

Earth Science CP-A

Course Description

This course centers on the study of the Earth's systems and how these systems interact to support the life of the planet and its inhabitants. Students will learn the fundamentals of geology, meteorology, oceanography, environmental science, and astronomy. Throughout this course, students will participate in laboratory activities designed to reinforce the concepts studied in each unit and to encourage scientific reasoning. This document provides links to resources that will supplement the textbook. Varied sources have been selected to familiarize students with the network of information that is available for research and lifelong learning.

The course aligns with the *Portrait of the Crusader* by encouraging students to think both critically and creatively in order to solve problems. In addition, students are encouraged to work collaboratively, demonstrate respect for others, take responsibility for individual and group work, and demonstrate integrity in all activities.

Course Curriculum

Unit I. Introduction to the Study of Earth Science

4 weeks

Focus Questions:

- What branches of science are involved in the study of the Earth?
- How do scientists determine the age of the Earth?
- How does the Nebular Theory explain the formation of our planet and our solar system?
- What is the role of the Sun in supporting life on Earth?
- Why are the Earth and its atmosphere considered dynamic?
- What is biodiversity? How is biodiversity impacted by human activity?
- How can the study of the earth help us address global issues and make positive change?

Concepts/Skills:

- Read for information: Welcome to Earth [In Depth | Earth – NASA Solar System Exploration](#).
- Describe the disciplines of astronomy, geology, oceanography, meteorology, and environmental science.
- Explain/model the Nebular Theory of how the solar system was formed.
- Define the process of radiometric dating used by scientists to determine the ages of rocks, sediment, and fossils. [Radiometric Age Dating - Geology \(US National Park Service\)](#)
- Analyze how the energy of the Sun directs the life of the planet. Discuss the factors that make Earth the most hospitable planet for life in our solar system. <https://education.nationalgeographic.org/resource/sun>
- Describe the four major spheres (systems) of the Earth: geosphere, hydrosphere, atmosphere, and biosphere. Analyze how these systems interact to create a dynamic planet. [1 Everything in Earth's system can be placed into one of four major subsystems](#)
- Conduct research to identify a current environmental issue; determine how this issue affects the Earth's spheres. (Examples: deforestation, wildfires, mining, drought)

Labs:

- Global Issues Lab
- Tragedy of the Commons Lab

Summative Assessments:

- Unit Test focused on the big ideas of Earth Science and the concepts and terms taught in the unit.

Unit II. The Geosphere

6 weeks

Focus Questions:

- What is the structure of the Earth?
- What forces sculpt the surface of the Earth?
- How does the Rock Cycle support the planet?
- What natural resources do rocks and minerals provide?
- How does the extraction of fossil fuels impact the land?
- How does the Theory of Plate Tectonics explain the formation of continents and ocean basins?
- How does the Theory of Plate Tectonics explain earthquakes and volcanoes?
- How do scientists measure and predict earthquakes, volcanoes and tsunamis?

Concepts/Skills:

- Model the structure of the earth and explain geothermal energy.
- Analyze the varied ways that the surface of the Earth is sculpted through daily forces of wind, water and ice, and through significant natural events such as earthquakes, volcanoes and glacial movement.
- Explain/model the Rock Cycle.
- Identify the natural resources that come from rocks and minerals, including fuel sources.
- Describe how soil is created and replenished and analyze why the quality and abundance of soil is important to the health of the planet and its inhabitants.
- Determine how fuel sources are located and extracted. Analyze the impact to the environment as fuel is extracted.
- Explain the key concepts of the Plate Tectonics Theory. [Understanding Plate Tectonic Theory](#)
- Describe how the characteristics of continents and ocean basins are developed by the movement of plates and plate boundaries.
- Analyze how Plate Tectonics explains the causes of earthquakes and volcanic activity. [What is an earthquake and what causes them to happen? | US Geological Survey](#).
- Research/explain the processes used to measure and predict these events to help mitigate their impact.
- Describe how the movements of the Earth's crust release life-sustaining minerals into the biosphere.

Labs:

- Weathering Lab
- Soil Lab
- Plate Tectonics Data Analysis Lab

Summative Assessments:

- Formal Lab Report on Weathering
- Natural Disaster Project
- Unit Test focused on the concepts of the unit, including the Theory of Plate Tectonics.

Unit III. The Atmosphere and Meteorology

6 weeks

Focus Questions:

- What is the structure of the atmosphere?
- What is the Water Cycle and how does this cycle impact all of Earth's spheres (systems)?
- How do the earth's systems interact to affect the climate and weather of the planet?
- What forces drive weather phenomena? What is the role of the Sun?
- How does El Nino and La Nina affect climate and weather?
- What are three types of weather fronts and how do they affect the weather in a region?
- What are weather stations and why are they important in weather forecasting?
- How does climate and climate change impact the inhabitants of the Earth?
- How does climate change affect the water cycle?

Concept/Skills:

- Model the vertical structure of the atmosphere, including pressure and temperature changes.
- Explain the major gasses composing the earth's atmosphere and identify those that are most important to understanding weather and climate.
- Explain the Water Cycle and how this cycle affects all spheres of the planet. [NWS JetStream - The Hydrologic Cycle](#)
- Distinguish between the basic elements of weather and of climate.
- Explain how the energy from the sun drives weather phenomena, including how the unequal heating of the Earth based on direct radiation, the density of the atmosphere, and presence of water set the atmosphere in motion. [What causes the weather? - NCAS](#).
- Describe the atmospheric conditions that produce fog, rain, sleet, freezing rain, and hail.
- Define air pressure and explain how low and high pressure centers form.
- Define air masses and fronts, including warm and cold fronts, stationary and occluded fronts. Explain how/why a thunderstorm forms; describe the stages in the development of a thunderstorm.
- Summarize how tornadoes and hurricanes form and how they are forecasted.
- Explain how barometric pressure, temperature, wind speed and direction, humidity, and dew point can be collected and analyzed to predict weather and climatic patterns.

- Interpret weather maps, including the placement of high and low pressure systems, front, isotherms, and precipitation. Analyze weather data based on specific weather stations.
- Develop a weather forecast for a three day period based on weather data.
- Analyze the causes and effects of ozone depletion.
- Analyze the causes and effects of climate change and summarize how climate change affects the Water Cycle. [The Water Cycle and Climate Change | Center for Science Education](#).
- Varied topics for further learning: [What is the difference between weather and climate change? | US Geological Survey](#)

Labs:

- Isotherm Lab
- Forecasting Lab

Summative Assessments:

- Lab Reports
- Unit Test

Unit IV: The Hydrosphere and Oceanography

5 weeks

Focus Questions:

- How do bodies of water form on Earth?
- What are the four distinct reservoirs for water? How does water move through these reservoirs?
- What are the primary causes of flooding?
- Why does the Earth have areas of desert and areas of wetlands?
- Why is there a lack of drinking water in specific regions of the world?
- What are the features of the ocean? What natural resources does the ocean floor provide?
- How biodiverse is the ocean?
- How is human activity impacting the biodiversity of the oceans? What is marine pollution?
- Can we turn salt water into drinking water on a large scale?

Concepts and Skills:

- Explain the four major reservoirs for water: the oceans, ice sheets and glaciers (the cryosphere), terrestrial storage, and the atmosphere. Describe how water moves through these reservoirs.
- Read for information to determine how bodies of water form on Earth. Summarize key ideas. [Why do we have an ocean? Rivers, Streams, and Creeks | US Geological Survey](#).
- Examine how the Earth's systems interact to cause deserts and wetlands. Analyze the geosphere and hydrosphere of the island of Kauai to determine why one side looks like a desert although the island gets more rain than almost any area on Earth.
- Discuss the causes and effects of floods. Examine the methods of flood control.
- Analyze why the Earth has a shortage of drinking water. [Water Scarcity | Threats | WWF](#)
- Read and explain the attributes of the ocean: [All About the Ocean | National Geographic Society](#)
- Explain the resources associated with the ocean floor and how the ocean floor is mapped.

- Identify the physical factors used to divide the ocean into marine life zones.
- Research the diversity of ocean life and the impact of human activities on ocean life.
- Analyze the use of Elemental Water Makers and determine why they are not more widely used.

Summative Assessments:

- Research and Presentation focused on one topic studied in the unit
- Unit Test

Unit V. The Biosphere

5 weeks

Focus Questions:

- What factors distinguish between a biome and an ecosystem?
- What are the major ecosystems on Earth? What are the major biomes?
- How is energy transferred in biomes and ecosystems?
- What is the nutrient cycle? How do humans impact the nutrient cycle?
- What causes the extinction of a species? What causes a mass extinction?
- What are the most pressing global issues affecting life on the planet? What are the best solutions?

Concepts/Skills:

- Explain the concept of biosphere. <https://education.nationalgeographic.org/resource/biosphere>
- Describe the major ecosystems and biomes on Earth.
- Analyze the connection between the location of biomes, ecosystems and climate.
- Determine which biomes are threatened and investigate the causes and effects of this threat.
- Determine which species are in danger of extinction and investigate the causes and possible solutions.
- Explain /model the nutrient cycle and how humans impact this cycle.
[The Nutrient Cycle | SSWM - Find tools for sustainable sanitation and water management!](#)
- Research and analyze the causes and effects of global warming. Make an informed decision as to feasible approaches and support this decision with relevant evidence.

Summative Assessments:

- Global Warming Debate and Reflection
- Unit Test

Unit VI. Outer Space and Astronomy

5 weeks

Focus Questions:

- How did gravity and energy direct the formation of the solar system?
- What do we learn from asteroids?
- How does the solar system interact?
- How do astronomers use light to measure distance and time?

- How big is the universe? How old is it?
- What is a black hole and what does it mean to have a black hole at the center of our galaxy?
- What is the role of NASA and what are its current projects?

Concepts/Skills:

- Revisit the Nebular Theory and analyze how gravitational and thermal energy directed the formation of the solar system. Explain why some planets are terrestrial and others are gaseous. [The formation of the solar system](#)
- Summarize the process of nuclear fission in the Sun. Sequence the stages of the life cycle of a star.
- Explain why/how the planets rotate around the sun in an elliptical pattern; explain how moons rotate around planets and the sun. Contrast a solar and a lunar eclipse.
- Explain the concept of the light year and summarize how astronomers use light to measure distance in space. Examine how astronomers can say that the universe is 93 billion light years in diameter.
- Examine the concept of Cosmic Microwave Background and how scientists use this to determine the age of the universe.
- Define black holes and dark matter. Examine how scientists know that black holes exist and summarize the basics of what astronomers currently know about black holes and dark matter.
- Research the web site nasa.gov. Read and share information about a recent discovery/innovation.

Labs:

- Eclipse Lab

Summative Assessments:

- Life on Another Planet Project
- Unit Test

Resources for the Course:

- *Tarbuck and Lutgens - Earth Science - 2018*
- [Earth Science Literacy Principles](#).
- Resource links are embedded throughout this document and may be changed as newer resources become available.

Grading Policy:

- Point System. The point value of each assignment is shared with students when the assignment is given.