Mission Statement

Changes

   Based on examination of direct and indirect measures of student understanding of the scientific method, evolution, and the impact of biology on human affairs, the biology faculty have decided to implement several changes.
   1. Increased use of primary scientific literature in most classes will attempted.
   2. More explicit consideration of the scientific method will be used in most classes.
   3. We will consider requiring all majors to take a seminar/literature based course. Implementation of this one is tricky, and we will review this this year.
   4. Biology 101 and Biology 161 will be modified slightly, to include more case studies/experimental studies in order to reinforce the critical thinking emphasis better.

Recommendations

   Use of indirect measures for the 1st 4 SLOs. These can be included in the IDEA form easily.

Comments

   We don't have a departmental mission statement. This will be addressed Fall 2009.
Goal Number 1
Increase budget to match needs better

Report Comments

Goal Measures Combined
• Comparison of annual budgets

Frequency
Annually

Goal Number 2
Reduction of average class size to 24 from its current 28 (or so)

Report Comments
Not much progress on this. High enrollments continue.

Goal Measures Combined
• Examination of class sizes

Frequency
Each semester
Department Name: Biology  
Program Name: Biology  
Department Chair: Paul Gier  
Academic Year: 2008-09

Goal Number 1

demonstrate an understanding of the concepts and principles of cell biology

Report Comments
MFT Subsection 1 score was 45.5, improved from 39.9 in the previous year.
Cell Biology final exam average score was 78.

Goal Measures Combined
- MFT Subsection 1
- Average Final Exam Score in BIOL 322, Cell Biology

Frequency
Annually, but only once per student; each semester the course is taught

Goal Number 2

demonstrate an understanding of the concepts and principles of molecular biology and genetics

Report Comments
MFT subsection 2 score was 51.4, improved from 38 in the previous year.
Genetics final exam average was 82.

Goal Measures Combined
- MFT Subsection 2
- Average Final Exam Score in BIOL 231, Genetics

Frequency
Annually, but only once/student; each semester the course is taught

Goal Number 3

demonstrate an understanding of the concepts and principles of organismal and evolutionary biology

Report Comments
MFT subsection 3 score was 52, improved from 40.4 in the previous year.
Zoology final exam average score was 81.
Botany final exam average score was 71.

Goal Measures Combined
- MFT Subsection 3
- Average Final Exam Score in BIOL 202, General Biology - Zoology
- Average Final Exam Score in BIOL 227, General Biology - Botany

Frequency
Annually, but only once/student; each semester the course is taught
**Goal Number 4**
demonstrate an understanding of the concepts and principles of population biology and ecology

**Report Comments**
MFT subsection 4 score was 52.6, improved from 45.1 in the previous year. Ecology final exam average score was 77.

**Goal Measures Combined**
- MFT Subsection 4
- Average Final Exam Score in BIOL 336, Ecology

**Frequency**
Annually, but only once/student; each semester the course is taught

**Goal Number 5**
demonstrate an understanding of the biological sciences’ impact on environmental and human affairs

**Report Comments**
Average % correct on embedded final exam questions in Bio 101 and Bio 161 was 74.8. Average IDEA response in Bio 101 and Bio 161 to the statement "This course was effective in building an appreciation of the Biological sciences' role in environmental and human affairs" was 4.0.

**Goal Measures Combined**
- Embedded final exam questions in BIOL 101, Principles of Biology (direct)
- Embedded final exam questions in BIOL 161, Environmental Science (direct)
- IDEA Form questions (indirect)

**Frequency**
Each Semester

**Goal Number 6**
demonstrate an ability to: • apply and communicate the scientific process • use critical thinking skills

**Report Comments**
Embedded final exam questions in Cell Biology had correct responses by 92% of the students for the first question, and 69% correct for the second question, overall 81% correct. Average IDEA response in Bio 101 and Bio 161 to the statement "This course was effective in building an understanding of the scientific method" was 4.1. MFT indicator 9, which reports average % correct on questions requiring analytical skills, was 54, up from 38 in the previous year. MCAT/DAT results not fully collated.

**Goal Measures Combined**
- Embedded final exam questions in BIOL 322, Cell Biology (direct)
- IDEA Form questions (indirect)
- MCAT/DAT results (verbal reasoning, direct)
- MFT indicator 9

**Frequency**
Each semester as data become available; annually
Mission Statement

Changes

Based on examination of direct and indirect measures of student understanding of the scientific method, evolution, and the impact of biology on human affairs, the biology faculty have decided to implement several changes.

1. Increased use of primary scientific literature in most classes will be attempted.
2. More explicit consideration of the scientific method will be used in most classes.

Recommendations

Use of indirect measures for the 1st 4 SLOs. These can be included in the IDEA form easily.
More clear distinction between the SLOs for Cell Biology.

Comments

We will develop a mission statement Fall 2009
Department Name Biology
Program Name Cell Biology
Department Chair Paul Gier
Academic Year 2008-09

Goal Number
ReportComments
GoalMeasuresCombined
Frequency
Department Name Biology
Program Name Cell Biology

Department Chair Paul Gier
AcademicYear 2008-09

Goal Number 1
demonstrate an understanding of the concepts and principles of cell biology

Report Comments
MFT Subsection 1 score was 51.5, improved from 49.7 in the previous year.
Cell Biology final exam average score was 78.

Goal Measures Combined
• MFT Subsection 1
• Average Final Exam Score in BIOL 322, Cell Biology

Frequency
Annually, but only once/student

Goal Number 2
demonstrate an understanding of the concepts and principles of molecular biology and genetics

Report Comments
MFT subsection 2 score was 51.5, improved from 45.7 in the previous year.
Genetics final exam average was 82.

Goal Measures Combined
• MFT Subsection 2
• Average Final Exam Score in BIOL 231, Genetics

Frequency
Annually, but only once/student

Goal Number 3
demonstrate an understanding of the concepts and principles of organismal and evolutionary biology

Report Comments
MFT subsection 3 score was 47.7, improved from 43.6 in the previous year.
Zoology final exam average score was 81.
Botany final exam average score was 71.

Goal Measures Combined
• MFT Subsection 3
• Average Final Exam Score in BIOL 202, General Biology - Zoology
• Average Final Exam Score in BIOL 227, General Biology - Botany

Frequency
Annually, but only once/student
Goal Number 4  
demonstrate an understanding of the concepts and principles of population biology and ecology

ReportComments  
MFT subsection 4 score was 52.7, improved from 43.1 in the previous year.  
Ecology final exam average score was 77.

GoalMeasuresCombined  
• MFT Subsection 4  
• Average Final Exam Score in BIOL 336, Ecology

Frequency  
Annually, but only once/student

Goal Number 5  
demonstrate an understanding of the biological sciences' impact on environmental and human affairs

ReportComments  
Average % correct on embedded final exam questions in Bio 101 and Bio 161 was 74.8.  
Average IDEA response in Bio 101 and Bio 161 to the statement "This course was effective in building an appreciation of the Biological sciences' role in environmental and human affairs" was 4.0.

GoalMeasuresCombined  
• Embedded final exam questions in BIOL 101, Principles of Biology (direct)  
• Embedded final exam questions in BIOL 161, Environmental Science (direct)  
• IDEA Form questions (indirect)

Frequency  
Each semester

Goal Number 6  
demonstrate an ability to: • apply and communicate the scientific process • use critical thinking skills

ReportComments  
Embedded final exam questions in Cell Biology had correct responses by 92% of the students for the first question, and 69% correct for the second question, overall 81% correct.  
Average IDEA response in Bio 101 and Bio 161 to the statement "This course was effective in building an understanding of the scientific method" was 4.1.  
MFT indicator 9, which reports average % correct on questions requiring analytical skills, was 54, up from 38 in the previous year.  
MCAT/DAT results not fully collated.

GoalMeasuresCombined  
• Embedded final exam questions in BIOL 322, Cell Biology (direct)  
• IDEA Form questions (indirect)  
• MCAT/DAT results (verbal reasoning, direct)  
• MFT indicator 9

Frequency  
Each semester, as data become available; annually
<table>
<thead>
<tr>
<th>Teacher</th>
<th>Course</th>
<th>Term</th>
<th>Embed-Sci</th>
<th>IDEA-Sci</th>
<th>Embed-Evo</th>
<th>IDEA-Evo</th>
<th>Embed-Eco</th>
<th>IDEA-Eco</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daniels</td>
<td>101</td>
<td>Fall '08</td>
<td>61</td>
<td>4.1</td>
<td>77</td>
<td>3.7</td>
<td>72</td>
<td>3.7</td>
</tr>
<tr>
<td>Dudley</td>
<td>101</td>
<td>Fall '08</td>
<td>86</td>
<td>4.6</td>
<td>49</td>
<td>4.3</td>
<td>45</td>
<td>4.2</td>
</tr>
<tr>
<td>Gier</td>
<td>101</td>
<td>Fall '08</td>
<td>72</td>
<td>4.2</td>
<td>62</td>
<td>3.7</td>
<td>93</td>
<td>4.5</td>
</tr>
<tr>
<td>Guthrie</td>
<td>101</td>
<td>Fall '08</td>
<td>81</td>
<td>4.5</td>
<td>91</td>
<td>4.6</td>
<td>82</td>
<td>4.3</td>
</tr>
<tr>
<td>Guthrie</td>
<td>101</td>
<td>Spring '09</td>
<td>81</td>
<td>4.2</td>
<td>91</td>
<td>4.1</td>
<td>86</td>
<td>4.2</td>
</tr>
<tr>
<td>Daniels</td>
<td>161</td>
<td>Spring '09</td>
<td>3.8</td>
<td>3.3</td>
<td>3.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gier</td>
<td>161</td>
<td>Fall '08</td>
<td>68</td>
<td>4.2</td>
<td>90</td>
<td>4.1</td>
<td>69</td>
<td>4.4</td>
</tr>
<tr>
<td>Tubbs</td>
<td>161</td>
<td>Spring '09</td>
<td>89</td>
<td>3.5</td>
<td>89</td>
<td>3</td>
<td>79</td>
<td>3.6</td>
</tr>
</tbody>
</table>

### Scientific Method

![Scientific Method Diagram](image)

### Evolution

![Evolution Diagram](image)

### Human Impact

![Human Impact Diagram](image)
Hey Topher,

Here are the idea results for the extra questions for biol161 in spring 2009. I can't find my copy of the questions...I know Paul still has them somewhere

question 48  3.8 sd=0.8
question 49  3.3 sd=1.1
question 50  3.4 sd=1.2

I forgot to include any standardized questions for assessment on the final. So have no information for you in that regard...my bad.
Topher,
I think I have all the information you requested, but I only have the embedded question data from my own classes; I don't have the data from our colleagues. Here goes:

1. Average Biol 202 final exam score, spring 2009: 81% (based on 43 tests).

2. Average scores on embedded questions in final exams for Bio 101 and Bio 161, fall 2008: see two attached files.

3. Average of the first three "additional questions" on the IDEA forms for my fall classes. What I think you're looking for there are questions 48-50 (please let me know if I'm wrong), and the results are (numbers are averages):
   Biology 101, fall 2008:
   q48: 4.2
   q49: 3.7
   q50: 4.5

   Biology 161, fall 2008:
   q48: 4.4
   q49: 4.1
   q50: 4.0

   Biology 103, fall 2008 Monday section:
   q48: 4.0
   q49: 4.0
   q50: 3.7

   Biology 103, fall 2008 Tuesday section:
   q48: 4.5
   q49: 4.4
   q50: 4.6

   Biology 103, fall 2008 Wednesday section:
   q48: 4.3
   q49: 3.9
   q50: 4.7

Sorry you have to do all this during summer! Hope you're family's doing well!

Paul
Biology 101 Course assessment results from final exam (direct assessment of course and core objectives)
Dr. Gier’s section, fall 2008, 31 students.
Note: three multiple choice questions used for each objective, except for just two questions for Core Obj #2.
The list below begins with the three core objectives, two of which also overlap with course objectives)

Understanding of Scientific Method and Philosophy (Course Objective 1, Core Objective 1):
What distinguishes science as a way of understanding the universe?
   a. It attempts to understand human morality and ethics from a physical and biological viewpoint.
   b. All ideas are considered tentative, so that any theory or hypothesis can be tested by anyone.
   c. The goal of science is to start with theories and turn them into facts.
   d. Once an idea has been put forward by a great scientist (e.g., Einstein, Darwin, Newton), it is considered a certainty, and scientists no longer question those ideas.

When you are trying to understand something new you begin by making a specific observation, and then applying that observation in a logical fashion to form a general principle. This is called ______.
   a. inductive reasoning
   b. rule enhancement
   c. theory production
   d. deductive reasoning

What is the best definition of a theory?
   a. It is a logical explanation for a phenomenon, but it does not yet have evidence to support it.
   b. It is an observation (fact) that is certain, and therefore it is a trustworthy idea.
   c. It is a single hypothesis that has withstood a test.
   d. It is a collection of hypotheses that have been tested many times and not rejected.

RESULT: 72.04% of all answers correct

Understanding evolution (Course objective 5, Core objective 2)
Which is correct of the history of evolution?
   a. The basic principles of evolution, including natural selection, were known by the 1700s.
   b. Darwin was the first European to believe in evolution.
   c. Alfred Wallace discovered natural selection on his own, and wrote to Darwin about his ideas.
   d. Darwin’s contribution to the field of evolution was his experiments with heredity, which showed how genes were passed down from parents to offspring.

Which is the best definition of “evolution?”
   a. Survival of the fittest
   b. Individual organisms trying to adapt to their environment.
   c. Genetic change in a population over time.
   d. Random change in species over time.

Natural selection __________.
   a. is based on different abilities among individuals to successfully survive and reproduce
   b. is based on one species surviving while another species goes extinct
   c. is caused by evolution
   d. can occur in a population even if there is no genetic variation among individuals

RESULT: 62% correct
Understanding the role of biology in human and environmental affairs (Core Obj 3)

Lately, many medical breakthroughs have occurred as a direct result of our understanding of DNA structure and how DNA codes for proteins. Which scientist(s) are most directly responsible for this knowledge?

a. Darwin
b. Watson and Crick
c. Mendel
d. Hershey and Chase
e. Griffith

There is still a social debate about the teaching of evolution. Most recently, some have advocated teaching intelligent design in science courses. Intelligent design is the idea that evolution may have occurred, but only with the help of miracles. Which of the following represents the correct scientific philosophy about this?

a. Miracles may happen, but science can’t study miracles because they can’t be disproved by data.
b. Biologists agree that miracles probably did occur, since there is no way the first cell could have shown up without a miracle.
c. Since miracles should leave some evidence, many scientists are currently searching the fossil record for signs of them.
d. Science should be responsive to public opinion; if most people think that intelligent design is a good idea, it should be taught as science.

RESULT: 93.5% of all answers correct

Understanding that organisms are subject to laws of chemistry and physics (Course obj 2)

What is the best predictor for how an atom will bond with other atoms?

a. The total number of electrons
b. The number of electrons in the outermost shell
c. The number of protons
d. The number of protons and neutrons, combined

Which of the following facts best demonstrates how the second law of thermodynamics affects living systems?

a. Cells are small, rather than large.
b. Cells must harvest energy (e.g., sugar) in order to stay alive and maintain their order.
c. Homologous chromosomes move apart during meiosis.
d. When DNA replicates, it creates two new molecules, each of which is half-old and half-new.
e. Genetic change is inevitable, in most populations.

Which is a correct match?

a. Hydrogen bond \( \rightarrow \) a weak bond between two polar molecules; e.g., between two adjacent molecules of H₂O.
b. Ionic bond \( \rightarrow \) a bond in which electrons spend more time orbiting one nucleus than another; e.g., the electrons in a single molecule of H₂O.
c. Covalent bond \( \rightarrow \) one atom donates an electron to another; e.g., between the Na and Cl in salt.
d. Ionic bond \( \rightarrow \) one atom shares an electron with another; e.g., between the two atoms in H₂.
e. None of the above is a correct match.

RESULT: 78.5% correct
Understanding the cell as the basic unit of life (Course obj 3)
Which of the following is one of the three main principles of the Cell Theory?
   a. All cells are small, rather than large.
   b. All cells are structurally complex, with many internal organelles.
   c. Cells are the smallest living things.
   d. Bacterial cells are smaller than animal cells.

Which is the correct match between a process and its main goal or function?
   a. Photosynthesis \(\rightarrow\) makes sugar
   b. Cell respiration \(\rightarrow\) makes \(\text{O}_2\) (oxygen)
   c. Mitosis \(\rightarrow\) sexual reproduction
   d. Transcription \(\rightarrow\) makes a new DNA molecule

You inhale \(\text{O}_2\) and you exhale \(\text{CO}_2\), to meet the needs of which cellular process?
   a. Mitosis
   b. Sugar production
   c. Replication
   d. Cell respiration
   e. ALL cellular chemical reactions directly require oxygen and give off carbon dioxide.

RESULT: 83% of all answers correct

Understanding genetics, inheritance, sources of genetic variability… (Course obj 4)
Which statement is true concerning the behavior of chromosomes in mitosis?
   a. Genetic diversity is created because each daughter cell receives different kinds of chromosomes.
   b. The chromosomes with dominant alleles go to one daughter cell, and the chromosomes with recessive alleles go to the other daughter cell.
   c. If the parent cell has 46 duplicated (X-shaped) chromosomes, then each daughter cell will receive 23 duplicated chromosomes.
   d. If the parent cell has 46 duplicated (X-shaped) chromosomes, then each daughter cell will receive 46 unduplicated chromosomes.
   e. Both a. and b. are correct.

Which of the following is a source of genetic variability in sexual reproduction?
   a. Alleles move from chromosome to chromosome during crossing over.
   b. Independent assortment of chromosomes.
   c. Sister chromatids are pulled apart during anaphase of mitosis.
   d. The chromosomes condense, prior to cell division.
   e. Both a. and b. are sources of genetic variation in sexual reproduction.

Flower color in one breed of roses is controlled by incompletely dominant alleles so that white and red flowers are homozygous, while pink is heterozygous. The cross of two pink-flowered plants will produce ______.
   a. 100% pink-flowered offspring
   b. 50% red-flowered offspring, and 50% white-flowered offspring
   c. 50% white-flowered offspring, and 50% pink-flowered offspring
   d. 50% red-flowered offspring, and 50% pink-flowered offspring
   e. 50% pink-flowered offspring, 25% white-flowered offspring, and 25% red-flowered offspring

RESULT: 69% correct
Understanding of the ecological foundations of living systems (Course obj 6)

Which of the following is an example of an ecosystem?
- a. All of the species on Huntingdon’s campus (human, squirrels, fungi, etc.)
- b. All the people in this room
- c. The entire world, including all life
- d. The environment surrounding the city, plus all the species in it, plus the physical factors such as air and water

Which is true of competition, in ecology?
- a. In order for it to be counted as competition, the two animals have to have a confrontation over the resource.
- b. If a squirrel steals a nut from another squirrel, that is intraspecific competition
- c. Interspecific competition is always more important than intraspecific competition
- d. Competition has rarely been observed in nature, and most ecologists don’t think it is a very important phenomenon

“A Huntingdon student is an omnivore, who is day-active, and competes intensely with other students for food. Huntingdon students inhabit buildings, but they roam through all habitats on campus.” This is the beginning of a description of your ________.
- a. population dynamics
- b. natural selection potential
- c. evolution
- d. niche

RESULT: 84% of all answers correct
Biology 161 Course assessment results from final exam (direct assessment of course and core objectives)  
Dr. Gier’s section, fall 2008, 27 students.  
Note: three multiple choice questions used for each objective, except for just two questions for Core Objectives #1 and #2.  
The list below begins with the three core objectives, two of which also overlap with course objectives)

**Understanding of Scientific Method and Philosophy (Core Objective 1, Course Objective 2):**
What distinguishes science as a way of thinking?
   a) Its emphasis is on data and evidence.
   b) The scientists’ personal desires and politics are not allowed to affect their scientific results or conclusions.
   c) Science is a source of ethics and morals, similar to religion.
   d) Some scientific ideas, like evolution, are considered “absolute truth” by scientists and no one is allowed to question them scientifically.
   e) Both a. and b. are true.

What is the best definition of a theory?
   a) It is a logical explanation for a phenomenon, but it does not yet have evidence to support it.
   b) It is an observation (fact) that is certain, and therefore it is a trustworthy idea.
   c) It is a single hypothesis that has withstood a test.
   d) A scientific theory is an idea with just a little bit of evidence to back it up, but it’s almost equally likely to be wrong.
   e) It is a collection of hypotheses that have been tested many times and not rejected.

**RESULT:** 68.5% of all answers correct

**Understanding evolution (Core objective 2)**
Which is the best summary of the process that produces genetic change in a population over time?
   a) Some traits become more common in future generations simply based on random chance, and because the process takes place over very long time periods, all that randomness adds up to big change.
   b) Animals and plants mutate (“invent” new genes) in order to cope with environmental change.
   c) The species that is best adapted to the environment outcompetes the poorly-adapted species, and drives it to extinction.
   d) The individuals that are best suited to surviving in the current conditions reproduce the most, and thus pass their genes on to the next generation.

Which is true of the process of speciation?
   a) Usually, one ancient (ancestral) species gives rise to two different species over time.
   b) Speciation often involves one population being split into two subpopulations, separated geographically.
   c) Speciation is the process by which two different species evolve to be similar enough that they can interbreed (hybridize).
   d) Speciation usually takes less than 100 years to complete.
   e) Both a. and b. are correct.

**RESULT:** 90.7% correct
Understanding the role of biology in human & environmental affairs (Core Obj 3, Course Obj 1)

Which would be an example of an ecosystem service?

a) A hurricane hits a Caribbean island, but due to the fact that the forest is still intact, the people do not suffer from mudslides and floods.
b) A timber company loses profit as a result of having an endangered species on their property.
c) The Atlantic cod fishery collapses.
d) Scientists develop a special kind of orange tree that doesn’t need to be pollinated, so it can set fruit without insects.
e) All of the above are examples of ecosystem services.

Which is true of economics?

a) For the past 100 years, the U.S. economy has been generally flat, with GDP or any other measure of economic activity staying the same from year to year.
b) Old-style, classical economics (a la Adam Smith) advocated rapid economic growth from year to year.
c) Ecologists argue that it is impossible for an economy to have “sustained growth” forever.
d) Some U.S. companies are “going green,” and in so doing, they will certainly see reduced profits because there is no economic benefit in being better environmental stewards.
e) Our U.S. economy is not based on physical resources, so if the environment collapses, our economy will still be fine.

Who is best associated with the idea that we should protect natural resources because they have a practical, utilitarian value?

a) John Muir
b) Rachel Carson
c) Gifford Pinchot
d) Aldo Leopold

RESULT: 69.1% of all answers correct

Understanding principles of evolution, ecology, physics and chemistry (Course obj 3)

The 2\textsuperscript{nd} law of thermodynamics (which deals with the inefficiency of energy transformations) can be used to explain __________.

a) ecological energy pyramids
b) the loss of unusable heat that occurs when coal is burned to make electricity
c) why it is possible to feed more people on an acre of corn than on an acre of cattle
d) why rabbits are more common than foxes
e) All of the above may be explained by the 2\textsuperscript{nd} law of thermodynamics.

We studied the movement of energy and materials through ecosystems. Which statement is true?

a) Both energy and materials must be constantly recycled within the Earth, because Earth does not absorb either of these from space.
b) Earth absorbs materials from space, but all energy is recycled within Earth’s systems.
c) Earth absorbs energy from space, but all physical material is recycled within Earth’s systems.
d) The carbon cycle is a way of tracking the movement of energy.

Which is the best summary of the process that produces genetic change in a population over time?

a) Some traits become more common in future generations simply based on random chance, and because the process takes place over very long time periods, all that randomness adds up to big change.
b) Animals and plants mutate (“invent” new genes) in order to cope with environmental change.
c) The species that is best adapted to the environment outcompetes the poorly-adapted species, and drives it to extinction.
d) The individuals that are best suited to surviving in the current conditions reproduce the most, and thus pass their genes on to the next generation.

RESULT: 61.7% correct
Understanding the history and current status of issues including population growth, energy, biodiversity and habitat loss, and air pollution (Course obj 4)

Which is true of biodiversity?

a) Scientists believe they have described about 90% of all species on Earth, and the total number is less than one million.
b) As you move farther from the equator, biodiversity increases.
c) All biomes have about the same biodiversity.
d) According to the fossil record, over tens of millions of years, biodiversity tends to increase on average, although mass extinctions cause occasional decreases.
e) Alabama has lower biodiversity than most states.

Which is true of global human population?

a) In countries where women have good access to education, the birth rate tends to increase.
b) Latin American countries have the highest birth rates and highest poverty levels in the world.
c) India has one of the largest populations of any country in the world.
d) Ecologists generally think that human population growth is a good thing, because it will lead to technological innovation and good economic growth.
e) Currently, about 12 billion people live on Earth.

Which is a correct match of a pollutant and the problem it causes?

a) Chlorofluorocarbons (CFCs) → acid rain
b) Sulfur (and SO$_2$) and Nitrogen (and NO$_x$) → global warming
c) Sulfur (and SO$_2$) and Nitrogen (and NO$_x$) → acid rain
d) CO$_2$ → ozone loss

RESULT: 77.8% of all answers correct

Understanding environmental policy and legislation (Course obj 5)

What was the significance of Rachel Carson’s book Silent Spring?

a) Dating back to the 1800’s, it was the first book that made Americans aware of environmental issues.
b) It was the book that made conservation biologists aware of the danger of genetic inbreeding.
c) It was written as a protest to the bad environmental policies of the Reagan administration.
d) It focused on pesticides and pollution, and spurred the environmental awareness of the 1960’s.

When the northern spotted owl was listed under the Endangered Species Act (ESA), what happened?

a) The biome most directly affected was the savannah.
b) It became illegal to directly harm the owls, but it was not illegal to destroy the specific forests where the owl lived.
c) Private landowners had to keep from harming the owls or their habitat.
d) It was an example of how the country rallied around an environmental cause, because the decision to list the owl as endangered was unanimously praised, and there was no controversy.

Which is the best description of a “Tragedy of the Commons?”

a) An exotic weed invades the U.S. and causes the extinction of a native species of flower.
b) The last remaining population of grizzly bears loses its genetic diversity due to inbreeding.
c) The Gulf of Mexico fisheries collapse because each fishing boat is trying to catch as many fish as possible for their own economic gain.
d) Hurricane Katrina devastates New Orleans.

RESULT: 95.0% correct
Guthrie Class data: **FALL 2008**

**Biology 101 (principles)**
Final overall average: 72%
Final exam core embedded questions average: 83%

Core objective 1 (sci process)
The final had 4 embedded questions. The average % correct for all of them was 80.5%.

Core objective 2 (evolution)
The final had 4 embedded questions. The average % correct for all of them was 90.5%.

Core objective 3 (human impact/affairs)
The final had 4 embedded questions. The average % correct for all of them was 81.8%.
Guthrie Class data:

**Biology 231 (genetics)**
Final exam overall average: 82%
Final exam specific aim embedded questions average: 90%
Specific Aim question objective summary:

Objective 1: Demonstrate understanding of the principles of heredity.
The final had 4 embedded questions. The average % correct for all of them was 93%.

Objective 2: Demonstrate understanding of the biological and chemical basis of heredity.
The final had 10 embedded questions. The average % correct for all of them was 90%.

Objective 3: Demonstrate understanding of the experimental evidence on which much of this understanding (objective #1 and 2) is based.
The final had 7 embedded questions. The average % correct for all of them was 88%.

Objective 4: Demonstrate understanding of how genetics fits into the larger context of the biological sciences and serves as the basis for biological evolution.
The final had 6 embedded questions. The average % correct for all of them was 88%.

Evaluation (from IDEA forms)
After taking this course, I feel I can demonstrate an understanding of:

48. the principles of heredity.
   Score: 4.2
49. the biological and chemical basis of heredity.
   Score: 3.9
50. the experimental evidence on which much of this understanding is based.
   Score: 4.0
51. how genetics fits into the larger context of the biological sciences and serves as the basis for biological evolution.
   Score: 4.2

**Biology 101 (principles)**
Final overall average: 77%
Final exam core embedded questions average: 90%

Core objective 1 (sci process)
The final had 4 embedded questions. The average % correct for all of them was 81%.

Core objective 2 (evolution)
The final had 4 embedded questions. The average % correct for all of them was 91%.

Core objective 3 (human impact/affairs)
The final had 4 embedded questions. The average % correct for all of them was 86%.
Evaluation (from IDEA forms)

After taking this course, I feel I can demonstrate an understanding of:

48) 4.2  49) 4.1  50) 4.2  51) 4.2  52) 4.1  53) 4.1
54) 4.3
55) 4.1
56) 4.2
57) 4.0