

EARTH/SPACE SCIENCE

LENGTH OF TIME: 90 minutes daily for one semester

GRADE LEVEL: 10 - 12

COURSE STANDARDS:

The student will:

1. Explain the theory of plate tectonics, its relation to volcanoes, earthquakes, and mountain formation and give evidence to support it. (PA Std 3.5)
2. Diagram and explain the water cycle as well as its surface and subsurface effects. (PA Std 3.5)
3. Identify Earth's land forms and describe their formation. (PA Std 3.5)
4. Understand and describe the structure, formation, and history of our solar system, and the universe. (PA Std 3.4)
5. Identify, define, and measure the factors that make up weather and aid in its prediction. (PA Std 3.5)
6. Work in cooperative teams for the purpose of performing the required inquiry investigations, and acquiring knowledge and information. (PA Std 3.2)
7. Use peer editing to review designs, plans, and presentations.
8. Read and comprehend informational materials to develop understanding and expertise and produce written or oral work that:
 - restate or summarizes information
 - relates new information to prior knowledge and experience
 - extends ideas
 - makes connections to related topics of information
9. Participate in group meetings for the purpose of making decisions, peer editing, and obtaining responses. (PA Std 3.2)
10. Demonstrate an understanding of rules of the English language in every written report, essay, proposal, oral presentation, and written communication.

RELATED PA ACADEMIC STANDARDS FOR SCIENCE AND TECHNOLOGY

- 3.1 Unifying Themes
 - B. Models
 - C. Patterns
 - D. Scale
 - E. Change
- 3.2 Inquiry and Design
 - A. Nature of Scientific Knowledge
 - B. Process Knowledge
 - C. Scientific Method
- 3.4 Physical Science, Chemistry and Physics
 - A. Matter
 - B. Energy

- C. Forces and Motion
- D. Astronomy
- 3.5 Earth Sciences
 - A. Land Forms and Processes
 - B. Resources
 - C. Meteorology
 - D. Hydrology and Oceanography

PERFORMANCE ASSESSMENTS:

Students will demonstrate achievement of the standards by:

1. Writing and performing a radio play that relates the formation of mountains, earthquakes, and volcanoes to the processes of plate tectonics. (Course Standard 1,3,6,7,8,10; PA Std 3.5)
2. Using seismological data to locate an earthquake's epicenter and assess its magnitude. (Course Standard 1,3,6,8; PA Std 3.5)
3. Developing a key and using it to identify a sampling of rocks and minerals. (Course Standard 1,3,6; PA Std 3.5)
4. Generating a cognitive map that interprets the rock cycle and compares and contrasts the characteristics and formation of igneous, sedimentary, and metamorphic rocks. (Course Standard 1,3,6; PA Std 3.5)
5. Locating and identifying features on topographic maps and use this information to draw profiles of regional land forms. (Course Standard 3,6,8; PA Std 3.5)
6. Developing a comic book that explains the stages in the life cycles of stars and the possible origin of the universe. (Course Standard 4,6,7,8,9,10; PA Std 3.4)
7. Producing a travel brochure focused on one of the members of our solar system. (Course Standard 4,6,7,8,9,10; PA Std 3.4)
8. Writing a research report concerning the Earth's moon. (Course Standard 4,6,7,8,9,10; PA Std 3.4)
9. Attending a night time star watch and identifying at least ten celestial objects. (Course Standard 4; PA Std 3.4)
10. Measuring, recording, and graphing meteorological data, and analyzing its relation to various types of air masses, fronts, and cloud types. (Course Standard 5,6; PA 3.5)
11. Diagramming the layers of the atmosphere and describing the characteristics of each layer. (Course Standard 5,6; PA Std 3.5)
12. Interpreting the features of weather maps and utilizing them to make forecasts. (Course Standard 5,6; PA Std 3.5)
13. Creating a learning cube that compares and contrasts the features and formation of tornadoes, hurricanes, and mid-latitude lows. (Course Standard 5,6,7,8,9,10; PA Std 3.5)

DESCRIPTION OF COURSE:

In Earth and Space Science, students will use the theory of plate tectonics to explain the occurrence of earthquakes, volcanoes and mountain ranges. They will describe the structure of our universe and Earth's place in it. Finally, they will analyze the various factors that make up our weather and use them to make predictions. Students will

produce cooperative projects, perform activities and laboratory investigations, interact with their text, technology, and other references, as well as be assessed through traditional and alternative methods.

TITLES OF UNITS:

1. Earth's Origin, Shape, Dimensions, and Internal Heat	1 week
2. Plate Tectonics	2 weeks
3. Volcanism, Earthquakes, and the Origin of Mountains	3 weeks
4. Surface and Subsurface Water	1 week
5. Topographic Maps and Structural Geology	1 week
6. Studying the Heavens	1 week
7. Stars and Galaxies	2 weeks
8. The Sun and Solar System	2 weeks
9. The Moon	1 week
10. Composition and Heating of the Atmosphere	1 week
11. Atmospheric Pressure and Winds	1 week
12. Evaporation, Condensation and Precipitation	1 week
13. Air Masses, Fronts, Storms, and Forecasts	2 weeks

SAMPLE INSTRUCTIONAL STRATEGIES:

1. Cooperative learning groups
2. Problem solving activities
3. Small group activities
4. Individual explorations
5. Recitation
6. Process writing
7. Oral presentations
8. Lecture and discussion
9. Audio-visual presentations
10. Simulations
11. Model construction
12. Independent reading
13. Laboratory activities
14. Technology assisted learning
15. Computer simulations
16. Research activities
17. Cognitive mapping
18. Student created charts, posters, graphs, weather maps, comic books, maps, and brochures

MATERIALS:

1. Text - Earth Science, Spaulding and Namowitz, Heath, 1994.
2. Computers and appropriate software (*Red Shift*)
3. Selected audio visual materials
4. Rock and mineral specimens

5. Instruments: Telescope, spectroscope, weather station, psychrometer, and magnetic compasses
6. Topographic maps
7. Interactive weather maps (*Weather Cyclers*)
8. Land form models
9. Art supplies

METHODS OF ASSISTANCE AND ENRICHMENT:

1. Opportunities for retesting
2. Tutorial opportunities
3. Pretests and test previews
4. Extra credit opportunities
5. Study guides
6. Strategies developed with the Instructional Support Team
7. Collaborative assessment opportunities
8. Alternative modes of assessment
9. Resource room
10. Minimal reading required at a 9th grade level
11. Learning extensions

PORTFOLIO DEVELOPMENT:

In order to document achievement and show evidence of improvement in science, students may include in their portfolios selections from the following:

1. Lab reports
2. Science writing
3. Projects/presentations
4. Tests/quizzes
5. Demonstration of scientific method and problem solving
6. Drawings/models
7. Graphic organizers
8. Evidence of extended learning
9. Science awards

METHODS OF EVALUATION:

1. Tests and quizzes
2. Homework
3. Oral presentations
4. Group and individual projects with detailed, standards driven scoring rubrics
5. Laboratory reports
6. Research reports
7. Peer editing prior to evaluation by the instructor
8. Self evaluations

INTEGRATED ACTIVITIES:

1. Concepts

- describe the nature of the universe and Earth's place in it
- outline the theory of plate tectonics and describe its relation to earthquakes, volcanoes, and the formation of mountains
- define the various factors that make up weather and use them to forecast weather

2. Communication

- read and use a variety of methods to make sense of texts
- respond orally and in writing to information and ideas gained by reading, and use information and ideas to make decisions and solve problems
- write for a variety of purposes
- exchange information orally, ask and answer questions appropriately and promote effective group communication and functioning
- compose and make oral presentations

3. Thinking/Problem Solving

- use effective research and information management skills
- compute, measure and estimate to solve theoretical and practical problems
- evaluate, infer and draw appropriate conclusions from charts, tables and graphs
- construct and evaluate models of scientific systems
- develop and apply skills of observation, data collection, analysis, pattern recognition, and scientific reasoning in designing and conducting experiments
- think critically

4. Application of Knowledge

- appropriate use of laboratory equipment and materials
- traditional library and computer aided research
- demonstrate knowledge of basic concepts and principles of earth science through traditional and alternate forms of assessment
- written communications

5. Interpersonal Skills

- demonstrate skills of communicating, negotiating, and cooperating with others
- demonstrate that they can work effectively and cooperatively in group situations
- work together with peers to edit and prepare oral presentations, written documents, and projects