

Warren County School District

PLANNED INSTRUCTION

COURSE DESCRIPTION

Course Title: Introduction to Earth Science-College Prep

Course Number: _____

Course Prerequisites: _____

Course Description: (Include “no final exam” or “final exam required”)

This course focuses on the study of rocks and minerals, the theory of plate tectonics, biogeochemical cycles, climate, meteorology and astronomy. Relevant lab activities will be incorporate throughout, utilizing scientific inquiry and appropriate technology. This course involves writing, detailed content and lab analysis.

Suggested Grade Level: 9

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

Units of Credit: .5 (Insert **NONE** if appropriate.)

PDE Certification and Staffing Policies and Guidelines (CSPG) Required Teacher Certification(s)
(Insert certificate title and CSPG#) General Science, Earth and Space Science

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)
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.

3.4.10 Physical Science, Chemistry and Physics

- A. Explain essential ideas about the composition and structure of the universe.

3.4.12 Physical Science, Chemistry and Physics

- A. Analyze the essential ideas about the composition and structure of the universe.

3.5.10 Earth Sciences

- A. Relate earth features and processes that change the earth.
- B. Explain sources and uses of earth resources.
- C. Interpret meteorological data.
- D. Assess the value of water as a resource.

3.5.12 Earth Sciences

- A. Analyze and evaluate earth features and processes that change the earth.
- B. Analyze the availability, location and extraction of earth resources.
- C. Analyze atmospheric energy transfers.
- D. Analyze the principles and history of hydrology.

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.
- C. Identify and explain why adaptations can lead to specialization.

3.8.10. Science Technology and Human Endeavors

- A. Analyze how human ingenuity and technological resources satisfy specific human needs and improve the quality of life.
- B. 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.1.3 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.A.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.3 Ecological Behavior and Systems

S11.B.3.1 Use evidence or examples to explain the characteristics of and interactions within an ecosystem.

PA Standard References: 4.3.10C, 4.6.10.A

X – performance assessed during that semester

	Performance Indicators	1	2	Assessment
A.	S11.B.3.1.2 Explain the biotic (i.e., plant, animal, and microbial communities) and abiotic (i.e., soil, air, temperature, and water) components of an ecosystem and their interaction.			

S11.B.3.2 Analyze patterns of change in natural or human-made systems over time.

PA Standard References: 3.1.10.C, 4.2.10.D, 4.3.10.B, 3.1.10.E, 4.3.10.C

X – performance assessed during that semester

	Performance Indicators	1	2	Assessment
A.	S11.B.3.2.3 Explain how natural processes (e.g., seasonal change, catastrophic events, habitat alterations) impact the environment over time.			

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

PA Standard References: 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.3.3.1 Describe different human-made systems and how they use renewable and nonrenewable natural resources (i.e., energy, transportation, distribution, management and processing).			

S11.D. Earth and Space Sciences

S11.D.1 Earth Features and Processes that Change Earth and Its Resources

S11.D.1.1 Explain and analyze the forces in the lithosphere that continually shape Earth.

PA Standard References: 3.5.10.A, 4.4.10.B, 4.1.10.B

X – performance assessed during that semester

	Performance Indicators	1	2	Assessment
A.	S11.D.1.1.1 Classify and describe major types of rocks (i.e., igneous – granite, basalt, obsidian, pumice; sedimentary-limestone, sandstone, shale, coal; and metamorphic-slate, quartzite, marble, gneiss) and minerals (e.g., quartz, calcite, dolomite, clay, feldspar, mica, halite, pyrite) by their origin and formation.			
B.	S11.D.1.1.2 Explain the processes that take place at plate boundaries and how these processes continue to shape Earth (e.g., volcanic activity, earthquakes, mountain building, mid-ocean ridges, deep-sea trenches, new land being formed).			
C.	S11.D.1.1.3 Analyze features created by the interaction of processes that change Earth's surface (e.g., wind and moving water help break down rock into soil; plate movement, earthquakes, and volcanic activity help cause mountains and valleys to form; flowing water and deposition of material help form deltas).			

S11.D.1.3 Explain the significance and contribution of water as a resource to living things and the shaping of the land.

PA Standard References: 3.5.10.D, 4.1.10.B, 4.3.10.B

X – performance assessed during that semester

	Performance Indicators	1	2	Assessment
A.	S11.D.1.3.1 Explain the multiple functions of different water systems in relation to landforms (e.g., buffer zones, nurseries, food production areas, habitat, water quality control, biological indicators).			
B.	S11.D.1.3.2 Explain relationships among physical characteristics, vegetation, topography, and flow as it relates to water systems.			
C.	S11.D.1.3.3 Explain factors (e.g., nutrient loading, turbidity, rate of flow, rate of deposition, biological diversity) that affect water quality and flow through a water system.			

S11.D.2 Weather, Climate and Atmospheric Processes

S11.D.2.1 Analyze how the transfer of energy and substances between Earth's atmosphere and its surface influences regional or global weather or climate.

PA Standard Reference: 3.5.10.C

X – performance assessed during that semester

	Performance Indicators	1	2	Assessment
A.	S11.D.2.1.1 Describe how changes in concentration of minor components (e.g., O ₂ , CO ₂ , ozone, dust, pollution) in Earth's atmosphere are linked to climate change.			
B.	S11.D.2.1.2 Compare the transmission reflection, absorption, and radiation of solar energy to and by the Earth's surface under different environmental conditions (e.g., major volcanic eruptions, greenhouse effect, reduction of ozone layer, increased global cloud cover).			
C.	S11.D.2.1.3 Explain weather patterns and seasonal changes using the concepts of heat and density.			
D.	S11.D.2.1.4 Analyze weather maps and weather data (e.g., air masses, fronts, temperature, air pressure, wind speed, wind direction, precipitation) to predict regional or global weather events.			

S11.D.3 Composition and Structure of the Universe

S11.D.3.1 Explain the composition, structure and origin of the universe.

PA Standard Reference: 3.4.10.D

X – performance assessed during that semester

	Performance Indicators	1	2	Assessment
A.	S11.D.3.1.1 Describe planetary motion and the physical laws that explain planetary motion.			
B.	S11.D.3.1.2 Describe the structure, formation, and life cycle of stars.			
C.	S11.D.3.1.3 Explain the current scientific theories of the origin of the solar system and universe (e.g., big bang theory, solar nebular theory, stellar evolution).			

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
- Outlining
- Journaling
- Student presentations/projects
- Open-ended response
- Quizzes/tests
- Activities

Suggested Summative Assessments:

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

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
Earth Science	
I. Nature of Science	2 weeks
II. Rocks/Minerals	3 weeks
III. Plate Tectonics	3 weeks
A. Plate Movement	
B. Forces that shape topography	
IV. Biogeochemical Cycles	4 weeks
A. Carbon	
B. Nitrogen	
C. Mineral, soil formation	
D. Hydrologic, watersheds	
V. Climate	2 weeks
VI. Meteorology	2 weeks
VII. Astronomy	3 weeks

Objectives:

1. Conduct scientific investigations by formulating hypotheses, collecting and analyzing data, and drawing conclusions using appropriate tools.
2. Classify and describe major groups of rocks and minerals.
3. Analyze the processes that shape tectonic plates.
4. Explain how topographical features are created.
5. Explain factors that affect water quality and flow through a watershed and water's relationship to landforms, vegetation, and living organisms.
6. Explain the relationships between the parts of each biogeochemical cycle.
7. Analyze the transfer of energy and substances between the atmosphere and the earth's surface and how this influences weather and climate.
8. Explain the composition, structure and origin of the universe.
9. Describe planetary motion.

WRITING TEAM: Tina Toole, Rob Musi, Laura Dorunda, John Fedak

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?
 X Yes 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)