Bergen Community College

Assessment Report for the Biology Department.

Academic Chair: Dr. Robert Highley.

Assessment Period: Fall 2010 – Spring 2012

Review Leader: Charles Sontag, Ph. D.

Course included in the scope of the review: Biology 108, Introduction to Environmental Biology.

1) Intended Outcomes:

(1) Identify the components of an ecosystem and investigate how they interact. Assessment will be based upon performance on exam questions.

2) Identify the components of an ecological community and population ecology and analyze how it relates to human population growth.

(3) Identify and explain predator prey relationships. Assessment will be based on lab quizzes, lab book checks and observation in the lab.

2) General Education Requirements to which the intended outcome relates.

(1) Quantitative Knowledge and Skills.
Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.

(2) Scientific Knowledge and Reasoning.
Students will use the scientific method of inquiry, through the acquisition of scientific knowledge.

(3) Historical Perspective.
Students will understand historical events and movements in World, Western, non-Western or American societies and assess their subsequent significance.

3) Sections of the Strategic Plan to which the intended outcomes relates:

(1) We will improve student engagement and student success.

Goal 1.3; Help students better navigate the college experience through the focused coordination and development of student … support services.

(2) We will promote a fully engaged and empowered faculty … who are firmly committed to the success of our students and to fully realizing the College's mission.

Goal 2.2 suggests a need to "Build community and to improve two way communication on the campus through the development of … dialogues process.

(3) We will expand and improve our key programs and processes.

Goal 3.1 states a need to renew academic programs.

4) Means of assessment.

The lab used an analogue, mechanical simulation to describe the relationship of Lynx and Hare over 20 years. Students worked in pairs. A Petri dish was used as a model forest in which both the Lynx and the Hare inhabit. The Hare were represented with 5mm plastic beads. The Lynx were represented by decorated plastic spoon in which the face of a ferocious Lynx had been drawn on the underside of the bowl.

The Students acted as the Lynx (spoon) each turn by blindly scooping up as many Hare (beads) as they could in the Forest (Petri dish).

Each turn, the number of Hare doubled from the number of survivors of the prior turn, with a minimum of 10 and a maximum of 100. The assumption stated is that an empty forest attracts immigrating Hare and overpopulated forest encourages emigration. The number of Lynx is determined by consequence of the hunt from the prior turn. Each Lynx has to capture a minimum of 5 Hare to survive the year. For every 5 Hare captured, a new Lynx is born. If the population of Lynx went extinct, a new Lynx immigrated to the forest.

The student completed 20 years or turns and then plotted the populations on a logarithmic graph.

We chose to use an analogue mechanical simulation over a computer simulation for several reasons.
(1) It is inexpensive and we don't have to pay a licensing fee.
(2) It is an active, tactile event that requires participation of both students in each pair.
(3) Computer simulations can encourage passivity of one or both students whereas this simulation requires them to calculate the populations each turn.
(4) Labs are one of the primary ways for Kinesthetic Learners to master a subject and an analogue mechanical simulation encourages Kinesthetic Learning.

Assurance that the quiz is a valid assessment.

We used the attached quiz based on established questions found at the back of the lab while including a data set for the students to plot. To compare student achievement between instructors, the same quiz was administered to all students, graded by one instructor when possible, to normalize instructor differences. The results of all quizzes were quantified and analyzed to compare teacher effectiveness.

Criterion for success of students.

Overall 70% of the students will pass the quiz. The quizzes were given either the week of the lab, at the end of the lab by two professors or the week after the lab in the case of one.

All three instructors use a 90 +: A, 80 - 89: B, 70 - 79: C, 60 - 69: D grading scale. A total of 7 labs were evaluated. An average for the lab of above 70% was considered successful.

5) Summary of the results.

Here are the overall results for each class: 85.3%, 82.7%,84.3%, 75.95%, 74.6%, 72%, and 77%.

Question 1: Overall 90% were able to answer this question correctly. Most students were able to accurately plot the logarithmic graph. Several students didn't even attempt to complete the graph.

Question 2: Overall 60% were able to answer this question correctly. Sadly, this question gave many students trouble.

Question 3: Overall 30.3 % and 42% were able to answer this question correctly and partially. Many students had trouble with the "Why?" question.

Question 4: Overall 79% were able to answer this question correctly.

Question 5: Overall 92% were able to answer this question correctly.

Question 6: Overall 80.3% were able to answer this question correctly.

Question 7: Overall 91% were able to answer this question correctly. This is a topic that one Professor spent some time discussing with the class and was pleased with the results.

6) Recommendations.

The desired results were met. The design of the lab encourages active participant learning and draws on the disciplines of biology, environmental science, population biology and mathematics. The students analyze the data constructing a logarithmic graph that allows them to note the sinusoidal nature of population fluctuations and note the Π/2 offset between prey (leading) and predator (following) populations. This information allowed the professor to re-enforce the description of population biology in environmental biology as a discipline of science in which predictions can be hypothesized and tested.

When you look at the results from Questions 2 & 3, there were some problems with student comprehension.

Question 2, "Which population (predator or prey) shows the second increase in numbers?" This question determined if the student understood that the prey's population directly controlled the birth and death rates of predator.

Question 3, "Does a peak in Lynx Population occur simultaneously as or after the hare population? Why?" The populations of predator and prey tend to oscillate in a sinusoid wave with the predators peak occurring Π/2 after the peak of prey. This question determined if the student understood that we could use one population to predict the outcome of another.

All professors had averages above 70%. We might improve this by focusing on some of the key mathematical concepts instead of assuming that the students were ready to do these problems.

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