

Program SLOs

Biology

A.S. – Biology, Biological Sciences, with options in: Biology; Health Science/Pre-Professional; Pre-Nursing

Biology Program Student Learning Outcomes from the 2005 PrOF (Program Review)

P-SLO 1: Students will be able to demonstrate understanding of the processes of science, the scientific method, and the relationship between scientific research and established knowledge. This includes the ability to...

- Recognize the way in which research leads to generally accepted conclusions and the integration of new research data with the building of a body of scientific knowledge.
- Recognize that the information presented in science textbooks and other established “authorities” is the result of research conducted in the field or the lab and is based on an accumulation of data.
- Design a scientific inquiry, including use of proper controls and analyses.
- Demonstrate critical thinking skills shown by the analysis of data sets, recognition of the implications of perturbations to biological systems, and synthesis of information to draw conclusions.

P-SLO 2: Students will be able to express themselves clearly when writing or speaking about biology, demonstrating knowledge of basic biological terminology and understanding of major biological concepts. This includes the ability to produce:

- Laboratory reports which address background information, procedures, results, and analysis of data developed during a laboratory exercise or inquiry project.
- Essays explaining biological processes in clear and concise terms.

P-SLO 3: Students will be able to demonstrate both content knowledge and test taking skills when completing essay, objective, and multiple choice exams. This includes the ability to:

- Demonstrate problem-solving abilities in the major content areas of biology including cell biology, anatomy, physiology, genetics, ecology, and evolution.
- Analyze the logic of a multiple-choice question and choose the correct response from among related items.
- Write clear responses to essay question prompts without including extraneous information or omitting information necessary to provide a clear answer.
- Utilize test-taking skills such as critical analysis of information, test-time management and focused writing.
- Demonstrate content knowledge in the broad areas of biology including cell biology, anatomy & physiology, molecular and transmission genetics, ecology and evolution.

See attached page for details of content outcomes based in IMPAC processes.

P-SLO 4: Students will be able to use appropriate laboratory techniques proficiently. Specific techniques to be mastered will depend on the goal of the student as shown below:

Biology majors lab techniques include:

- Measurement
- Microscopy
- Pipetting
- Gel electrophoresis
- Dissection
- Basic biochemical techniques such as pH testing, Biuret test, Benedict’s test, etc.
- Ability to design a laboratory experiment, including the use of adequate controls and choice of analyses used to

examine data.

- Additional laboratory techniques relevant to biology majors can be found in the SLOs for the chemistry and physics courses required for this major.

Pre-nursing majors lab techniques include:

- Measurement (use of metric measures)
- Microscopy (including histology)
- Identification of unknown microorganisms.
- Staining of bacteria
- Use of equipment used to gather physiological data on humans.
- Additional laboratory techniques relevant to pre-nursing majors can be found in the SLOs for the chemistry courses required for this career option.

GE biology students lab techniques:

- Microscopy
- Ability to conduct a simple laboratory experiment, given procedural information.

P-SLO 5: Evaluate biological data, draw reasonable conclusions, recognize the ethical implications of these conclusions, and apply these conclusions to personal, community, and scientific problems. This includes the ability to:

- Ability to choose what data to collect in order to address a specific hypothesis.
- Ability to collect data and keep organized records.
- basic graphical and statistical analysis of data
- Ability to reach and clearly express logical conclusions based on biological data.
- Ability to relate, in presentations and/or in written reports, how biological information is relevant to personal and community issues.
- Ability to recognize the ethical implications of biological research and the responsibility to use knowledge wisely.

P-SLO 6: Employ information-gathering tools investigate biological ideas.

- Ability to use the Internet in order to gather scientific information, including the ability to recognize the relevance and scientific validity (or lack thereof) of information when found.
- Ability to use the library in order to gather scientific information, including the ability to recognize the relevance and scientific validity (or lack thereof) of information when found.

Content-related SLOs for Biology Majors (based on IMPAC outcomes). These outcomes are part of general Biology Program SLO #3

Diversity

1. Identify major groups of organisms and arrange them taxonomically.
2. Describe and identify structures and explain their functions.
3. Determine phylogenetic relationships among organisms based on characteristics.
4. Compare and evaluate different phylogenetic schemes.

Ecology

1. Characterize interactions among organisms and between organisms and environment.
2. Discriminate among populations, community and ecosystem level interactions.
3. Evaluate human impact on ecological systems.

Evolution

1. Outline the major events in evolutionary history of life.
2. Explain the principles and mechanisms of evolution.
3. Characterize evolution at multiple levels of biological organization.

Genetics

1. Explain the organization, regulation and transmission of genetic information at the molecular level.
2. Analyze patterns and mechanisms of heredity.
3. Analyze and calculate allele frequencies in populations over time.

Cell Biology

1. Identify and describe cell structures and explain their functions.
2. Compare and contrast the processes of cellular reproduction in prokaryotes and eukaryotes.
3. Identify mechanisms of inter- and intracellular communication.

A.S. – Biology, Biological Sciences Student Learning Outcomes*

SLO 1 DEMONSTRATE UNDERSTANDING OF THE PROCESSES OF SCIENCE, THE SCIENTIFIC METHOD, AND THE RELATIONSHIP BETWEEN SCIENTIFIC RESEARCH AND ESTABLISHED KNOWLEDGE. This includes the ability to: *Elucidate the way in which research leads to generally accepted conclusions and the integration of new research data with the building of a body of scientific knowledge. * Recognize that the information presented in science textbooks and other established “authorities” is the result of research conducted in the field or the lab and is based on an accumulation of data. *Design a scientific inquiry, including use of proper controls and analyses. *Demonstrate critical thinking skills by the analysis of data sets, recognition of the implications of perturbations to biological systems, and synthesis of information to draw conclusions.

SLO 2 EXPRESS ONE'S SELF CLEARLY WHEN WRITING OR SPEAKING ABOUT BIOLOGY, DEMONSTRATING KNOWLEDGE OF BASIC BIOLOGICAL TERMINOLOGY AND UNDERSTANDING OF MAJOR BIOLOGICAL CONCEPTS. This includes the ability to produce: *Laboratory reports which address background information, procedures, results, and analysis of data developed during a laboratory exercise or inquiry project. *Essays explaining biological processes in clear and concise terms. *Reports and term papers which clearly explain biological processes and elucidate current theories explaining biological phenomena.

SLO 3 DEMONSTRATE BOTH CONTENT KNOWLEDGE AND TEST TAKING SKILLS WHEN COMPLETING ESSAY, OBJECTIVE, AND MULTIPLE CHOICE EXAMS. This includes the ability to: *Demonstrate problem-solving abilities in the major content areas of biology including cell biology, anatomy, physiology, genetics, ecology, and evolution. *Analyze the logic of a multiple-choice question about biology and select the correct response from among related items. *Write clear

responses to essay question prompts without including extraneous information or omitting information necessary to provide a clear answer. *Utilize test-taking skills such as critical analysis of information, test-time management and focused writing. *Demonstrate content knowledge in the broad areas of biology including cell biology, anatomy, physiology, genetics, ecology, and evolution.

SLO 4 CHOOSE AND UTILIZE APPROPRIATE LABORATORY TECHNIQUES PROFICIENTLY. Biology majors' lab techniques include: *Measurement (use of metric measures) *Microscopy *Pipetting *Gel electrophoresis *Dissection *Basic biochemical techniques such as pH testing, Biuret test, Benedict's test, etc. *Ability to design a laboratory experiment, including the use of adequate controls and choice of analyses used to examine data, etc. Additional laboratory techniques relevant to biology majors can be found in the SLOs for the chemistry and physics courses required for this major.

SLO 5 EVALUATE BIOLOGICAL DATA, DRAW REASONABLE CONCLUSIONS, RECOGNIZE THE ETHICAL IMPLICATIONS OF THESE CONCLUSIONS, AND APPLY THESE CONCLUSIONS TO PERSONAL, COMMUNITY, AND SCIENTIFIC PROBLEMS. This includes the ability to: *Choose what data to collect in order to address a specific hypothesis. *Collect data and keep organized records. *Conduct basic graphical and statistical analysis of data. *Reach and clearly express logical conclusions based on biological data. *Relate, in presentations and/or in written reports, how biological information is relevant to personal and community issues. *Recognize the ethical implications of biological research and the responsibility to use knowledge wisely.

SLO 6 EMPLOY INFORMATION-GATHERING TOOLS TO INVESTIGATE BIOLOGICAL IDEAS. This includes the ability to: *Use the Internet in order to gather scientific information, including the ability to recognize the relevance and scientific validity (or lack thereof) of information when found. *Use the library in order to gather scientific information, including the ability to recognize the relevance and scientific validity (or lack thereof) of information when found.

* Developed through the Curriculum Committee approval process.