

BIOLOGY

LENGTH OF TIME: 90 minutes daily per semester

GRADE LEVEL: 9

COURSE STANDARDS:

Students will:

1. Work in cooperative teams for the purposes of performing the required investigations, and acquiring knowledge and information needed to address the chapter activities. (PA Std 3.2.10a)
2. Reflect on the results of inquiry activities and relate them to larger concepts. (PA Std 3.2.10c)
3. Investigate new situations and be challenged to either explain observed phenomena using established constructs or develop new constructs that more adequately explain the phenomena. (PA Std 3.2.10b)
4. Use graphs as a way of representing ideas symbolically and recognize its usefulness in exploring and understanding the world around them. (PA Std 3.7.10b)
5. Solve problems related to technological applications and related issues. (PA Std 3.2.10d)
6. Read and comprehend informational materials to develop understanding and expertise and produce written or oral work that: (PA Std 3.1.10b)
 - restates or summarizes information
 - relates new information to new experience or prior knowledge
 - extends ideas
 - makes connections to related topics of information
7. Participate in group meetings for the purpose of making decisions, peer editing, and obtaining responses. (PA Std 3.2.10a)
8. Demonstrate an understanding of rules of the English language in every written or oral communication throughout the course. (PA Std 3.2.10a)
9. Develop knowledge of the chemistry of important molecules and the function of these molecules within living systems. (PA Std 3.3.10b)
10. Demonstrate an understanding of the cellular basis of life and be able to describe cellular processes. (PA Std 3.3.10b)
11. Interpret experimental data and apply it to related living systems. (PA Std 3.2.10c)
12. Demonstrate knowledge of genetics and the laws of heredity on both a molecular and organism level. (PA Std 3.3.10c)
13. Describe the theories of evolution and their implications in speciation and biodiversity. (PA Std 3.3.10d)
14. Explain and compare the structure and function of animal and plant systems and their adaptations. (PA Std 3.3.10a)
15. Develop an understanding of the dynamics of ecology. (PA Std 4.6.10.a,b,c)

RELATED PA ACADEMIC STANDARDS FOR SCIENCE AND TECHNOLOGY

- 3.1 Unifying Themes
 - B. Models
- 3.2 Inquiry and Design
 - A. Nature of Scientific Knowledge
 - B. Process Knowledge
 - C. Scientific Method
 - D. Problem Solving in Technology
- 3.3 Biological Sciences
 - A. Living Forms
 - B. Structure and Function
 - C. Inheritance
 - D. Evolution
- 3.7 Technological Devices
 - B. Instruments

RELATED PA ACADEMIC STANDARDS FOR ENVIRONMENT AND ECOLOGY

- 4.6 Ecosystems and their Interactions
 - A. Living and Nonliving Components
 - B. Cycles
 - C. Change over Time

PERFORMANCE ASSESSMENTS:

Students will demonstrate achievement of the standards by:

1. Building models related to curriculum. (Course Standard 10)
2. Preparing written/oral reports on various biological concepts and systems. (Course Standard 2,6,8,11)
3. Designing a project, demonstration or presentation that shows the appropriate concepts related to speciation, evolution, adaptation or genetics. (Course Standard 2,4,12,13,14,15)
4. Using acceptable microscopic techniques to examine slides of various cell/tissue/organism samples for observation, identification and comparison. (Course Standard 2,3,10)
5. Organizing information into essay form for self or group evaluation. (Course Standard 7)
6. Completing lab activities and preparing written reports summarizing findings. (Course Standard 1,2,3,4,9)

DESCRIPTION OF COURSE:

The objective of the course is to develop a basic literacy in the underlying themes in the study of life; that is, form fits function, genetic continuity, cellular basis of life, emergence, DNA as the basic unit of heredity, hierarchy of structure, taxonomic organization of life, interaction with the environment, six kingdoms, and evolution. Laboratory and fieldwork are used to introduce and develop these topics within a context of experiential learning.

TITLES OF UNITS:

1. Characteristics of Life	1 week
2. Science as Inquiry and Emergence	1 week
3. Biochemistry	2 weeks
4. Cellular Basis of Life	3 weeks
5. Evolution and Taxonomy	2 weeks
6. Genetics	3 weeks
7. Diversity of Life	3 weeks
8. Form fits Function, Hierarchy of Structure	1 week
9. Interaction with the Environment	4 weeks

SAMPLE INSTRUCTIONAL STRATEGIES:

1. Inquiry based activities (both guided inquiry and open inquiry)
2. Issues based curriculum introducing major themes in biology
3. Authentic assessment with appropriate rubrics
4. Cooperative group learning
5. Individual explorations using research protocols
6. Model building and computer simulations
7. Use of educational technology
8. Problem solving and process writing
9. Learning extensions
10. Use of team building activities in experiential learning
11. Laboratory and field activities
12. Independent readings

MATERIALS:

1. Biology; Johnson & Raven; Holt, Rinehart, & Winston, 2004
2. Computers and appropriate software
3. Laboratory specimens
4. Microscopes and appropriate materials
5. A-V equipment and resources
6. Appropriate laboratory equipment and supplies related to implement curriculum requirements
7. Supplemental materials/texts
8. Field sampling in support of individual units

METHODS OF ASSISTANCE AND ENRICHMENT:

1. Opportunities for re-testing
2. Tutorial opportunities
3. Strategies developed with the special education teachers
4. Alternative modes of assessment
5. Resource room
6. Maintenance of a daily journal to assist in organizational skill building
7. Fieldwork, including museum-based learning activities

PORTFOLIO DEVELOPMENT:

In order to document achievement and show evidence of acquisition of basic literacy in science, students may include selections from the following in their portfolio:

1. Selections from the student's daily journal
2. Examples of original research protocols developed by the student
3. Examples of major projects, reports, presentations, or designed experiments developed to support major themes in biology

METHODS OF EVALUATION:

1. Concept based tests
2. Oral presentations
3. Evaluation of daily journal
4. Group and individual projects with standards based rubrics tailored for each project
5. Written reports and proposals
6. Peer review prior to instructor evaluation
7. Self-evaluation

INTEGRATED ACTIVITIES:

1. Concepts
 - communicate and defend scientific argument
 - emergence in form and function
 - technology in society
 - identify and describe the life functions common to all living things
 - identify and describe the taxonomic kingdoms and their characteristics
 - identify the basic nutrients found in foods and describe how they are made available and used by the body
2. Communication
 - reading resources for information
 - writing for a variety of purposes
 - oral response and presentations
 - exchange of information with classmates
 - cooperative group communication
3. Thinking/Problem Solving
 - use effective research to gather information
 - drawing conclusions
 - inferring meaning from resources
 - altering paradigms
 - evaluate, infer, and draw appropriate conclusions from charts, tables and graphs
4. Application of Knowledge
 - use of computer and Internet
 - appropriate use of laboratory equipment and instruments

- oral and written communications to instructors and/or classmates
- traditional library and computer aided research
- demonstrate knowledge of basic concepts of biology through traditional and alternate forms of assessment

5. Interpersonal Skills

- demonstrate skills of communication, negotiating, and cooperating with others
- demonstrate effective group work
- give and take of peer evaluation