

Curriculum Map: Earth Science 2021-2022

Course: EARTH SCI Sub-topic: Uncategorized

Grade(s): 9

Course Description: Earth Science follows content presented by the Next Generation Science Standards. Students will be able to demonstrate an understanding and construct well based ideas/thoughts on such topics as the sun's role in our solar system and nuclear fusion, and the Big Bang Theory. As well they will demonstrate knowledge in radiometric dating, earth's early formation, plate tectonics, earth's interior, weathering, meteorology and cycles of matter through our ecosystems.

Course Textbooks, Workbooks, Materials Citations: There will be various materials used throughout the year used to enhance the curriculum and lessons. The primary platform of information will be found on the google classroom homepage of the students Earth science class. There is no text book nor workbook for this class.

Course Interdisciplinary Connections: Earth science is as very broad science. There are many subdisciplines within Earth Science that will each offer a unique study to the processes, products, cycles and history that make up planet Earth. Because Earth science is a geoscience this course will include some applications to chemistry, math and physics. Other more narrow disciplines include paleontology, hydrogeology, geologic mapping, and more.

Unit: Space Systems

Timeline: Week 1 to 3

Unit Description: The universe is composed of a variety of different objects that are organized into systems each of which develops according to accepted physical processes and laws. The lessons in this unit will focus on origins of the universe, life cycle of the stars including our sun, and the astronomical evidence to support the Big Bang.

Unit Essential Questions: What is the universe and what is Earth's place in it?

Unit Big Ideas: The universe is composed of a variety of different objects that are organized into systems each of which develops according to accepted physical processes and laws

Unit Materials: Hard copy of notes
Google classroom
various lab activities

Unit Assignments: TBD

Unit Key Terminology & Definitions : Blue shift
Cosmic microwave background radiation
Electromagnetic spectrum
Non-solar gases
Red shift
Stellar spectra
Black hole
Dwarf
HR diagram
Main sequence
Nebula

Neutron star
Nova
Protostar
Red giant
Supernova
Density Gravity
Thermal expansion
Elements
Nuclear fusion
Nuclei Supernova

Unit Notes: All agenda, notes and resources can be found on the google classroom page.

STANDARDS: STANDARDS

NGSS Arranged by Disciplinary Core Idea (DCI) - Science (2013)

[HS-ESS1-2 \(Mastered\)](#) 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.

[HS-ESS1-3 \(Mastered\)](#) Communicate scientific ideas about the way stars, over their life cycle, produce elements.

[HS-ESS1-4 \(Mastered\)](#) Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.

NGSS Arranged by Topic - Science (2013)

[HS-ESS1-1 \(Mastered\)](#) 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.

Topic: Nuclear Fusion within the sun's core

Minutes for Topic: 220

Core Lesson Description: Understand the parts of the atom and the forces within the atom that likely played a role in the expansion and formation of the universe.

Core Lesson Student Learning Objectives: Explain the Big Bang Theory and the events that both led up to the Big Bang. Identify evidence that Hydrogen and small amounts of Helium expanded slowly over a period of time in a process that involved nuclear fusion to create the universe nearly 14 billion years ago.

Core Lesson Essential Questions: What is the universe and what is Earth's place in it?

Core Lesson Big Ideas: Nuclear processes drive the events that help form the universe.

Core Lesson Materials: Notes
Access to Google Classroom

Core Lesson Key Terminology & Definitions: Big Bang Theory
Atoms
Protons
Neutrons
Electrons

Core Lesson Notes: All resources, notes and agendas will be located on the google classroom website.

STANDARDS

NGSS Arranged by Disciplinary Core Idea (DCI) - Science (2013)

[HS-ESS1-1 \(Mastered\)](#) 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.

Topic: Big Bang Theory

Minutes for Topic: 220

Core Lesson Description: The Milky Way Galaxy consists of more than two hundred billion stars, the sun being one of them, and is one of hundreds of billions of galaxies in the known universe.

Identify the astronomical evidence to support evidence of the Big Bang.

Core Lesson Student Learning Objectives: Use data about the expansion, scale and age of the universe to explain the Big Bang theory as a model for the origin of the Universe.

Core Lesson Essential Questions: What is the universe and what is Earth's place in it?

Core Lesson Big Ideas: The universe is composed of a variety of different objects that are organized into systems each of which develops according to accepted physical processes and laws

Core Lesson Materials: White board, PowerPoint, Colored pencils, Station Material

Core Lesson Key Terminology & Definitions: Big Bang Theory
Nuclear Fusion
Atomic Nuclei
Heavy Elements
Red Shift
Cosmic Background Radiation
Doppler Effect

STANDARDS

NGSS Arranged by Topic - Science (2013)

[HS-ESS1-2 \(Mastered\)](#) 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.

Topic: Life Cycle of Stars and Elements

Minutes for Topic: 220

Core Lesson Description: The compositions and masses of stars determine their life cycle.

Core Lesson Student Learning Objectives: Develop a model of how the competing forces of gravity and thermal expansion effect a star's density throughout its life cycle.

Core Lesson Essential Questions: How did our mother star the 'sun' form and what role does nuclear fusion play in its life.

Core Lesson Big Ideas: Where is our star 'the sun' currently at its stage in the life cycle of a star. What processes are needed to for our star to turn from a low mass star to a Red Giant? What is the life expectancy of our sun?

Core Lesson Materials: White board
PowerPoint
Hands on Activities

Core Lesson Key Terminology & Definitions: Black hole
Dwarf planet
HR diagram
Main sequence
Nebula
Neutron star
Protostar
Red giant
Supernova
Nuclear Fusion
Nuclear Fission
Electromagnetic Radiation

STANDARDS

NGSS Arranged by Topic - Science (2013)

[HS-ESS1-3 \(Mastered\)](#) Communicate scientific ideas about the way stars, over their life cycle, produce elements.

Topic: Newtonian Gravitational Law

Minutes for Topic: 44

Core Lesson Description: Kepler's laws describe the motions of orbiting objects, including their elliptical paths around the Sun. Orbits may change due to the gravitational effects from, or collisions with, other objects in the solar system.

Core Lesson Student Learning Objectives: Use mathematical and computational representations of human-made and solar system objects in order to describe their motions and predict their trajectories and/or collisions

Core Lesson Essential Questions: What or how are scientist able to predict the motion of orbiting objects in the solar system?

Core Lesson Big Ideas: The universe is composed of a variety of different objects that are organized into systems each of which develops according to accepted physical processes and laws

Core Lesson Materials: White board
PowerPoint
Lab Resources

Core Lesson Key Terminology & Definitions: Elliptical orbit
Kepler's laws of motion
Newton's Law of Gravitational Pull

STANDARDS

NGSS Arranged by Disciplinary Core Idea (DCI) - Science (2013)

[HS-ESS1-4 \(Practiced\)](#) Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.

Unit: History of the Earth

Timeline: Week 34

Unit Description: This unit will cover the evidence used to support the age of the earth via radioactive dating to develop a geologic time scale for our planet. Evidence used to support the geologic time scale will be determined by studying sea-floor spreading, meteorological activity and plate tectonics.

Unit Essential Questions: How can we use current and past conditions of earth's crustal surface to identify the age of the Earth.
How does the age and location of oceanic vs continental rocks play a role in determining the age of the Earth?
How does sea floor spreading at mid ocean ridges prove the Plate tectonic Theory?
How do scientists use radiometric dating to determine the age of rocks.

Unit Big Ideas: Determine how age of the earths crust (both continental and oceanic) can help determine the age of the Earth. How can evidence from meteorites and other planetary surfaces be used to help account for the formation of earth.

Unit Materials: Hard copy of notes

Google classroom

various lab activities

Unit Assignments: TBD

Unit Key Terminology & Definitions : Elements
Geologic time scale
Half-life
Isotope
Radioactive
(radiometric) dating
Asthenosphere
Conduction
Convection
Convergence

Crust
Density
Inner core
Lithosphere
Mantle
Mid-Ocean
Outer core
Pangaea
Plate boundaries
Seafloor spreading
Topography

Unit Notes: All notes, resources and agendas can be found on the google classroom page.

STANDARDS: STANDARDS

NGSS Arranged by Disciplinary Core Idea (DCI) - Science (2013)

[HS-ESS1-5 \(Mastered\)](#) 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.

[HS-ESS1-6 \(Mastered\)](#) Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.

Topic: Age of earth

Core Lesson Description: Identify the beginning steps to the formation of our solar system. This will include using space rocks (meteorites) to help determine the age of when the process began.

Core Lesson Student Learning Objectives: Determine the steps to the formation of Earth and our solar system from evidence using current lithospheric crust with the help of radiometric dating.

Core Lesson Essential Questions: How does radioactive dating help determine the age of the Earth and or the solar system?

What role do mid-ocean ridges play in determining the age of the earth?

Core Lesson Big Ideas: Be able to identify the steps to the formation of our solar system by using radiometric dating of earths crust.

Core Lesson Materials: White board
PowerPoint
lab resources

Core Lesson Key Terminology & Definitions: Mid Ocean Ridge
Radioactive dating
Half-life

Isotope
daughter atoms

STANDARDS

NGSS Arranged by Disciplinary Core Idea (DCI) - Science (2013)

[HS-ESS1-5 \(Mastered\)](#) 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.

Topic: Ancient Earth Materials

Core Lesson Description: Identify how studying the earth's crust, lunar rocks, asteroids and meteorites play a significant role in determining the age of the Earth.

Core Lesson Essential Questions: How is radioactive decay used in determining the age of the Earth.

What role do lunar rocks, and meteorites play in helping to determine the age of the solar system.

Core Lesson Big Ideas: Radioactive Dating can be used to determine the age of earth and its ancient material.

Core Lesson Key Terminology & Definitions: Half-Life
Radioactive Decay
Spontaneous Decay
Nuclear Lifetime
Meteorite
Asteroid
Comet
Meteoroid
Meteor

STANDARDS

NGSS Arranged by Disciplinary Core Idea (DCI) - Science (2013)

[HS-ESS1-6 \(Mastered\)](#) Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.

Topic: Forces that create Mntns.

Minutes for Topic: 44

STANDARDS

NGSS Arranged by Disciplinary Core Idea (DCI) - Science (2013)

[HS-ESS2-1 \(Mastered\)](#) 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.

Unit: Earth Systems

Timeline: Week 34

Unit Description: This unit will focus on the components that make up the biosphere. Collectively the lithosphere, hydrosphere and atmosphere formations will be discussed in detail as well as their part in the role of the evolution of life.

Unit Essential Questions: How and why is Earth constantly changing?
What role does the biosphere play in evolution?
What is required for evolutionary changes?

Unit Big Ideas: The Earth is a complex and dynamic set of interconnected systems (e.g. geosphere, hydrosphere, atmosphere, biosphere) that interact over a wide range of temporal and spatial scales.

Unit Materials: Hard copy of notes

Google classroom

various lab activities

Unit Assignments: TBD

Unit Key Terminology & Definitions : Atmosphere Biosphere Fossil Geosphere Hydrosphere Lithosphere Carbon cycle Chemical properties Geosphere Hydrosphere Nitrogen cycle Water (hydrologic) cycle Phosphorous cycle Photosynthesis Physical properties

Unit Notes: All resources, agendas and notes can be found on google classroom.

STANDARDS: STANDARDS

NGSS Arranged by Disciplinary Core Idea (DCI) - Science (2013)

[HS-ESS2 \(Advanced\)](#) Earth's Systems

[HS-ESS2-1 \(Advanced\)](#) 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.

[HS-ESS2-2 \(Advanced\)](#) Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.

[HS-ESS2-3 \(Advanced\)](#) Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.

[HS-ESS2-5 \(Advanced\)](#) Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.

[HS-ESS2-6 \(Advanced\)](#) Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.

[HS-ESS2-7 \(Advanced\)](#) Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.

(* standards consolidated from Topic level)

Topic: Cause and Effect to changing systems

STANDARDS

NGSS Arranged by Disciplinary Core Idea (DCI) - Science (2013)

[HS-ESS2 \(Advanced\)](#) Earth's Systems

[HS-ESS2-1 \(Advanced\)](#) 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.

[HS-ESS2-2 \(Advanced\)](#) Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.

Topic: Thermal Convection Earth's Interior

Minutes for Topic: 220

STANDARDS

NGSS Arranged by Disciplinary Core Idea (DCI) - Science (2013)

[HS-ESS2-3 \(Advanced\)](#) Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.

Topic: Properties of Water

Minutes for Topic: 220

STANDARDSNGSS Arranged by Disciplinary Core Idea (DCI) - Science (2013)[HS-ESS2-5 \(Advanced\)](#)

Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.

Topic: Atmosphere Formation

Minutes for Topic: 44

STANDARDSNGSS Arranged by Disciplinary Core Idea (DCI) - Science (2013)[HS-ESS2-7 \(Advanced\)](#)

Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.

Topic: Coevolution of Life

Minutes for Topic: 220

STANDARDSNGSS Arranged by Disciplinary Core Idea (DCI) - Science (2013)[HS-ESS2-7 \(Advanced\)](#)

Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.

Topic: Carbon Cycle

Minutes for Topic: 88

STANDARDSNGSS Arranged by Disciplinary Core Idea (DCI) - Science (2013)[HS-ESS2-6 \(Advanced\)](#)

Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.

Unit: Weather and Climate

Timeline: Week 34

Unit

This unit will focus on Earth's climate happening as a result of an output of the sun's electromagnetic radiation. Climate can be altered over time as a result of Earth's orbit, tectonic events, ocean circulation, volcanic activity, glaciers, vegetation, and/or human activities.

Description:**Unit Essential Questions:**

How and why is Earth constantly changing?

Unit Big Ideas: Earth's climate depends on the sun's output of electromagnetic radiation, as well as that energy's reflection, absorption and re-radiation by various Earth systems and types of surfaces.

Climate changes happen on various time scales (e.g. - sun's energy output, Earth's orbit, tectonic events, ocean circulation, volcanic activity, glaciers, vegetation, and/or human activities).

Unit Materials: Hard copy of notes

Access to google classroom

Various lab activities

Unit Assignments: TBD

Unit Key Terminology & Definitions : Absorption Atmosphere Biosphere Climate Electromagnetic radiation Equilibrium Geosphere Hydrosphere Radiation Re-radiation Reflection Climate change Global warming

Unit Notes: All notes, resources and agendas can be found on the google classroom page.

STANDARDS: STANDARDS

NGSS Arranged by Disciplinary Core Idea (DCI) - Science (2013)

[HS-ESS3-1 \(Advanced\)](#) Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

(* standards consolidated from Topic level)

Topic: Causes of global climate change

Minutes for Topic: 220

STANDARDS

NGSS Arranged by Disciplinary Core Idea (DCI) - Science (2013)

[HS-ESS3-1 \(Advanced\)](#) Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

Topic: Global climate data overtime

Minutes for Topic: 220

STANDARDS

NGSS Arranged by Disciplinary Core Idea (DCI) - Science (2013)

[HS-ESS3-1 \(Advanced\)](#) Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

Unit: Human Sustainability

Timeline: Week 34

Unit Description: This unit will focus on how human interactions has impacted the Earth. Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species.

Unit Big Ideas: Resource availability has influenced the development of human society.

The extraction of resources and production of energy have benefits and risks.

Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species.

Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste.

Unit Materials: Hard copy of notes

Access to google classroom

Unit Assignments: TBD

Unit Key Terminology & Definitions : Benefit Biogeochemical cycles Biome Biosphere Carrying capacity Community Consumption Cost Desertification Earth system Ecology Economical Ecosystem Environment Extinction Geopolitical Habitat Nonrenewable Pollution Population Renewable Risk Species Sustainability System Temperature Benefit Biogeochemical cycles Biome Biosphere Carrying capacity Community Consumption Cost Desertification Earth system Ecology Economical Ecosystem Environment Extinction Geopolitical Habitat Nonrenewable Pollution Population Renewable Risk Species Sustainability System Temperature

Unit Notes: All notes, resources and agendas can be found on the google classroom page.

STANDARDS: STANDARDS

NGSS Arranged by Disciplinary Core Idea (DCI) - Science (2013)

- [HS-ESS3-1 \(Advanced\)](#) Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
- [HS-ESS3-2 \(Advanced\)](#) Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
- [HS-ESS3-3 \(Advanced\)](#) Create a computational simulation to illustrate the relationships among the management of natural resources, the sustainability of human populations, and biodiversity.
- [HS-ESS3-4 \(Advanced\)](#) Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
- [HS-ESS3-5 \(Advanced\)](#) 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.
- [HS-ESS3-6 \(Advanced\)](#) Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.

(* standards consolidated from Topic level)

Topic: Natural Hazards and impact on Resources

Minutes for Topic: 220

Topic: Pros and Cons of Mineral Resources

Minutes for Topic: 220

STANDARDS

NGSS Arranged by Disciplinary Core Idea (DCI) - Science (2013)

- [HS-ESS3-1 \(Advanced\)](#) Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
- [HS-ESS3-2 \(Advanced\)](#) Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
- [HS-ESS3-3 \(Advanced\)](#) Create a computational simulation to illustrate the relationships among the management of natural resources, the sustainability of human populations, and biodiversity.
- [HS-ESS3-4 \(Advanced\)](#) Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
- [HS-ESS3-5 \(Advanced\)](#) 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.
- [HS-ESS3-6 \(Advanced\)](#) Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.

Topic: Sustainability of Natural Resources

Minutes for Topic: 220

STANDARDS

NGSS Arranged by Disciplinary Core Idea (DCI) - Science (2013)

- [HS-ESS3-1 \(Advanced\)](#) Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
- [HS-ESS3-2 \(Advanced\)](#) Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.

[HS-ESS3-3 \(Advanced\)](#)

Create a computational simulation to illustrate the relationships among the management of natural resources, the sustainability of human populations, and biodiversity.

[HS-ESS3-4 \(Advanced\)](#)

Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

[HS-ESS3-5 \(Advanced\)](#)

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.

[HS-ESS3-6 \(Advanced\)](#)

Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.

Topic: Technology solutions to human impact

Minutes for Topic: 220

STANDARDS

NGSS Arranged by Disciplinary Core Idea (DCI) - Science (2013)

[HS-ESS3-4 \(Advanced\)](#)

Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

[HS-ESS3-6 \(Advanced\)](#)

Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.

Topic: Earth Systems and human interaction

Minutes for Topic: 220

STANDARDS

NGSS Arranged by Disciplinary Core Idea (DCI) - Science (2013)

[HS-ESS3-6 \(Advanced\)](#)

Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.