



## Biology| 2015-2016 Assessment Report

1. Please give a brief overview of the assessment data you collected this year. This can be in any form you feel is appropriate, such as a table, a short narrative of results, statistical analysis, highlighting findings that were of particular interest, etc.

The Biology Disciplinary Unit assessed the following learning outcome during this review period:

**Describe the organization and diversity of life at levels of complexity from subcellular to ecosystem.**

Embedded assessments were implemented in Biology 201, a core course required by all Biology majors, by Dr. Pott (fall 2015 and spring 2016) and Dr. Mueller (fall 2015).

A pre-test with 15 questions related to our learning objective was delivered during the first week of class. The same questions were included on the final exam, but each faculty member created their own set of questions. Only students that completed both the "pre-test" and the "post-test" questions are included in the analyses.

Results from Dr. Pott's sections (fall 2015 and spring 2016):

In both semesters, the average score for students approximately doubled. The ratios of post-test score over pre-test score (averages: fall 2015 = 2.12, spring 2016 = 2.29) were not significantly different between semesters (Two-Sample unequal Variance T-Test of Ratios F15 vs. S16:  $p=0.27$ ). For a fair comparison of the two semesters (two student populations) Pott analyzed the same 15 questions for each semester. The average increase in the fraction of correct answers was 0.35 (35 %) in the fall of 2015 and 0.32 (32 %). These increases were not significantly different between semesters (Two-Sample equal Variance T-Test of Post- minus Pre-test Fraction Increases F15 vs. S16:  $p=0.47$ ). On average the fraction of correct answers doubled from pre- to post-test in both semesters.

In both semesters a highly significant improvement of both the test results of participating students and the fractions of correct answers occurred from the beginning to the end of the semester, indicating significant student learning. Moreover, the performance of the students in both semesters was not significantly different.

Results from Dr. Mueller's section (fall 2015):

The mean number of correct answers on the "pre-test" was 6, while the mean number of correct answers on the "post-test" was 11: a 1.8 fold improvement. In terms of individual questions, the fold-improvement ranged from 1.1 to 7.8. The questions with the greatest fold-improvement typically were those in which the students scored very poorly in the pretest and improved on the post-test. For example, on the pre-test, only 7% of the student correctly answered question #9, while 57% got that question correct on the post-test. Conversely, for questions with the more

modest improvement, the students typically scored correct on the pretest, meaning that there was little room for improvement. For example, question 13 went from 94% correct to 100% correct.

2. How will you use what you've learned from the data that was collected?

Despite the overall improvement on all questions, the assessment helped identify two complex concepts for which students did not reach the desired level of understanding in Bio-201. The first is in the area of energy metabolism. The second area is related to genome organization.

Instructors of Biology 201 have discussed results of these assessments and plan to commit additional class time and review sessions to emphasize concepts in these two areas. Pott and Mueller intend to continue the embedded assessment in future classes to monitor changes in learning based on increased attention given to these concepts. In addition, the questions used to assess genome organization will be modified to better reflect general understanding, since the question used was possibly too specific.

The fact that Bio-201 is taught by two instructors requires that the instructors communicate with each other on a regular basis so that students experience equivalent instruction. In order to compare outcomes in both sections of the class, using the same pre- and post-test in both sections would be advantageous. Instructors plan to discuss which level of student performance in the Bio-201 class is acceptable. Pott and Mueller will share results from this assessment and discuss strategies to implement changes at the first Biology Faculty meeting of fall 2016.