College of Sciences & Mathematics
Chemistry & Biochemistry
Chemistry, BS/BA

Expected Outcome 1: Critical Thinking and Problem Solving Skills
Auburn University graduates majoring in chemistry and biochemistry will be able to solve open-ended problems, organize and interpret scientific findings and be able to critique work done by other scientists for quality and reliability.

Assessment Method 1: Self-assessment via graduating seniors exit interviews

Assessment Method Description
22 students who graduated (fall 2012 and spring 2013) were asked to evaluate themselves on the following topics.
   - Ability to locate, evaluate and use information resources
   - Ability to construct effective arguments in support of a position
   - Ability to critique someone else’s argument
   - Ability to read analytically and critically
   - Ability to generate solutions to open-ended or ill-defined problems

The students who took the survey were asked to measure their abilities based on the following rubrics; little or no ability, basic ability, intermediate ability or advanced ability.

Findings
The table below summarizes the students’ self-evaluation outcomes. The numerical number gives the number of students who assessed themselves against that specific grading rubric, the percentage of students is in brackets,
n =22. The mean is based on the average score calculated by using a score of 1 for little/no ability, 2 for basic ability, 3 for intermediate ability and 4 for advanced ability.

<table>
<thead>
<tr>
<th>Topic assessed</th>
<th>Little / no ability</th>
<th>Basic ability</th>
<th>Intermediate ability</th>
<th>Advanced ability</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ability to locate, evaluate and use information resources</td>
<td>0 (0%)</td>
<td>1 (4%)</td>
<td>5 (23%)</td>
<td>16 (73%)</td>
<td>3.68</td>
</tr>
<tr>
<td>Ability to construct effective arguments in support of a position</td>
<td>0 (0%)</td>
<td>1 (4%)</td>
<td>5 (23%)</td>
<td>16 (73%)</td>
<td>3.68</td>
</tr>
<tr>
<td>Ability to critique someone else’s argument</td>
<td>0 (0%)</td>
<td>1 (4%)</td>
<td>7 (32%)</td>
<td>14 (64%)</td>
<td>3.59</td>
</tr>
<tr>
<td>Ability to read analytically and critically</td>
<td>0 (0%)</td>
<td>1 (4.5%)</td>
<td>4 (18.2%)</td>
<td>17 (77.3%)</td>
<td>3.73</td>
</tr>
<tr>
<td>Ability to generate solutions to open-ended or ill-defined problems</td>
<td>0 (0%)</td>
<td>2 (9%)</td>
<td>6 (27%)</td>
<td>14 (64%)</td>
<td>3.55</td>
</tr>
</tbody>
</table>

**How did you use findings for improvement?**

Over 64 % of graduating seniors assessed themselves as having advanced ability in all the topics outlined in the table above. The department of chemistry and biochemistry will encourage more students to be proactive in engaging with faculty mentors so that they can be guided and helped to develop any deficiencies they have in the above mentioned topics.

**Additional Comments**
Expected Outcome 2: Effective Oral Communication Skills

Students will be able to prepare and give an oral presentation on chemistry and biochemistry topics.

Assessment Method 1: Research Seminar

Assessment Method Description

Chemistry and biochemistry majors (BS program) are required to do research and give an oral presentation of their work (CHEM 4950 class) before they graduate. This work is presented in departmental divisional seminars where faculty and students evaluate and make brief written comments on each speaker’s performance.

Findings

18 students presented their research work in divisional seminars for fall 2012 and spring 2013 and they were scored on the topics listed below. The scoring ranged from (1-5) with 1 being the worst and 5 being the best score.

Communication of the scientific significance and background knowledge of research work done or literature paper being presented

Content knowledge of the subject being presented

Clarity of the presentation

Quality of presentation

Quality of visual aids

The following grading rubric was used.

<table>
<thead>
<tr>
<th>Score</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Little ability</td>
</tr>
<tr>
<td>2.1</td>
<td>Basic ability</td>
</tr>
<tr>
<td>3.1</td>
<td>Intermediate ability</td>
</tr>
<tr>
<td>4.1</td>
<td>Advanced ability</td>
</tr>
</tbody>
</table>

The table below summarizes the students’ oral presentation evaluation.
The numerical number gives the number of students against that specific grading rubric, the percentage of students is in brackets, n = 18. The mean was then calculated; 1 for little ability, 2 for basic ability, 3 for intermediate ability and 4 for advanced ability.

<table>
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<tr>
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<tr>
<td>Communication of the scientific significance and background knowledge of research work</td>
<td>0 (0 %)</td>
<td>0 (0 %)</td>
<td>1 (6 %)</td>
<td>17 (94 %)</td>
<td>3.94</td>
</tr>
<tr>
<td>Content knowledge of the subject matter</td>
<td>0 (0 %)</td>
<td>0 (0 %)</td>
<td>6 (33 %)</td>
<td>12 (67 %)</td>
<td>3.67</td>
</tr>
<tr>
<td>Clarity of presentation</td>
<td>0 (0 %)</td>
<td>0 (0 %)</td>
<td>2 (11 %)</td>
<td>16 (89 %)</td>
<td>3.89</td>
</tr>
<tr>
<td>Quality of presentation</td>
<td>0 (0 %)</td>
<td>0 (0 %)</td>
<td>6 (33 %)</td>
<td>12 (67 %)</td>
<td>3.67</td>
</tr>
<tr>
<td>Quality of visual aids (slides, blackboard, PowerPoint etc.)</td>
<td>0 (0 %)</td>
<td>0 (0 %)</td>
<td>3 (17 %)</td>
<td>15 (83 %)</td>
<td>3.83</td>
</tr>
</tbody>
</table>

**How did you use findings for improvement?**

Over 67 % of students that presented their undergraduate research had advanced ability in all the 5 topics listed in the table above. Proposed action to increase the number of students having advanced ability in all the 5 areas listed above is to have a faculty member from each division give the first seminar at the beginning of semester (both fall and spring) where the topic of the seminar will focus on how to deliver an effective research seminar/talk.
Additional Comments

Assessment Method 2: Self-assessment via graduating seniors exit interviews

Assessment Method Description

22 students who graduated (fall 2012 and spring 2013) were asked to evaluate themselves on the following topics.

Ability to make an effective oral presentation

Ability to use technology to create visual materials of any kind (graphs, charts, figures, design)

Findings

The table below summarizes the students’ self-evaluation. The numerical number gives the number of students who assessed themselves against that particular grading rubric, the percentage of students is in brackets, n =22. The mean is based on the average score calculated by using a score of 1 for little/ no ability, 2 for basic ability, 3 for intermediate ability and 4 for advanced ability.

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<td>Ability to make an effective oral presentation</td>
<td>0 (0 %)</td>
<td>1 (4 %)</td>
<td>7 (32 %)</td>
<td>14 (64 %)</td>
<td>3.59</td>
</tr>
<tr>
<td>Ability to use technology to create visual materials of any kind (graphs, charts, figures, design)</td>
<td>0 (0 %)</td>
<td>3 (14%)</td>
<td>6 (27 %)</td>
<td>13 (59%)</td>
<td>3.45</td>
</tr>
</tbody>
</table>

How did you use findings for improvement?

64 % of graduating seniors assessed themselves as having advanced ability in oral presentation skills while 59 % thought they have advanced
ability in use of technology to create visual materials. Importance of using tables, figures, charts, graphs and other visual aids to communicate biochemical and chemical information will be emphasized more in upper level laboratory classes during write up / presentation of technical reports.

Additional Comments

Expected Outcome 3: Fundamental Understanding of Chemistry and Biochemistry Principles

Auburn University students majoring in chemistry and biochemistry will have a basic understanding of the fundamental laws of nature and have a mastery of basic principles which relate to chemical or biochemical reactions. Students will acquire basic knowledge and be able to explain or translate basic principles relevant to each specialty area (general chemistry, organic chemistry, inorganic chemistry, physical chemistry, analytical chemistry and biochemistry).

Assessment Method 1: Self-assessment via graduating seniors exit interviews

Assessment Method Description

22 students who graduated (fall 2012 and spring 2013) were interviewed on their overall satisfaction with the bachelors program. The questions asked were:
Ability to apply the scientific method
Ability to describe basic principles, laws and theories of one area of science
Ability to synthesize learning across multiple courses or experiences

The students who took the survey were asked to measure their abilities based on the following rubrics; little or no ability, basic ability, intermediate ability or advanced ability.

Findings

The table below summarizes the students’ self-evaluation. The numerical number gives the number of students who assessed themselves against that particular grading rubric, the percentage of students is in brackets, n =22. The mean is based on the average score calculated by using a score of 1 for little/ no ability, 2 for basic ability, 3 for intermediate ability and 4 for advanced ability.
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<tr>
<td>Ability to apply the scientific method</td>
<td>0 (0 %)</td>
<td>1 (5 %)</td>
<td>4 (18 %)</td>
<td>17 (77 %)</td>
<td>3.73</td>
</tr>
<tr>
<td>Ability to describe basic principles, laws and theories of one area of science</td>
<td>0 (0 %)</td>
<td>1 (5 %)</td>
<td>2 (9 %)</td>
<td>19 (86 %)</td>
<td>3.82</td>
</tr>
<tr>
<td>Ability to synthesize learning across multiple courses or experiences</td>
<td>0 (0 %)</td>
<td>3 (13.6 %)</td>
<td>5 (23 %)</td>
<td>14 (63.4 %)</td>
<td>3.50</td>
</tr>
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</table>

**How did you use findings for improvement?**

77 %, 86 % and 63 % of graduating seniors assessed themselves as having advanced ability in application of the scientific method, ability to describe basic principles, laws and theories of one area of science and ability to synthesize learning across multiple courses or experiences respectively. The department of chemistry and biochemistry does not intend to make any changes of the curriculum at this time however; one pedagogical suggestion will be to encourage more students to participate in peer-led study sessions outside class times. This will give students an opportunity to explain or teach their peers the chemical / biochemical concepts they have learned from faculty-led discussions (lecture classes).

**Additional Comments**

The chemistry and biochemistry department is looking into addition of questions that directly relate to (or specifically reflect to chemistry and biochemistry) into the graduating seniors exit surveys.
Assessment Method 2: American Chemical Society (ACS) standardized diagnostic exams

Assessment Method Description

American Chemical Society (ACS) standardized diagnostic exams will be given to graduating seniors to determine their knowledge of chemistry and biochemistry concepts learned throughout their undergraduate program. Fall 2012 / spring 2013 graduating seniors were not tested however we anticipate to devise an online testing mechanism starting fall 2014. The undergraduate program committee will meet later to discuss the specifics of how this will be accomplished.

Findings

none

How did you use findings for improvement?

Additional Comments