



## Environmental Science | 2014-2015 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. You will, however, likely want to submit results for each learning outcome you assessed this year individually.

This year, faculty in the Department of Natural and Applied Sciences (NAS) have chosen to assess the following learning objective for majors in the Environmental Science major: Environmental Science Learning Outcome 5: **Demonstrate competency in collecting, managing, evaluating, interpreting, and communicating information through hands-on research.**

All students in the core course Principles of Ecology (ENV SCI 302) are required to collect original field data, enter and manage these data, statistically analyze the results, and interpret statistical outcomes in 5 separate field exercises. Evidence that the students have successfully completed these exercises is provided by written lab reports, in addition to an oral presentation on one of these projects given in class at the end of the semester. Among the 23 students enrolled in Env Sci 302 during spring semester 2015, all students completed satisfactory reports, with scores ranging from 70% to 100%, with a mean score of 88%.

In addition to the lab reports, two questions were imbedded in written examinations during the semester (Exam 1 in September) and on the final exam in May. The purpose of these questions was to test the competency of students in evaluating and interpreting quantitative information.

*Question 1: Researchers are interested in the effects of average forest tree diameter (a variable associated with forest age) on the weight gain in nesting red-bellied woodpeckers. Nests were found in 20 different-aged forests with different average tree diameters. Weight gain in nestlings was measured from 1 June through 1 July in each sample forest. Which statistical test would be most appropriate for analyzing the effect of average forest tree diameter on woodpecker weight gain?*

1. t-test
2. ANOVA
3. linear regression
4. Chi<sup>2</sup> test of association
5. correlation

The correct answer is c, linear regression, because we are interested in predicting woodpecker weight gain from average tree diameter. We are interested in more than just the association (or correlation) between these two variables; we want to know how average tree diameter affects woodpecker weight gain, not vice-versa.

Question 2: *A statistical test of differences in mean leaf area between two groups of plants yielded a p-value of 0.02. According to the convention used by most scientists, this result would lead to the conclusion that:*

6. the null hypothesis should be rejected/
7. the difference in means between the two groups is approximately 20%.
8. the differences between the two groups is statistically insignificant.
9. There is a positive correlation between these two groups.
10. The difference in means between these two groups is approximately 2%.

The correct answer is a.

Among the 23 students enrolled in this class, 12 answered both questions correctly on the first exam, 7 answered one of the two correctly, and 4 answered both questions incorrectly. On the final exam, an almost identical outcome was recorded. Among 22 students taking the final exam, 12 answered both questions correctly, 7 answered one of the two correctly, and 4 answered both questions incorrectly. Although this result represents no significant improvement, the students were taught relevant information before the first exam, and they would have studied this material in preparation for this test. The results on the final exam show that this learning was retained during the semester.

2. How will you use what you've learned from the data that was collected? Some examples are: particular improvements to the curriculum, incorporation of a different pedagogy, a change in assessment plan for the following year in order to obtain more specific feedback, better information or a better response rate, a determined need for faculty development in a particular area, better career alignment, a faculty retreat to discuss the data and how best to use it, etc.

Faculty in NAS have recognized that students at UWGB (and most other institutions) tend to be weak in quantitative statistics and data analysis, especially when the data are original and not intuitively predictable. We have built in exercises in our statistics and other courses (like ENV SCI 302) to help provide a better foundation for quantitative analysis. Environmental Science Learning Outcome 5 reflects this objective. The fact that some students (even if a relatively small percentage) still have trouble answering fundamental analytical questions like these reinforces our efforts to provide hands-on science exercises in core courses. If anything, we need to increase these types of exercises and we need to better emphasize the quantitative/analytical elements of these projects. NAS faculty have recently added a new 2 credit advanced statistics core requirement for Environmental Science majors, intended to address parts of learning objective 5.