SUNY College at Brockport

General Education Natural Science Assessment (Outcome #2)

Instructions: Please provide the information requested in the form below and return to P. Michael Fox, Vice Provost for Academic Affairs, 618 Allen Administration Building. Fall assessments should be submitted in January 2015; Spring assessments in May 2015.

Department: Chemistry and Biochemistry
Course Reporting Data: CHM 121 Chemistry & Scientists

There are two General Education student learning outcomes for the Natural Sciences. Assessment data for the two outcomes are to be submitted on separate report forms.

Natural Science Student Learning Outcome #2:
Students are able to apply their knowledge of scientific data, concepts, and models in one of the natural sciences

Sources of Assessment Data on Outcome #2:
Data can be test scores from items on exams testing a specific understanding of the scientific method; data can also be scores on laboratory reports that evaluate students’ practical understanding of scientific method; or other sources as specified below.

Semester(s) in which reported assessment data were collected: Fall 2014 ☐ Spring 2015 X Both ☐

Below briefly describe how you collected these assessment data. What specific assessment methods—exams, assignments, lab reports, or other instruments did you use to acquire the data reported. Use of a scoring rubric is highly recommended for less-quantitative assessments.

• In Chem121, students were assessed on their understanding of the scientific method by answering questions on exams which target the five key steps of the scientific method. Moreover, as different topics and scientists are discussed, the instructor highlighted how each topic or particular scientist’s research relates back to the scientific method. To test the students’ understanding of this concept, students answered a series of short-answer questions comparing and contrasting law versus theory. This was covered on Exam 3.

• In order to assess students’ ability to properly apply math to given scientific scenarios, commonly performed calculations which are typically done in the chemistry laboratory were assessed. Each type of problem/calculation and on what exam it will be assessed are listed below. The questions consisted of simple short-answer mathematical problems (9/14) as well as short-answer problems where a written response was required. (5/14).

  • Finding volume of object when density and mass are known – Exam 1
  • Converting temperatures from Fahrenheit to Celsius – Exam 1
  • Conversions using the metric system – Exam 1
  • Finding molecular mass of a chemical compound – Exam 2
  • Converting grams to moles or moles to grams – Exam 2
  • Balancing chemical equations – Exam 2
  • Finding molarity of a solution – Exam 2
  • Finding pressure, volume, or temperature using various gas laws – Exam 3
  • Determining the pH of a solution if the hydrogen concentration is known – Exam 3
  • Determining if a hydrocarbon is saturated or unsaturated – Exam 3

Enter the total number of students from whom you collected the assessment data. N = 29
CHECK: Data are totals from a multi-section course? ☐ Data are only from one course/section? X
In the spaces provided below, enter the number of students (and percent of total) who scored in each of the achievement levels indicated:

<table>
<thead>
<tr>
<th>Achievement Level</th>
<th>Number of students who reached this level</th>
<th>Percent of total students assessed who reached this level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exceeded Criterion (A/B) 80-100 %</td>
<td>16</td>
<td>55.2%</td>
</tr>
<tr>
<td>Met Criterion (C) 70-79.99%</td>
<td>2</td>
<td>6.9%</td>
</tr>
<tr>
<td>Approached Criterion (D) 60-69.99%</td>
<td>6</td>
<td>20.7%</td>
</tr>
<tr>
<td>Did Not Meet Criterion (E) &lt;59.99%</td>
<td>5</td>
<td>17.2%</td>
</tr>
</tbody>
</table>

Closing the Loop Recommendations: After examining these assessment results, do you find any weaknesses in student performance on this specific student learning outcome that you plan to address by changes in course content, curricular emphasis, instructional approaches? If so, please describe the need for improvement and what you will do. Also, even if you have reached your desired criterion, you should have a plan to go beyond this level in the performance expectations on this outcome.

Based on my assessments, which mainly focused on students’ mathematical and reasoning skills to solve problems, a majority of the students (62.1%) met expectations. However, 37.9% of the students did not meet expectations. A desired outcome for this course is to have 90% of students meeting or exceeding expectations. With this in mind, the following activities/teaching approaches will be employed starting in Fall 2015.

- **Activity 1:** The lecture format will be slightly changed. Instead of working out problems and letting the students copy the instructor’s notes, students will see the problem and then be asked to solve the problem with a group of peers. This will compel the students to think about what is being asked in addition to what method or concept is needed to solve the problem. An added benefit is that I can see the mistakes being made early on and correct them instantaneously by interacting with the students instead of simply writing comments on an exam or quiz.

- **Activity 2:** To enhance the students’ math skills, the “Best Teaching Practice” of “Just In Time” will be used in conjunction with the Student Learning Center. Prior to my introduction of chemical math problems that uses algebraic manipulation and/or logs, I will ask the Student Learning Center to hold a workshop for my students showing how to rearrange linear equations and perform calculations using logs.

- **Activity 3:** Implementation of a variety of meta-cognition based self-learning techniques with the goal of enhancing students’ understanding and depth of knowledge in chemistry.
  1. Require students to write chapter summaries in their own words
  2. Require students to create a vocabulary notebook, where students define terms in their own words

- **Activity 4:** Incorporate confidence-building assignments which, based on my experience, greatly impacts how students perform in class
  1. Do multi-step complex problems in simple steps, and let the students guide themselves to the answer instead of being shown what to do.
  2. Design my lectures in a way that guides students to the answer or idea behind the concept instead of being lectured and told what the major theme for the day will be.

- These changes seem extensive, but each activity builds on one another; therefore, it is not very burdensome to implement. I know this because I successfully implemented these strategies in my summer course.