Warren County School District

PLANNED INSTRUCTION

COURSE DESCRIPTION

Course Title: Applied Biology

Course Number: 00311

Course Prerequisites: _____

Course Description: (Include "no final exam" or "final exam required")
Biology is recommended for 10th grade students who have successfully completed Introduction to Earth and Environmental Sciences in their ninth grade year. The course focuses on the study of biochemistry, cells, genetics, evolution and biological diversity. Appropriate lab activities will be used including elements of scientific inquiry, concepts of models and the use of technological devices.

Suggested Grade Level: 10

Length of Course: _____ One Semester X Two Semesters _____ Other (Describe)

Units of Credit: 1 (Insert ***NONE*** if appropriate.)

PDE *Certification and Staffing Policies and Guidelines (CSPG)* Required Teacher Certification(s)
(Insert certificate title and CSPG#) Biology

Certification verified by WCSD Human Resources Department:
X Yes _____ No

Board Approved Textbooks, Software, Materials:
Title:
Publisher:
ISBN #:
Copyright Date:
Date of WCSD Board Approval:

BOARD APPROVAL:

Date Written: September 2009

Date Approved: _____

Implementation Year: _____

Suggested Supplemental Materials: (List or insert **None**)

Course Standards

PA Academic Standards: (List by Number and Description)

3.1.10 Unifying Themes

A. Discriminate among the concepts of systems, subsystems, feed back and control in solving technological problems.
B. Describe concepts of models as a way to predict and understand science and technology.
C. Apply patterns as repeated processes or recurring elements in science and technology.
D. Apply scale as a way of relating concepts and ideas to one another by some measure.
E. Describe patterns of change in nature, physical and man made systems.

3.2.10 Inquiry and Design

A. Apply knowledge and understanding about the nature of scientific and technological knowledge.
B. Apply process knowledge and organize scientific and technological phenomena in varied ways.
C. Apply the elements of scientific inquiry to solve problems.
D. Identify and apply the technological design process to solve problems.

3.3.10 Biological Sciences

A. Explain the structural and functional similarities and differences found among living things.
B. Describe and explain the chemical and structural basis of living organisms.
C. Describe how genetic information is inherited and expressed.
D. Explain the mechanisms of the theory of evolution.

3.3.12 Biological Sciences

A. Explain the relationship between structure and function at all levels of organization.
B. Analyze the chemical and structural basis of living organisms.
C. Explain gene inheritance and expression at the molecular level.
D. Analyze the theory of evolution.

3.7.10 Technological Design

A. Identify and safely use a variety of tools, basic machines, materials and techniques to solve problems and answer questions.
B. Apply appropriate instruments and apparatus to examine a variety of objects and processes.

3.8.10. Science Technology and Human Endeavors

B. Analyze how human ingenuity and technological resources satisfy specific human needs and improve the quality of life.
C. Evaluate possibilities, consequences and impacts of scientific and technological solutions.

WCSD Academic Standards: (List or **None**)

None

Industry or Other Standards: (List, Identify Source or **None**)
None

WCSD EXPECTATIONS

WCSD K-12 Expectations for instruction in writing, reading, mathematics and, technology have been developed and revised annually. The teacher will integrate all WCSD Expectations into this planned instruction.

SPECIAL EDUCATION AND GIFTED REQUIREMENTS

The teacher shall make appropriate modifications to instruction and assessment based on a student's Individual Education Plan (IEP) or Gifted Individual Education Plan (GIEP).

SPECIFIC EDUCATIONAL OBJECTIVES/CORRESPONDING STANDARDS AND ELIGIBLE CONTENT WHERE APPLICABLE

(List Objectives, PA Standards #'s, Other Standards (see samples at end))

S11.A The Nature of Science

S11.A.1 Reasoning and Analysis

S11.A.1.1 Analyze and explain the nature of science in the search for understanding the natural world and its connection to technological systems.

PA Standards References: 3.1.10.A, 3.2.10.A, 3.1.10.E

X – performance assessed during that semester

	Performance Indicators	1	2	Assessment
A.	**S11.A.1.1.1** Compare and contrast scientific theories, scientific laws, and beliefs (i.e., the law of universal gravitation, how light travels, formation of moons, stages of ecological succession).			
B.	**S11.A.1.1.2** Analyze and explain the accuracy of scientific facts, principles, theories, and laws.			
C.	**S11.A.1.1.3** Evaluate the appropriateness of research questions (e.g., testable vs. not-testable).			
D.	**S11.A.1.1.4** Explain how specific scientific knowledge or technological design concepts solve practical problems (e.g., momentum, Newton's universal law of gravitation, tectonics, conservation of mass and energy, cell theory, theory of evolution, atomic theory, theory of relativity, Pasteur's germ theory, relativity, heliocentric theory, ideal gas laws).			
E.	**S11.A.1.1.5** Analyze or compare the use of both direct and indirect observation as means to study the world and the universe (e.g., behavior of atoms, functions of cells, birth of stars).			

S11.A.1.2 Identify and analyze the scientific or technological challenges of societal issues; propose possible solutions and discuss implications.

PA Standard References: 3.2.10.A, 4.3.10.B

X – performance assessed during that semester

	Performance Indicators	1	2	Assessment
A.	**S11.A.1.2.1** Explain and explain scientific concepts to societal issues using case studies (e.g., spread of HIV, deforestation, environmental health, energy).			
B.	**S11.A.1.2.2** Use case studies (e.g., Wright brothers' flying machine,			

	Tacoma Narrows Bridge, Henry Petoskey's Design Paradigms) to propose possible solutions and analyze economic and environmental implications of solutions for real-world problems.			

S11.A.1.3 Describe and interpret patterns of change in natural and human-made systems.

PA Standard References: 3.1.10.C, 3.1.10.E, 4.8.10.A

X – performance assessed during that semester

	Performance Indicators	1	2	Assessment
A.	**S11.A.1.3.1** Use appropriate quantitative data to describe or interpret change in systems (e.g., biological indices, electrical circuit data, automobile diagnostic systems data).			
B.	**S11.A.1.3.2** Describe or interpret dynamic changes to stable systems (e.g., chemical reactions, human body, food webs, tectonics, homeostasis).			
C.	**S11.A.1.3.3** Describe how changes in physical and biological indicators (e.g., soil, plants, or animals) of water systems reflect changes in these systems (e.g. changes in bloodworm populations reflect changes in pollution levels in streams).			
D.	**S11.A.1.3.4** Compare the rate of use of natural resources and their impact on sustainability.			

S11.A.2 Processes, Procedures and Tools of Scientific Investigations

S11.A.2.1 Apply knowledge of scientific investigation or technological design to develop or critique aspects of the experimental or design process.

PA Standard References: 3.2.10.B, 3.2.10.D

X – performance assessed during that semester

	Performance Indicators	1	2	Assessment
A.	**S11.A.2.1.1** Critique the elements of an experimental design (e.g., raising questions, formulating hypotheses, developing procedures, identifying variables, manipulating variables, interpreting data, and drawing conclusions) applicable to a specific experimental design.			
B.	**S11.A.2.1.2** Critique the elements of the design process (e.g., identify the problem, understand criteria, create solutions, select solution, test/evaluate, and communicate results) applicable to a specific technological design.			
C.	**S11.A.2.1.3** Use data to make inferences and predictions, or to draw conclusions, demonstrating understanding of experimental limits.			
D.	**S11.A.2.1.4** Critique the results and conclusions of scientific inquiry for consistency and logic.			
E.	**S11.A.2.1.5** Communicate results of investigations using multiple representations.			

S11.A.2.2 Evaluate appropriate technologies for a specific purpose, or describe the information the instrument can provide.

PA Standard References: 3.7.10.B, 3.8.10.B

X – performance assessed during that semester

	Performance Indicators	1	2	Assessment
A.	**S11.A.2.2.1** Evaluate appropriate methods, instruments, and scale for precise quantitative and qualitative observations (e.g., to compare properties of materials, water quality.).			
B.	**S11.A.2.2.2** Explain how technology (e.g., GPS, spectroscope, scanning electron microscope, pH meters, probe interface, imaging technology, telescope) is used to extend human abilities and precision.			

S11.A.3 Systems, Models and Patterns

S11.A.3.1 Analyze the parts of a simple system, their roles, and their relationships to the system as a whole.

PA Standard References: 3.1.10.A, 3.1.10.E, 4.3.10.C

X – performance assessed during that semester

	Performance Indicators	1	2	Assessment
A.	**S11.A.3.1.1** Apply systems analysis, showing relationships (e.g., flowcharts, concept maps), input and output, and measurements to explain to explain a system and its parts.			
B.	**S11.A.3.1.2** Analyze and predict the effect of making a change in one part of a change in one part of a system on the system as a whole.			
C.	**S11.A.3.1.3** Use appropriate quantitative data to describe or interpret a system (e.g., biological indices, electrical circuit data, automobile diagnostic systems data).			
D.	**S11.A.3.1.4** Apply the universal systems model of inputs, processes, outputs, and feedback to a working system (e.g. heating, motor, food production) and identify the resources necessary for operation of the system.			

S11.A.3.2 Compare observations of the real world to observations of a constructed model.

PA Standard References: 3.1.10.B, 3.2.10.B, 4.1.10.B, 4.6.10.A

X – performance assessed during that semester

	Performance Indicators	1	2	Assessment
A.	**S11.A.3.2.1** Compare the accuracy of predictions represented in a model to actual observations and behavior.			
B.	**S11.1.3.2.2** Describe advantages and disadvantages of using models to simulate processes and outcomes.			
C.	**S11.A.3.2.3** Describe how relationships represented in models are used to explain scientific or technological concepts (e.g., dimensions of object within the solar system, life spans, size of atomic particles, topographic maps).			

S11.A.3.3 Compare and analyze repeated processes or recurring elements in patterns.

PA Standard References: 3.1.10.C, 3.2.10.B

X – performance assessed during that semester

	Performance Indicators	1	2	Assessment
A.	**S11.A.3.3.1** Describe or interpret recurring patterns that form the basis of biological classification, chemical periodicity, geological order, or astronomical order.			
B.	**S11.A.3.3.2** Compare stationary physical patterns (e.g., crystals, layers of rocks, skeletal systems, tree rings, atomic structure) to the object's properties.			
C.	**S11.A.3.3.3** Analyze physical patterns of motion to make predictions or draw conclusions (e.g., solar system, tectonic plates, weather systems, atomic motion, waves).			

S11.B. Biological Sciences

S11.B.1 Structure and Function of Organisms

S11.B.1.1 Explain structure and function at multiple levels of organization.

PA Standard Reference: 3.3.10.A, 3.3.10.B, 4.6.10.A, 4.7.10.B

X – performance assessed during that semester

	Performance Indicators	1	2	Assessment
A.	**S11.B.1.1.1** Explain how structure determines function at multiple levels of organization (e.g., chemical, cellular, anatomical).			
B.	**S11.B.1.1.2** Compare and contrast the structural and functional similarities and differences among living things (e.g., classify			

	organisms into existing classification groups, compare systems).			
C.	**S11.B.1.1.3** Compare and contrast cellular processes (e.g., photosynthesis and respiration, meiosis and mitosis, protein synthesis and DNA replication).			

S11.B.2 Continuity of Life

S11.B.2.1 Explain the mechanisms of the theory of evolution.

PA Standard References: 3.3.10.C, 3.3.10.D, 4.7.10.C

X – performance assessed during that semester

	Performance Indicators	1	2	Assessment
A.	**S11.B.2.1.1** Explain the theory of evolution by interpreting data from fossil records, similarities in anatomy and physiology, or DNA studies that are relevant to the theory of evolution.			
B.	**S11.B.2.2.1.1** Explain the role of mutations, differential reproduction, and gene recombination in changing the genetic makeup of a population.			
C.	**S11.B.2.1.3** Explain the role of selective breeding and biotechnology in changing the genetic makeup of a population.			
D.	**S11.B.2.1.4** Explain why natural selection can act only on inherited traits.			

S11.B.2.2 Describe how genetic information is inherited and expressed.

PA Standard Reference: 3.3.10.C

X – performance assessed during that semester

	Performance Indicators	1	2	Assessment
A.	**S11.B.2.2.1** Describe how genetic information is expressed (i.e., DNA, genes, chromosomes, transcription, translation, and replication.			
B.	**S11.B.2.2.2** Compare and contrast mitosis and meiosis in passing on genetic information.			
C.	**S11.B.2.2.3** Explain how different patterns of inheritance affects populations variability. (i.e., multiple alleles, codominance, dominance, recesiveness, and sex-influenced traits and sex-linked traits)			

S11.B.3 Ecological Behavior and Systems

S11.B.3.3 Explain how human-made systems impact the management and distribution of natural resources.

PA Standard Reference: 4.2.10.C, 4.4.10.C, 3.8.10.C

X – performance assessed during that semester

	Performance Indicators	1	2	Assessment
A.	**S11.B.3.3.3** Explain the environmental benefits and risks associated with human-made systems (e.g., integrated pest management, genetically engineered organisms, organic food production).			

ASSESSMENTS

PSSA Assessment Anchors Addressed: The teacher must be knowledgeable of the PDE Assessment Anchors and/or Eligible Content and incorporate them into this planned instruction. Current assessment anchors can be found at pde@state.pa.us.

Suggested Formative Assessments: The teacher will develop and use standards-based assessments throughout the course.

- Pre-Assessments of prior knowledge (e.g. entrance cards or KWL chart)
- Labs/lab reports
- Bell ringers/Problems of the Day(PODs)
- Discussions
- Teacher observation/Questioning
- Graphic organizers (e.g. Venn diagrams, word mapping, webbing, KWL chart, etc.)
- Summarizing
- Retelling
- Notetaking
- Problem-based learning modules
- Authentic assessment
- Oral presentations
- Outlining
- Journaling
- Student presentations/projects
- Open-ended response
- Quizzes/tests
- Activities
- Classroom Performance System (CPS)
- White boards

Suggested Summative Assessments:

- Essays
- Open-Ended Responses
- Projects
- Quizzes/tests
- Student presentations
- Portfolios
- Lab Practical
- Lab Report

District Approved Assessment Instruments

- PSSA Tests-Grades 4, 8 and 11 only

Differentiated Instructional Assessment Strategies

Portfolio Assessment: _____ Yes __X__ No

District-wide Final Examination Required: _____ Yes __X__ No

Course Challenge Assessment (Describe):

REQUIRED COURSE SEQUENCE AND TIMELINE

(Content must be tied to objectives)

This is a topical outline. Specific content is identified in the assessment anchors.

Content Sequence Dates

1. Nature of Science **2 weeks**
    a. Scientific Method
    b. Observations and Inferences
    c. Quantitative and Qualitative Data
    d. Data Analysis
2. Biochemistry **4 weeks**
    a. Chemical bonding
    b. Carbon Compounds
    c. Acids/Bases
    d. Enzymes
3. Cell **9 weeks**
    a. Types of cells
    b. Cell organelles
    c. Cell membranes
    d. Microscopes and cell studies
    e. Hierarchy of organization
    f. Photosynthesis
    g. Respiration
4. Genetics **14 weeks**
    a. DNA/RNA
    b. Genes and chromosomes
    c. Mitosis/Meiosis
    d. Spermatogenesis/Oogenesis
    e. Protein synthesis
    f. Reproductive patterns and selective breeding
    g. Mendelian genetics
    h. Types of inheritance
    i. Genetic mutations
    j. Genetic engineering techniques, applications, and impacts
5. Evolution **5 weeks**
    a. Evidence of evolution
    b. Genetic variation in populations
    c. Microevolution
        i. Mutations and gene recombination (antibiotic resistance)
        ii. Gene frequency
        iii. Natural selection and genetic drift
    d. Macroevolution
        i. Speciation
        ii. Extinction
        iii. Phylogeny
    e. Human Evolution
6. Biological Diversity **2 weeks**
    a. Taxonomy

b. Classification Keys

Objectives:

1. Conduct scientific investigations by formulating hypotheses, collecting and analyzing data, and drawing conclusions using appropriate tools.
2. Describe and explain the chemical and structural basis of organic molecules and the functions they serve in organisms.
3. Analyze the chemical and structural factors affecting metabolic function.
4. Identify the specialized structures and the regions of the cell and explain the functions of each.
5. Explain and analyze the relationship between structure and function at the molecular, cellular, and organ-system level.
6. Explain cell functions and processes in terms of chemical reactions and energy changes.
7. Explain how cells store and use information to guide their functions.
8. Describe how genetic information is inherited and expressed at the molecular level.
9. Apply and analyze biotechnologies such as DNA analysis and gene therapy techniques.
10. Explain how populations change over time.
11. Classify organisms based on modern classification systems.

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WCSD STUDENT DATA SYSTEM INFORMATION

1. Is there a required final examination? ___X___ Yes _____ No
2. Does this course issue a mark/grade for the report card?

   ___XYes _____ No
3. Does this course issue a Pass/Fail mark? _____Yes ___X___ No
4. Is the course mark/grade part of the GPA calculation?

   ___X___Yes _____ No
5. Is the course eligible for Honor Roll calculation? ___X Yes _____ No
6. What is the academic weight of the course?

   _____ No weight/Non credit ___X___ Standard weight

   _____ Enhanced weight (Describe)