B.S. Environmental Science 2016-17 Learning Outcome Assessment Report

Learning Outcome 1 – Unit Conversion

Methods

We assessed students’ ability to properly implement unit conversions using samples of work from 16 students enrolled in GEL 5510 (Environmental Fate and Transport of Pollutants) during the Winter 2017 semester. GEL 5510 is a capstone course requiring students to apply knowledge and skills developed earlier in the Environmental Science course sequence.

The GEL 5510 assessment included four quiz questions requiring multiple unit conversion steps. The same quiz was given to students three times during the semester in January (second week of class), February, and April (final week of class) to assess their learning during the course. For each problem, the total number of correct unit conversions was counted and divided by the total number of unit conversions attempted. Problems or portions of problems not attempted by students were not included. In addition, the number of unit conversions that were documented (i.e., the student showed his/her work) and the number of unit conversions with correct problem setups were also counted and divided by the total number of unit conversions attempted. In this way, two performance metrics were generated: percentage of correct unit conversions and percentage of documented unit conversions.

Results

Using the final quiz as the one that will best approximate student learning, students completed 64% of unit conversions correctly. In the same sample set, students provided documentation of their work for 91% of their unit conversions. Documentation of conversions at 91% is comparable to the performance of students in the 2015-2016 assessment (96% documentation) and exceeds our stated goal (85%). However, the proportion of correct conversions (64%) is well below our stated goal of 85% and the performance of students in the 2015-2016 assessment (79%), although it is comparable to the performance of students in 2014-2015 (62%). Students showed notable improvement in unit conversions from the first week of class (24%) to the last week of class (64%). Notably, the assessment metrics used here were from an ungraded quiz, such that the students may have placed less effort into the assessment than in previous years.
Learning Outcome 2 – Ecological Writing

Methods

We assessed students’ ability to convey ecological concepts effectively in written form using samples of work from 12 Environmental Science majors enrolled in BIO 4130 (Ecology) during the Winter 2017 semester and 13 Environmental Science majors enrolled in BIO 5440 (Terrestrial Ecology) during the Fall 2016 semester. BIO 4130 is a formative intermediate course in which students solidify their understanding of ecological concepts. It is also the Environmental Science Program Writing Intensive course. BIO 5440 is a capstone course requiring students to apply ecological knowledge and analysis skills developed earlier in the Environmental Science course sequence to situations encountered in a field setting.

Assessment of student work in both courses involved the application of rubrics intended to measure both the students’ understanding of ecological concepts as well as their ability to communicate that understanding in written form. The BIO 4130 assessment involved the term paper (culmination of the Writing Intensive experience). The BIO 5440 assessment involved an open-ended essay question delivered as part of the course final exam in which students have to describe the ecological relationships exhibited and principles represented by ecological data.

Results

In the BIO 4130 sample set, 96% of student responses met or exceeded expectations for understanding of ecological concepts and written communication of ecological concepts. This exceeded our stated goal that 70% of students would meet or exceed expectations and was a significant improvement over the 2015-16 assessment for the same metric (77%). Writing mechanics and connections to related concepts were flagged as areas for future skill development among Environmental Science majors.
In the BIO 5440 sample set, 77% of student responses met or exceeded expectations for understanding of ecological concepts and written communication of ecological concepts. This was below our stated goal that 85% of students would meet or exceed expectations, and reduced from the 2015-2016 assessment (89%). Two areas stood out for future attention: correct usage of terminology associated with environmental concepts as well as basic writing mechanics (these were consistent with the 2015-16 assessment).

2017-18 Action Plan

As a consequence of the 2016-17 assessment results, four actions are planned for the 2017-18 academic year:

1. Continued emphasis on unit conversions will be placed in courses where unit conversion skills are developed and practiced including GEL 2130 (Mineralogy), GEL 3100 (Environmental Systems Analysis), GEL 5150 (Soils), BIO 5100 (Aquatic Ecology), and BIO 5440 (Terrestrial Ecology).
2. Continued emphasis on ecological writing, and in particular connections to related ecological concepts and practice with writing mechanics, will be stressed in BIO 3500 (Ecology and the Environment), BIO 4130 (Ecology), and BIO 5440 (Terrestrial Ecology).
3. A new learning outcome, focusing on the interpretation of environmental data and relationships among environmental variables displayed in figures and charts, will be assessed. This new learning outcome was scheduled for the current academic year but was delayed with replacement of the Program’s former Director.
4. An additional new learning outcome, focusing on the quantification of uncertainty and propagation of error in environmental calculations, will also be assessed.