Detailed Assessment Report

As of: 5/08/2015 04:01 PM EDT

2012-2013 Biology BA & BS

(Includes those Action Plans with Budget Amounts marked One-Time, Recurring, No Request.)

Mission / Purpose

The Biology program's mission is to prepare students for professional careers in areas such as medicine, veterinary medicine, dentistry, optometry and biology, and for acceptance into advanced graduate degree programs. The mission is consistent with the IU Kokomo Mission Statement.

The goals for attaining these objectives and the relationship of these goals pertaining to the overall campus mission are indicated below. The goals prepare students for professional careers in areas such as medicine, veterinary medicine, dentistry, optometry and biology, and for acceptance into advanced graduate degree programs.

Goals

G 1:Goal 1. Content

Goal 1. Content

G 2:Goal 2: Methodology

Goal 2: Methodology

G 3:Goal 3; Impact on Biodiversity

Goal 3: Impact on Biodiversity

G 4:Goal 4: Unifying Principles within Biodiversity

Goal 4: Unifying Principles within Biodiversity

Student Learning Outcomes/Components, with Any Associations and Related Artifacts/Objects, Benchmarks, Findings, and Action Plans

S 1:Goal 1, Outome 1, Component 1

Goal 1, Outcome 1: Students will describe the phylogenetic interrelationships between living organisms.

Component: observation

S 2:Goal 1, Outcome 1, Component 2

Goal 1, Outcome 1: Students will describe the phylogenetic interrelationships between living organisms.

Component: evaluation.

S 3:Goal 1, Outcome 1, Component 3

Goal 1, Outcome 1: Students will describe the phylogenetic interrelationships between living organisms.

Component: comparison

S 4:Goal 1, Outcome 1, Component 4

Goal 1, Outcome 1: Students will describe the phylogenetic interrelationships between living organisms.

Component: data collection

S 5:Goal 1, Outcome 1, Component 5

Goal 1, Outcome 1: Students will describe the phylogenetic interrelationships between living organisms.

Component: interpretation

S 6:Goal 1, Outome 2, Component 1

Goal 1, Outcome 2: Students will describe chemical and molecular processes fundamental to living organisms.

Components: experimentation, measurement, data collection, interpretation, evaluation.

S 7:Goal 1, Outcome 1

Students will describe the phylogenetic interrelationships between living organisms.

Components: observation, comparison, data collection, interpretation, evaluation.

S 8:Goal 1, Outcome 2

Students will describe chemical and molecular processes fundamental to living organisms.

Components: experimentation, measurement, data collection, interpretation, evaluation.

S 9:Goal 1, Outcome 3

Students will describe the biological world and its relationship to basic human needs and activities.

Components: measurement, data collection, observation, evaluation, calculation.

S 10:Goal 1, Outcome 4

Students will describe the interaction of plants, animals, microorganisms and their environment.

Components: measurement, data collection, observation, evaluation, calculation.

S 11:Goal 1, Outcome 5

Students will describe the cellular and molecular basis of genetics.

Components: measurement, data collection, observation, evaluation, calculation.

S 12:Goal 2, Outcome 1

Students will apply the methods biologists use to explore living organisms.

Components: observation, hypothesis development, measurement and data collection, experimentation, evaluation of evidence, employment of mathematical analysis.

S 13:Goal 2, Outcome 2

Outcome 2: Students will evaluate the outcomes of scientific experiments.

Components: observation, hypothesis development, measurement and data collection, experimentation, evaluation of evidence, employment of mathematical analysis.

S 14:Goal 3, Outcome 1

Outcome 1: The students will discuss the effect of the natural environment on humans.

Components: measurement, data collection, observation, evaluation, calculation.

S 15:Goal 3, Outcome 2

Outcome 2: The students will evaluate the implications of human modification of the environment.

Components: measurement, data collection, observation, evaluation, calculation.

Related Artifacts/Objects:

A 1:MICR-M 310 Exam
Goal 3, outcome 2 (component is "evaluation")

An exam question in MICR-M 310 Microbiology consisted of the following:

- Climate change has been associated with emerging and re-emerging infections. How is that possible? Briefly explain with one example.

In class, we discussed the impact of human activities on climate change. We looked into issues such as CO2 emission and CH4 (methane) production, especially as it relates to farming practices. Changes in climate and climatic patterns have been associated with the spreading of diease vectors (such as mosquitoes and ticks) to new and different areas. Climate change also relates to flooding and infrastructure disruption (e.g., sewage, potable water). I wanted students to relates these patterns of disruption to some possible increase in infections such as Lyme Disease (tick-borne) or waterborne infections.

I assessed the ability of students to evaluate the relationship between climate change and the (re) emergence of infectious diseases into new areas. I wanted to ascertain that they understood the relationship between human activities and disease patterns.

The performance criterion was "correct/incorrect" for their answer and the benchmark was 70%.

Overall, 15 out of 24 students (62.5%) answered the questions absolutely "correctly" with all or most of the elements I was looking for. This is a bit lower that the 70% benchmark. Next time, I perhaps need to have an in-class assignment question that will emphasize these associations or similar ones. Perhaps, with some group work, they will understand this better. This is actually an interesting and important aspect of the material and I may need to devote more class time to it.

Source of Evidence: Writing exam to assure certain proficiency level

Benchmark:
70%

A 2:Exam in BIOL-L 403
Goal 3, outcome 2 (component is "evaluation") An exam question in BIOL-L 403 Biology Seminar consisted of the following:

- What is the "Green Revolution"? What is the impact, if any, of the Green Revolution on: 1) human; 2) life expectancy; and 3) biodiversity?
The Green Revolution refers to a series of changes in agricultural practices that started about 50 or 60 years ago. It includes the growth of high-yielding cereals, the large-scale use of pesticides and fertilizers, hybridized seeds, and large monocultures to name a few. Although beneficial in many ways (increased food production), there are trade-offs and human health has been arguably impacted by these practices in the form of cancers, increased diabetes, and possible allergies. Ecological issues have been documented as well and include soil erosion, aquifer depletion, pollution, and loss of animal/plant diversity (interesting both wild and domestic). Students in this capstone course were expected to understand these issues thoroughly and to be able to articulate the rationale for these changes, especially as it relates to biodiversity.

The performance criterion was "correct/incorrect" for their answer and the benchmark was 70%.

Overall, 8 out of 16 students (50%) answered the questions absolutely "correctly" with all or most of the elements I was looking for. I think the students' answers showed a good understanding of the root of the problem, but not a thorough analysis of the impact on biodiversity. Since this is a capstone course, the biology program as a whole probably needs to address issues of biodiversity more completely in additional courses.

Source of Evidence: Writing exam to assure certain proficiency level

S 16:Goal 3, Outcome 3

Outcome 3: The students will assess the consequences of the modifications.

Components: measurement, data collection, observation, evaluation, calculation.

Related Artifacts/Objects:

A 3:PHSL-P 416

Comparative Animal Physiology PHSL-P 416 - Assessment

Instructor: Michael S. Finkler

Goal: Impact on Biodiversity

Outcome: The students will evaluate the implications of human modification of the environment on vertebrate taxa

Activity: Lecture Exam Question -- Influence of anthropogenic environmental contaminants on physiological systems

Source of Evidence: Writing exam to assure certain proficiency level

Understanding human impacts on biodiversity often requires understanding how changes made by humans to the environment alters the biochemistry of living organisms in ways that can profoundly influence the ability of the organisms to survive and reproduce. Investigations into environmental toxicology bridge the traditional disciplines of environmental science and physiology. In this assessment question, I wanted to test student's application of concepts introduced in class (mechanisms by which hormones induce physiological responses) to understanding how endocrine-disrupting contaminants can offset the physiology of organisms.

In the third lecture exam, I included the following question:

Polychlorinated biphenols (PCB's) are widespread nonpolar environmental contaminants that, among other toxicological effects, disrupt sexual development. Populations of turtles and alligators exposed to PCBs tend to have proportionately more females and "intersex" individuals, and males in these populations have lower circulating levels of testosterone and other androgens. A key potential target for PCBs is the enzyme aromatase, which converts androgens into estrogens.
Given the above, (A) **describe how you would expect aromatase activity to change in response to PCB exposure to account for the shift in the sex ratio,** and (B) provide a general mechanism for how PCB could change aromatase activity in cells exposed to it.

The first part of this question is the subject of the assessment. Aromatase activity would INCREASE with increased PCB exposure. Female characters are increased and male characters are reduced within populations exposed to PCBs. As aromatase converts androgens (responsible for male characteristics) into estrogens (responsible for female characteristics), an increase in aromatase would account for such an effect.

Components

I assessed the ability of the students to evaluate observations regarding changes in population sex distributions and predict a correlating change in an enzyme that would explain the observation. The following performance criteria were used to evaluate the components.

· Correct/incorrect

The benchmark for the question was 70%

Analysis:

Out of 13 students, ten (77%) correctly answered that aromatase activity increases with increased PCB exposure. The benchmark performance for this particular assessment, therefore, was met. However, one of students who answered correctly also stated (incorrectly) that PCBs contain aromatase. Of those students who answered incorrectly, two stated that aromatase activity decreased with PCB exposure, and one failed to answer how aromatase activity would change (i.e., she stated it would "change", but never indicated whether it would increase or decrease).

S 17:Goal 4, Outcome 1

Outcome 1: The students will explain similar/identical features of living systems.

Components: observation, comparison, data collection, interpretation, evaluation.

S 18:Goal 4, Outcome 2

Outcome 2: The students will explain biodiversity.

Components: observation, comparison, data collection, interpretation, evaluation.

Analysis Questions and Analysis Answers

What did you learn about your students' learning from the assessment process in the most recent year?

We learned that a significant proportion of our biology majors were not sufficiently familiar with the overall concept of biodiversity and how it can be impacted in many different ways (including by human activity).

How widely and frequently have these results been discussed with your program faculty?

The results have been shared in a biology faculty meeting. We will engage in a long-term discussion to remediate this problem.

What do these results mean for your program?

Biodiversity (and impact on biodiversity) needs to be more emphasized across the biology curriculum, and not just in a few courses. We probably need more discussion time and perhaps some in-class assignments in several classes to more broadly address these goals/components.

What are your next steps going forward?

The biology faculty will work on a curriculum map which will highlight courses (and areas) in which biodiversity could be more greatly emphasized.