

Unit: OTP 11A- Earth & Space Science

Content Area: **Science**
Course(s): **OTP Science**
Time Period: **Generic Time Period**
Length: **40 Weeks**
Status: **Published**

Unit Overview

Earth and Space Science is a multidisciplinary science that draws from all sciences to help us better understand the relationship between humans and the world in which we live. By teaching the students about the beauty of geological history, the amazing landforms around the globe, the nature of the sea and air, and the newest discoveries about our universe, it gives students an opportunity to relate to their everyday world. Students will explore topics such as:

- Earth's minerals and rocks
- Plate tectonics, earthquakes, volcanoes, and the movements of continents
- Weather and natural disasters
- The solar system and the universe

Transfer

Students will be able to independently use their learning to...

- Practice the scientific method to solve everyday problems.
- Identify what causes the seasons and how latitude/longitude effects climate.
- Describe the key aspects of weather (including: winds, precipitation, clouds, air masses and violent storms.)
- Compare and contrast weather and climate.
- How tectonics plates move and how they can form trenches, mountains, earthquakes and volcanoes.
- Identify the three main types of rocks in Earth's crust and compare the contents of different types of soil.
- Explain what fossils can show us about the Earth's history.
- Identify the planets and the Sun within our solar system.
- Describe important events in the history of space exploration.
- Explain how the Earth moves through the solar system while comparing rotation and revolution.

Meaning

Understandings

Students will understand that...

- Repeating experiments to get valid test results is an important part of scientific method.
 - Composing a hypothesis that is testable is critical to the experiment.
 - Identifying there can be more than one answer or solution to a problem.
 - The six steps of the scientific method don't have to follow a particular order.
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- Weather and climate affect people's lives every day.
 - Weather is unpredictable but we can use technology to help us plan for upcoming weather.
 - Violent storms can be very dangerous and how to prepare for them.
 - Air masses have a big role on weather.
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- Tectonic plates are always moving and how their movements can have huge impacts on our planet and how the land is shaped.
 - The earth's crust is made of rocks and each type of rock can tell us how it was made.
 - Weather and erosion can change the way the land is shaped.
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- We are just one galaxy in the universe and we are still exploring space.
 - The Sun is the main source of energy for our planet and how the earth moves around the Sun affects us every day.
 - The moon is a natural satellite and has effects on the Earth.
 - Asteroids, comets and meteoroids are a part of our solar system and the effects they can have on the Earth.

Essential Questions

Students will keep considering...

- Where can human error occur in an experiment?
- How to improve an experimental technique?
- How to improve an experiment after resulting in a rejected hypothesis?
- How can the scientific method be useful in my own life?
- How do the different variables (control groups and experimental group) relate to each other and how does a change in one variable affect the other variables?
- How observations can provide new insights to an experiment?

- What can effect climate?
- How can you tell if a violent storm is coming?
- What happens when a cold air mass passes into a warm air mass?
- What causes wind?

- What allows the plates to move?
- What can happen when plates collide?
- What can happen when plates move away from each other?
- How can rocks tell us about the pass?
- How can water and wind change the shape of rocks?

- What galaxy is our solar system apart of?
- What the is Sun and what it is made of?
- How many phases does the moon have?
- What happens to a meteoroid that enters the atmosphere?

Application of Knowledge and Skill

Students will know...

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- How to identify problems by using multiple observations.
- That lab reports help explain findings to the problem/solution, hypothesis, results, and conclusions in an experiment.
- Graphs and tables are great way to relay information about findings of an experiment. Students will know how to make graphs and tables.
- The six steps of the scientific method (Identify a problem or question, make observations, form a hypothesis, experiment, record and organize data and make conclusions) and how to use them.
- The different types of clouds.
- How weather has or can effected their lives.
- Identify how air masses move and how they form fronts.
- How to record the daily weather conditions.
- How mountains can effect climate.

- What tools can be used to gather weather data.
- How continents drift across the Earth's surface.
- What causes an Earthquake to happen.
- How the shifting of the continents has occurred throughout time.
- The three kinds of rocks and their characteristics
- What is galaxy is and how/why astronomers grouped them.
- The importance of our Sun and what would happen if the Sun went out.
- How the moon effects the Earth's tides.
- What a meteoroid can do to the Earth.

Students will be skilled at...

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- making predictions based on reasoning from prior knowledge.
- be able to test a hypothesis through experimental design.
- interpret graphs and tables.
- recalling and labeling different cloud types.
- analyze weather reports to be prepared for the day.
- interpret graphs to see how air masses are moving.
- using technology to record the daily weather conditions.
- predicting how continents fit together in the past, as well as, how they may drift in the future.
- comparing and contrasting earthquakes and volcanoes.
- comparing and contrasting the different soil types.
- Identifying the different planets in our solar system.
- Recalling the gases that make up our Sun.
- Describing important events in the history of space exploration.
- Comparing asteroids, comets and meteoroids to each other.

Academic Vocabulary

- Air Masses
- asteroid
- astronomy
- climate
- comet
- Continental Drift
- Control group
- Convection
- Earthquakes
- Erosion
- Experiment
- Experimental group
- front
- Galaxies
- hurrican
- Hypothesis
- Igneous Rocks
- Metamorphic Rocks
- meteorid
- Meteorology
- Moon
- Observations
- Plate Boundaries
- Plate Tectonics
- Sedimentary Rocks
- tornado
- typhoon
- weather
- Weathering

Learning Goal 1

Science is a process by which we learn about the world around us. Science progresses mainly by the experimental method.

9-12.HS-PS1-3.3.1

Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision

of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.

Creating an awareness of the need to protect and preserve natural resources is a goal of science education. Students must develop an awareness of environmental issues and learn to respond appropriately to environmental conditions.

Science and technology are interdependent. Technology can assist students in learning how to complete everyday tasks. Students need to know the range of technological tools available and how to use them to improve the quality of life and enhance independence.

Target 1

SWBAT: Investigate why the experimental method involves making observations, forming a hypothesis, performing an experiment, interpreting data, and communication results.

Target 2

SWBAT: Use models, including conceptual and mathematical models, to understand the systems they study.

Learning Goal 2

SWBAT describe how processes within the Earth change the make-up of our planet.

9-12.HS-ESS1-5	Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.
9-12.HS-ESS2-3	Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.
9-12.HS-ESS2-1	Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.

Target 1

SWBAT describe the three types of plate boundaries and what could form at each.

Target 2

SWBAT Describe how earthquakes and volcanoes form and the facts that go along with them

Target 3

SWBAT Describe the three different types of rocks along with identifying them in a lab setting.

Learning Goal 3

SWBAT describe weather and all that comes with it, along with explaining what causes the four seasons.

9-12.HS-ESS2-2	Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.
9-12.HS-ESS3-5	Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth's systems.
9-12.HS-ESS2-4.2.1	Use a model to provide mechanistic accounts of phenomena.

Target 1

SWBAT Describe the main components of weather such as temperature, pressure, humidity, fronts, precipitation, clouds, and the water cycle.

Target 2

SWBAT research weather and report it on a weekly form

Learning Goal 4

SWBAT describe the make-up of our Solar System and the life cycle of a star.

9-12.HS-ESS1-2	Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.
9-12.HS-ESS1-1	Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.

Target 1

SWBAT Describe how our Solar System formed and the general make up of our solar system.

Target 2

SWBAT Describe the life cycle of a star.

Summative Assessment

<http://www.edudemic.com/summative-and-formative-assessments/>

<https://sites.educ.ualberta.ca/staff/olenka.bilash/Best%20of%20Bilash/summativeassess.html>

- End of semester exam
- End of unit or chapter test
- Essay or report
- Oral examination
- Participation in lecture, discussion or group work
- Performance in task with rubric or checklist
- Presentation
- Projects
- Structured observation

21st Century Life and Careers

CRP.K-12.CRP1.1

Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.

CRP.K-12.CRP4.1

Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.

Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.

Formative Assessment and Performance Opportunities

<http://www.edudemic.com/summative-and-formative-assessments/>

<https://www.nwea.org/blog/2016/take-three-55-digital-tools-and-apps-for-formative-assessment-success/>

https://docs.google.com/presentation/d/1nzhdnyMQmio51NT75ITB45rHyLISHEEHZIHTWJRqLmQ/pub?start=false&loop=false&delayms=3000#slide=id.gb49e70aa_370

- Do now
- Exit ticket
- Graphic organizer
- Questioning/ discussion
- Role play
- Simulation
- Task analysis
- Task rubric
- Teacher observation
- Think-pair-share
- Visual representation
- Weekly quiz
- Work product

Accommodations/Modifications

Lessons and accompanying activities will be presented verbally, in writing and with visual examples of varying complexity to accommodate unique learning styles. Extra staff will be available to students to provide prompting and support.

- 1:1 instruction
- Community-based instruction
- Cueing/ prompting
- Reinforcement activities

- Role playing/ simulation
- Small group instruction
- Visual supports

Unit Resources
