53</td>
<td>57</td>
<td>51</td>
<td>50</td>
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<tr>
<td>Day</td>
<td>11</td>
<td>157</td>
<td>58</td>
<td>60</td>
<td>55</td>
<td>53</td>
</tr>
<tr>
<td>Evening</td>
<td>5</td>
<td>142</td>
<td>41</td>
<td>51</td>
<td>42</td>
<td>43</td>
</tr>
<tr>
<td>B.A. Biology</td>
<td>13</td>
<td>145</td>
<td>46</td>
<td>47</td>
<td>44</td>
<td>47</td>
</tr>
<tr>
<td>Day</td>
<td>7</td>
<td>145</td>
<td>46</td>
<td>53</td>
<td>42</td>
<td>44</td>
</tr>
<tr>
<td>Evening</td>
<td>6</td>
<td>145</td>
<td>45</td>
<td>40</td>
<td>46</td>
<td>50</td>
</tr>
</tbody>
</table>

As is clear in the table, day B.S. biology majors consistently score higher than B.A. biology majors. This relationship does not hold when comparing evening B.S. and B.A. majors. Within the B.S. students, day students have higher average scores in every category than evening students. However, there appears to be no consistent difference when comparing day and evening B.A. biology majors.

Assessment indicators reported by ETS provide additional information about areas of strength and weakness. These are reported separately only for day and evening students and it is not possible to separate B.A. and B.S. achievement levels. In every category measured, day program students have higher average scores. Within the day program, the lowest scores are found in ‘Organismal-Plant’, which is not surprising given that few students take botany or other plant-focused coursework. In the evening program, the lowest scores are in ‘Biochemistry and Cell Energetics’ and in ‘Organismal-Plant’. The highest scores in both programs are in ‘Organismal-Animal’.

The truly good news is that average MFT scores for Columbia College have maintained their steady improvement over the past few years. The day program has achieved the 40th percentile on a national basis. In addition, six of nine assessment indicators are now above the 50th percentile level for the day program; last year none of these indicators exceeded this level. The Evening program has shown less dramatic improvement with only a 15th percentile rank. Two of nine assessment indicators are above the 50th percentile level for the first time. Both programs need significant improvement to meet or exceed the national average but progress appears to be consistent.

**Use of this information by the Science Department**

The issues identified by assessment mechanisms are the source of many discussions among science faculty. We continue to investigate ways to strengthen our students'
achievement throughout the science curriculum. A recent focus has been on preparing students in lower-level classes with the skills and information they will be asked to demonstrate and synthesize in upper-level classes. There hasn’t yet been time for recent changes to have a full impact on students who are graduating so it is difficult to assess progress.

Recommendations from previous assessment reports that have been implemented include:

- Basic skills such as applying statistics, using literature and writing formal lab reports are being more comprehensively introduced in lower-level courses so that students are better prepared for upper-level courses.
- Topics courses such as Soil and Water Ecology and Environmental Toxicology have been added to the schedule to increase the diversity of courses offered.
- All majors are now required to take Cell Biology to reinforce and deepen the cellular biology they are exposed to in their first semester biology class.
- Forensic science students have a degree-specific senior seminar course and no longer take the biology senior seminar unless they are getting a dual degree in both fields.

Recommendations for improvement

- Develop a new one-semester chemistry course for B.A. biology students that provides better background for their upper-level biology courses. Currently, B.A. biology students only take Chemistry I and students are not exposed to important information found in Chemistry II that is relevant to cell biology, physiology and other courses.
- Continue to enhance the rigor and consistency of coursework.
- Investigate further the different levels of achievement between day and evening B.S. biology students to determine if these reflect demographic factors or fundamental differences in the form and content of day and evening science classes.
CHEMISTRY PROGRAM ASSESSMENT

B.A. Degree in Chemistry

Academic Year: 2008-2009

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 Senior Seminar
2. Major Field Test results

Analysis of Information:
Five students completed CHEM 490 Senior Seminar and took the chemistry MFT test in 2008-2009. All of these students were dual majors with the forensic science degree.

The Assessment of Major forms indicate that chemistry students have undergone a rigorous program and most tend to be academically strong. However, lab skills, data analysis and equipment usage were areas of weakness identified by the instructor.

Average MFT scores were at the 25th percentile nationally and showed a relatively narrow range of variation. The mean score of 140 was slightly lower than last year, but this may not be significant because sample sizes in both years were quite small.

Subscores among the five students showed no particular pattern of strengths and weakness. Only two assessment indicators were reported for this test; students were strongest (mean of 49% correct) in biochemistry and appeared weak (mean of 31% correct) in critical thinking and reasoning.

Use of this Information by the Science Department:
Data regarding chemistry program outcomes is limited because of the small number of majors. However, it is clear that the program can be strengthened. Faculty discussions have centered on the need for additional chemistry faculty, more coursework and additional instrumentation, equipment and facilities.

Recommendations for Improvement:
- Continue to 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 more independently in the laboratory.
- Incorporated more sophisticated equipment and technology into courses.
- Add a chemistry faculty member with expertise in analytical and environmental chemistry.
- Develop a course in instrumental analysis.