

8th Grade EARTH SCIENCE

I. Enduring Understanding:

The scientific method and technology allow us to gather data, analyze results, draw conclusions to solve problems.

Essential Questions:

In what ways is technology beneficial or controversial?

How are scientific tools and SI used properly to gather data?

Can I create an accurate experiment on my own?

Student Outcomes: Students will:

- A. *Understand science is a collection of tested ideas.*
 - 1. *Students will use the scientific method style of problem-solving to answer questions about the universe*
 - 2. *Ask appropriate questions determining what is known*
 - 3. *Write hypothesis*
 - 4. *Collect data*
 - 5. *Interpret data to determine validity of hypothesis*
 - 6. *Define a variable as a condition that may influence the outcome of an investigation*
 - 7. *Know the importance of testing one variable at a time*

- B. *Demonstrates the process of scientific measurement*
 - 1. *Collect, manipulate and analyze numerical data using appropriate methods*
 - 2. *Practice lab safety techniques*
 - 3. *Write numbers using scientific notation and vice versa*
 - 4. *Label, measure, and convert using SI*

- C. *Understand the human endeavors that connect technology to science.*
 - 1. *Cite examples of technology as the application of science in manufacturing, sanitation, space exploration, transportation, communication, and research.*
 - 2. *Describe how technology has impacted our culture and the environment either positively or negatively*
 - 3. *Utilize technology tools to gather and analyze data in astronomy, oceanography, meteorology, and geology.*
 - 4. *Explain and predict natural phenomena with the use of a scientific model.*

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II. Enduring Understanding:

The universe is made of matter and energy, which is continually being changed and transferred throughout the Earth and Universe.

Essential Questions:

Where is evidence of the law of conservation of matter in the environment?

How do atoms change when the state of matter changes?

How are atoms like Legos?

How do matter and energy balance?

Where and how does the sun affect Earth? Evidence?

Is all radiation bad?

Student Outcomes: Students will:

- A. Understand the structure of matter and how it's organized.
 - 1. *Give examples of how matter is neither created nor destroyed in a chemical reaction, the atoms get rearranged.*
 - 2. *Define atoms are the building blocks of matter.*
 - 3. *Categorize matter as mixtures, compounds, and elements.*
 - 4. Identify elements by their electrified light spectrum.
 - 5. *Identify the states of matter as solid, liquid, gas, and plasma*
 - 6. Describe how elements are in matter in your everyday life.

- B. *Understand energy and matter are changing the universe.*
 - 1. *Describe energy sources.*
 - 2. *Demonstrate how magma and lava rearrange matter into new rocks through volcanoes, hot spots, and the mid-ocean ridges*
 - 3. *Identify how transferred energy causes wind, water, and gravity to erode the lithosphere.*
 - 4. Describe how fusion in stars leads to formation of other elements and the release of energy.
 - 5. Describe the stages of development for stars.

- C. Understand radiation from the sun and stars are principle energy sources.
 - 1. *Compare and contrast conduction, convection, and radiation as methods of energy transfer.*
 - 2. *Explain heat from Earth's core leads to convection currents and how this relates to Earth's moving plates.*
 - 3. *Demonstrate how transferred energy leads to weather patterns.*
 - 4. *Describe how humans harness energy and transfer it to meet their needs.*
 - 5. *Analyze the energy from stars to describe their direction of travel, satellites and sizes.*
 - 6. *Analyze and organize the electromagnetic spectrum as the arrangement of all energy types including visible light in terms of speed, frequency, and wavelength.*

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III. Enduring Understanding:

Systems have cycles and patterns that allow us to make predictions. (PATTERNS AND CYCLES)

Essential Questions:

Where do the products you use come from?

Did a dinosaur once drink the same water that I drink?

How do scientists predict volcanic eruptions and earthquakes?

How does water get from clouds to your faucet?

How can I tell if my drinking water is in trouble?

What stories are in the rocks beneath my feet?

Why does the wind blow?

Why do we have seasons, day and night, months, and tides?

How do celestial bodies move?

Student Outcomes: Students will:

- A. Understand the patterns and cycles in the geosphere.
 1. *Diagram how igneous, metamorphic, and sedimentary rocks are recycled continuously on earth.*
 2. Tell the story of a place based on landforms, rocks, and mineral.
 3. *Describe, explain, or define minerals and rocks.*
 4. *Categorize objects as grown, mined, or both.*
 5. *Classify and identify minerals and rocks based on their properties which distinguish them and can be used to identify them.*
 6. *Describe how landforms have been created and are constantly changing due to moving tectonic plates, erosions, weathering, deposition, etc.*
 7. *Compare and contrast the types of plate boundaries and the constructive and destructive processes with each.*
 8. *Predict the severity, location, and type of volcanic eruptions due to the locations on the tectonic plates.*
 9. *Describe the causes and effects of earthquakes.*
- B. Understand the patterns and cycles of the atmosphere and hydrosphere
 1. *Describe how climate is determined by weather patterns.*
 2. *Explain the water cycle and its driving force*
 3. *Explain the impacts of humans on air and water quality*
 4. *Compare and contrast pressure systems, fronts, and other atmospheric structures.*
 5. *Observe, collect, and use weather data to predict weather.*
 6. *Explain how rotation causes wind patterns and ocean currents affecting weather and climate.*
 7. *Analyze the components, temperatures, and elevations in the stratification of the atmosphere.*

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- C. Understand the patterns and cycles in space.
 - 1. Analyze motions of earth, moon, and sun to explain moon phases, eclipses, and tides.
 - 2. Explain how the tilted axis and revolution around the sun cause seasons, climate patterns, and length of year.
 - 3. Show the rotation of Earth causes day and night.
 - 4. Describe how composition, mass, and distance from the sun effect the motion of the planets.
 - 5. Describe the differences between the inner planets and the outer planets.
 - 6. Describe the patterns in formation in the universe using Newton's Laws.

- D. Understand the geology of an area effects the local economy and culture.

IV. Enduring Understanding:

There is a long-term nature to processes and change on earth and in space. (TIME)

Essential Questions:

How did the sun, solar system, and universe begin?

When will our star die?

How have Earth and Minnesota changed over the past 4.5 billion years?

Student Outcomes: Students will:

- A. Understand forces beyond earth change our planet and solar system and universe over time.
 - 1. Describe how Newton's laws govern the formation of galaxies.
 - 2. Compare theories of moon formations.
 - 3. Apply Newton's laws to the formation of earth and our solar system.

- B. Understand the Earth provides a picture of the past 4.5 billion years.
 - 1. *Describe how wind, water, and gravity have and will shape landscapes over time.*
 - 2. *Diagram how humans have devised a geologic time scale based on fossil evidence.*
 - 3. Describe evidence in rocks, fossils, climate, and continent shape and how it points to continental drift and plate tectonics.
 - 4. *Analyze the interior of earth and its effects.*
 - 5. Analyze evidence of four main phases in Minnesota's history throughout geologic time.
 - 6. Predict future events based on the idea of uniformitarianism and understandings of the past.

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7. *Construct a model of a cross-section of Earth revealing the core, inner core, mantle, and crust.*
8. *Interpret layers in Earth's crust using the principle of superposition, unconformity, and uniformitarianism.*

V. **Enduring Understanding:**

Science is a way of knowing about the universe and working to keep resources in balance by using empirical information, logical argument, and skeptical review.

Essential Questions:

Science is a way of knowing about the universe and working to keep resources in balance by using empirical information, logical argument, and skeptical review.

Do consumers know what they are consuming?

How have humans impacted the geosphere, hydrosphere, and atmosphere?

How can environmental damage be repaired or reduced?

What is sustainability?

Are all global disasters caused by humans?

Student Outcomes: Students will:

- A. Use science to make ethical decisions and predicting consequences of various actions.
 1. Identify models which illustrate that sustainability is living to keep the environment in balance.
 2. Demonstrate how the conservation of resources relates to the law of conservation of matter and energy.
 3. *Identify technology, policies, and procedures which lead to further protection of land, seas, atmosphere, water supply, and diversity of life.*
 4. *Predict how pollution could effect climate.*
 5. *Identify and explore an environmental issue and its impact.*
 6. *Construct a timeline of events demonstrating development, usefulness, and limitations of scientific models.*
- B. Understand that all living things are connected.
 1. *Compare and contrast ways we contribute to the greater ecosystem (eg. Consumerism, pollution, environmental law, population, global warming, etc)*
 2. *Research the human impact on global climate change (eg. Ocean current, global warming, deforestation.)*
 3. *Research and collect data about the local environment to make educated decisions about sustainability*