Davison Community Schools
ADVISORY CURRICULUM COUNCIL
Phase I and II, April 1, 2014

Year one CI Science	
Course Essential Questions (from Phase I report): 1. How do inquiry and reflection help us understand our Scientific Community? 2. What is life and how is it organized and connected?	
Unit 1: Life Science: Structures and Processes of Living Things	
Essential Questions: 1. What are all living things composed of? 2. How is light energy transformed to chemical energy? 3. What are the different ways organisms reproduce?	**Essential Understanding:** • All living organisms are composed of cells, from one cell to many cells and they exhibit cell growth and division. • Specialized cells within multi-cellular organisms form different kinds of tissues and organs and organ systems that function together • Photosynthesis transforms light energy to chemical energy making possible the building of key chemical building blocks of living organisms. • All organisms have a life span and must reproduce in order to continue the species. Reproduction may be asexual or sexual.
Curriculum Standards	
L.OL.07.21 Recognize that all organisms are composed of cells (single cell organisms, multi-cellular organisms). **L.OL.07.22** Explain how cells make up different body tissues, organs, and organ systems. **L.OL.07.23** Describe how cells in all multi-cellular organisms are specialized to take in nutrients, which they use to provide energy for the work that cells do and to make the materials that a cell or organism needs. **L.OL.07.24** Recognize that cells function in a similar way in all organisms. **L.OL.07.31** Describe the growth and development in terms of increase of cell number and/or cell size **L.OL.07.32** Examine how through cell division, cells can become specialized for specific functions. **L.OL.07.6** Recognize the need for light to provide energy for the production of carbohydrates, proteins and fats. **L.OL.07.62** Explain that carbon dioxide and water are used to produce carbohydrates, proteins, and fats. **L.OL 7.63** Describe evidence that plants make, use, and store food. **L.HE.07.21** Compare how characteristics of living things are passed on through generations, both asexually and sexually. **L.HE.07.22** Compare and contrast the advantages and disadvantages of sexual vs. asexual reproduction. **S.IP.07.11** Generate scientific questions based on observations, investigations, and research. **S.IP.07.13** Use tools and equipment (microscopes) appropriate to scientific investigations on physical and chemical properties and changes in matter. **S.IP.07.14** Use metric measurement devices in an investigation. **S.IP.07.15** Construct charts and graphs from data and observations. **S.RS.07.15** Demonstrate scientific concepts through various illustrations, performances, models, exhibits, and activities	
Knowledge/Content **I Know ...**	**Skills/Processes** **I Can ...**

• the difference between multi cellular and single celled organisms (unicellular) • how to use a microscope • Sexual and Asexual Reproduction • Photosynthesis is $H_20 = CO_2$ + Sunlight $\rightarrow C_6H_{12}O_6 + O_2$ (Water + Carbon dioxide produces Glucose and Oxygen)	• View/Identify multi and uni-cellular organisms • Recognize specialized cells • Assess advantages of asexual and sexual reproduction
Phase 3 Purchased Materials	
Phase 4 Summative Assessment Evidence	
Phase V Learning Plan	

* indicates a Performance Task

Unit 2: Physical Science: Waves and Energy	
Essential Questions: 1. What are waves? 2. What are the different kinds of waves? 3. What are nuclear reactions? 4. How does the sun produce heat energy on Earth?	**Essential Understanding:** • Waves are produced through vibrations. • Waves transfer energy when they interact with matter. • Nuclear reactions that take place in the sun produce heat and light. • A fraction of the light energy from the sun provides energy to heat the Earth.

Curriculum Standards

P.EN.07.31: Identify examples of waves, including sound waves, seismic waves, and waves on water.
P.EN.07.32: Describe how waves are produced by vibrations in matter.
P.EN.07.33: Demonstrate how waves transfer energy when they interact with matter (For example: tuning fork in water, waves hitting a beach, earthquake knocking over buildings).
P.EN.07.61: Identify that nuclear reactions take place in the sun, producing heat and light.
P.EN.07.62: Explain how only a tiny fraction of light energy from the sun is transformed to heat energy on Earth.
S.IP.07.12 Design and conduct scientific investigations.
S.IP.07.13 Use tools and equipment (spring scales, stop watches, meter sticks and tapes, models, hand lens, thermometer, models, sieves, microscopes, hot plates, pH meters) appropriate to scientific investigations.
S.IP.07.14 Use metric measurement devices in an investigation.
S.IP.07.16 Identify patterns in data.
S.RS.07.15 Demonstrate scientific concepts through various illustrations, performances, models, exhibits, and activities.
S.RS.07.16 Design solutions to problems using technology.

Knowledge/Content I Know ...	Skills/Processes I Can ...
• The different types of waves • The role matter plays on vibrations • The types of energy transfer • The products of nuclear reactions in the sun. • The parts of waves: amplitude, wavelength, and frequency •	• Identify examples of waves. • Describe how waves are produced. • Describe how waves are characterized. • Demonstrate waves. • Explain the transformation of light to heat energy.

Phase 3 Purchased Materials

Phase 4 Summative Assessment Evidence

Phase V Learning Plan

* indicates Performance Assessment

Unit 3: Earth Science: Fluid Earth Systems and Human Activities

Essential Questions:

1. How does water flow from the Earth's surface to the atmosphere?
2. How does the warming of the Earth's surface affect the weather?
3. How do human activities change the surface of the Earth and affect the survival of organisms?
4. How does the atmosphere change at different elevations?
5. In what ways does water move through the four spheres of the Earth?

Essential Understanding:

- The sun is the major source of energy for phenomenon on Earth.
- The sun's warming relates to weather, climate, and the water cycle.
- Human interaction and use of natural resources affects the environment.
- The Earth's atmosphere is a mixture of gases and water vapor.

Curriculum Standards

E.ES.07.11: Demonstrate, using a model or drawing, the relationship between the warming by the sun of the Earth and the water cycle as it applies to the atmosphere (evaporation, water vapor, warm air rising, cooling, condensation, clouds).
E.ES.07.12: Describe the relationship between the warming of the atmosphere of the Earth by the sun and convection within the atmosphere and oceans.
E.ES.07.13: Describe how the warming of the Earth by the sun produces winds and ocean currents.
E.ES.07.41: Explain how human activities (surface mining, deforestation, overpopulation, construction and urban development, farming, dams, landfills, and restoring natural areas) change the surface of the Earth and affect the survival of organisms.
E.ES.07.42: Describe the origins of pollution in the atmosphere, geosphere, and hydrosphere, (car exhaust, industrial emissions, acid rain, and natural sources), and how pollution impacts habitats, climatic change, threatens or endangers species.
E.ES.07.71: Compare and contrast the difference and relationship between climate and weather.
E.ST.07.72: Describe how different weather occurs due to the constant motion of the atmosphere from the energy of the sun reaching the surface of the Earth.
E.ES.07.73: Explain how the temperature of the oceans affects the different climates on Earth because water in the oceans holds a large amount of heat.
E.ES.07.74: Describe weather conditions associated with frontal boundaries (cold, warm, stationary, and occluded) and the movement of major air masses and the **jet stream** across North America using a weather map.
E.FE.07.11: Describe the atmosphere as a mixture of gases.
E.FE.07.12: Compare and contrast the atmosphere at different elevations.
E.ES.07.81 Explain the water cycle and describe how evaporation, **transpiration**, condensation, cloud formation, **precipitation**, infiltration, surface runoff, ground water, and absorption occur within the cycle.
E.ES.07.82 Analyze the flow of water between the components of a watershed, including surface features (lakes, streams, rivers, wetlands) and **groundwater**.
S.IP.07.13 Use tools and equipment (spring scales, stop watches, meter sticks and tapes, models, hand lens, thermometer, models, sieves, microscopes, hot plates, pH meters) appropriate to scientific investigations.
S.IP.07.14 Use metric measurement devices in an investigation.
S.IA.07.11 Analyze information from data tables and graphs to answer scientific questions.
S.RS.07.13 Identify the need for evidence in making scientific decisions.
S.RS.07.15 Demonstrate scientific concepts through various illustrations, performances, models, exhibits, and activities.
S.RS.07.17 Describe the effect humans and other organisms have on the balance of the natural world.
S.RS.07.18 Describe what science and technology can and cannot reasonably contribute to society.

Knowledge/Content **I Know ...**	**Skills/Processes** **I Can ...**

• The water cycle and its parts. • The relationship between the warming of the atmosphere of the Earth by the sun and convection within the atmosphere and oceans. • The difference and relationship between climate and weather. • The different types of frontal boundaries. • How air pressure affect various weather fronts	• Identify frontal boundaries on a weather map. • Compare/contrast climate and weather. • Explain the path that water takes from Michigan to the ocean. • Describe how the warming of the Earth by the sun produces winds and ocean currents.
Phase 3 Purchased Materials	
Phase 4 Summative Assessment Evidence	
Phase V Learning Plan	

Unit 4: Physical Science: Physical and Chemical Properties and Changes in Matter	
Essential Questions: 1. What is Matter? 2. What are Elements? 3. How are Elements organized? 4. What are Physical Properties? 5. What are Chemical Properties? 6. How do you determine a chemical change has occurred?	**Essential Understanding:** • Matter is made up of atoms and molecules that are represented through models. • Elements are chemical substances that make up all other substances and are composed of one kind of atom. • Elements are organized on the Periodic Table in families. • Physical and chemical properties identify substances and determine when a chemical change has occurred.
Curriculum Standards	
P.PM.07.11: Classify substances by their chemical properties (flammability, pH, acid-base indicators, reactivity) **P.PM.07.21**: Identify the smallest component that makes up an element. **P.PM.07.22**: Describe how the elements within the Periodic Table are organized by similar properties into families (Highly reactive metals, less reactive metals, highly reactive nonmetals and some almost completely non-reactive gases) **P.PM.07.23**: Illustrate the structure of molecules using models or drawings (water, carbon dioxide, salt). **P.PM.07.24**: List examples of physical and chemical properties of elements and compounds (boiling point, density, color, conductivity, reactivity). **P.CM.07.21**: Identify evidence of chemical change through color, gas formation, solid formation, and temperature change. **P.CM.07.22**: Compare and contrast the chemical properties of a new substance with the original after a chemical change. **P.CM.07.23**: Describe the physical properties and chemical properties of the products and reactants in a chemical change. **S.IP.07.13** Use tools and equipment (spring scales, stop watches, meter sticks and tapes, models, hand lens, thermometer, models, sieves, microscopes, hot plates, pH meters) appropriate to scientific investigations. **S.IP.07.14** Use metric measurement devices in an investigation.	

S.IP.07.16 Identify patterns in data.
S.IA.07.11 Analyze information from data tables and graphs to answer scientific questions.
S.IA.07.14 Draw conclusions from sets of data from multiple trials of a scientific investigation to draw conclusions.
S.RS.07.19 Describe how science and technology have advanced because of the contributions of many people throughout history and across cultures.

Knowledge/Content **I Know ...**	**Skills/Processes** **I Can ...**
• What is meant by physical properties • What is meant by Chemical Properties • The organization of the periodic table	• Classify substances by their chemical properties. • Distinguish between an atom/molecule/ and element/compound. • Illustrate the structure of molecules. • Compare/Contrast Physical and Chemical Properties. • Compare/Contrast chemical changes.

Phase 3 Purchased Materials

Phase 4 Summative Assessment Evidence

Phase V Learning Plan

Davison Community Schools
ADVISORY CURRICULUM COUNCIL
CI 8th Grade Science
PHASE II

Earth Science

Enduring Course Goals (from Phase I):

- Recognize the potential impact of global climate change, involving studies of past climates, measurements of current interactions of Earth's systems. Protecting the human interests of health, safety and resource management depends upon an understanding of natural hazards and human impact on earth systems.

Topic: Climate Change and Human Impacts

Topic Essential Question(s):

1. How does the greenhouse effect work?
2. What natural mechanisms can result in changes in climate?
3. Are carbon dioxide levels related to global temperatures?
4. What are the consequences of changes in climate?
5. What are the consequences of using renewable and nonrenewable resources?
6. What impact do humans have on the environment?

Topic Essential Understandings:

1. The greenhouse effect keeps the Earth hospitable.
2. Changes in natural mechanisms can cause changes in climate.
3. Atmospheric carbon dioxide levels have increased since the Industrial Revolution.
4. Changing climates have consequences.
5. Renewable and Nonrenewable resources both have overall costs and benefits.
6. Human activities affect the Earth.

Curriculum Standards: SKILLS/BENCHMARKS:

E5.4A Explain the natural mechanism of the greenhouse effect including comparisons of the major greenhouse gases (water vapor, carbon dioxide, methane, nitrous oxide, and ozone).

E5.4B Describe natural mechanisms that could result in significant changes in climate (e.g., major volcanic eruptions, changes in sunlight received by the earth, meteorite impacts).

E5.4C Analyze the relationship between the emissions of carbon dioxide, atmospheric carbon dioxide levels and the average global temperature over the past 150 years.

E5.4D Based on evidence of observable changes in recent history and climate change models, explain the consequences of warmer oceans (including the results of increased evaporation, shoreline and estuarine impacts, oceanic algae growth, and coral bleaching) and changing climatic zones.

E2.4A Describe renewable and nonrenewable sources of energy for human consumption (electricity, fuels), compare their effects on the environment, and include overall costs and benefits.

E2.4B Explain how the impact of human activities on the environment (e.g., deforestation, air pollution, coral reef destruction).

E1.2A Answer specific questions through scientific investigations. .

E2.1A Explain why the Earth is essentially a closed system in terms of matter.

E2.1B Recognize the major systems (geosphere, atmosphere, hydrosphere, biosphere) that make up the Earth.

E2.1C Explain, using specific examples, how a change in one system affects other Earth systems.

E2.2B Identify differences in the origin and use of renewable (e.g., solar, wind, water, biomass) and nonrenewable (e.g., fossil fuels, nuclear [U-235]) sources of energy.

E2.2C Recognize heat transfer in the Earth occurs by conduction, convection, and radiation.

E2.2D Identify the main sources of energy to the climate system.

Knowledge/Content Students will know ...
Vocabulary:

- Greenhouse gases such as carbon dioxide, methane, nitrous oxide, water vapor, and ozone allow shortwave radiation to enter but prevent much of the long-wave radiation from leaving making Earth hospitable.
- Earth's temperature changes due to changes in sunlight, meteorites, and volcanic disruptions.
- Average global temperatures have increased since the Industrial Revolution due to increase in emissions and population.
- Renewable sources of energy have short term negative effects such as production and long term positive effects such as less greenhouse emissions.
- Renewable sources of energy are expensive to make and maintain.
- Nonrenewable sources of energy have short term positive effects due to equipment already in place but have negative long term effects such as greenhouse gas emissions.

Skills/Processes
Students will be able to...

- Understand by viewing a graph, the composition of the atmosphere and how effective each gas is at creating a greenhouse effect.
- Complete an internet search to find potential effects of natural mechanisms that may alter Earths climate.
- Look at data of global temperatures to make predictions of future temperatures and carbon dioxide levels.
- Create a document that shows consequences of warmer oceans and warmer climatic zones.
- Create a table with costs/benefits of renewable and nonrenewable resources.
- Create a PowerPoint presentation with problems and solutions to human impacts on the environment.

• Nonrenewable sources of energy are cheap to make when compare with the amount of energy produced.	

Topic: Unit 2: Earthquakes and Earth's Interior

Topic Essential Question(s):

1. How does heat transfer in the Earth?
2. How are the layers of the Earth different from one another based on physical characteristics?
3. How is Earth's magnetic field generated and where?
4. How do scientists know about the Earth's layers if we haven't been there?
5. How is oceanic and continental crust different in terms of density, age, and composition?
6. How do scientists measure earthquakes and volcanoes?
7. What are some catastrophic events that are caused by earthquakes and volcanoes?

Topic Essential Understandings:

1. Heat transfers in the Earth by conduction, convection, and radiation.
2. Earth's layers vary based on density, viscosity, pressure, temperature, and composition.
3. Earth's magnetic field is generated by motions within the outer liquid core that produce electrical currents that in turn create the earth's magnetic field.
4. Scientists use primary (P) and secondary (S) seismic wave arrivals to determine the Earth's layers. The travel speed of seismic waves in strongly influenced by rock density, state of matter and pressure from depth.
5. Oceanic crust is younger, thinner, denser and compositionally more.
6. Earthquakes are measured using instruments that respond to wave energy that reaches the surface.
7. Earthquakes can result in tsunamis, mass wasting, damage to human-made structures. Structures built on sediments are more vulnerable than those build on bedrock. Volcanism can cause temporary global cooling with secondary effects on the atmosphere, hydrosphere and biosphere.

Curriculum Standards:

SKILLS/BENCHMARKS:

E2.2 Energy in Earth systems can exist in a number of forms (e.g., thermal energy as heat in the Earth, chemical energy stored as fossil fuels, mechanical energy as delivered by tides) Movement of matter and its component elements, through and between Earth's systems, is driven by Earth's internal (radioactive decay and gravity) and external (Sun as primary) sources of energy. Thermal energy is transferred by radiation, convection, and conduction. Fossil fuels are derived from plants and animals of the past, are nonrenewable and, therefore, are limited in availability. All sources of energy for human consumption (e.g., solar, wind, nuclear, ethanol, hydrogen, geothermal, hydroelectric) have advantages and disadvantages.
E2.2C Describe natural processes in which heat transfer in the Earth occurs by conduction, convection, and radiation.
E3.2 Interior of the Earth The Earth can also be subdivided into concentric layers based on their physical characteristics: (lithosphere, asthenosphere, lower mantle, outer core, and inner core). The crust and upper mantle compose the rigid lithosphere (plates) that moves over a "softer" asthenosphere (part of the upper mantle). The magnetic field of the Earth is generated in the outer core. The interior of the Earth cannot be directly sampled and must be modeled using data from seismology.
E3.2A Describe the interior of the Earth (in terms of crust, mantle, and inner and outer cores) and where the magnetic field of the Earth is generated.
E3.2B Explain how scientists infer that the Earth has internal layers with discernable properties using patterns of primary (P) and secondary (S) seismic wave arrivals
E3.2C Describe the differences between oceanic and continental crust (including density, age composition).
E3.4 Earthquakes and Volcanoes Plate motions result in potentially catastrophic events (earthquakes, volcanoes, tsunamis, mass wasting) that affect humanity. The intensity of volcanic eruptions is controlled by the chemistry and properties of the magma. Earthquakes are the result of abrupt movements of the Earth. They generate energy in the form of body and surface waves.
E3.4B Describe how the sizes of earthquakes and volcanoes are measured or characterized.
E3.4C Describe the effects of earthquakes and volcanic eruptions on humans.
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Knowledge/Content

Students will know ...

Vocabulary:
Asthenosphere, continental crust, convection, crust, earthquakes, gravity, inner core, intensity, internal sources of energy, lithosphere, lower mantle, magnetic field, magnitude, modeling, oceanic crust, outer core, plates, primary seismic waves, properties of waves, P-waves, radioactive decay, reflection, rigid lithosphere, secondary seismic waves, seismology, surface waves, S-waves, thermal energy, upper mantle, wave amplitude.

Skills/Processes

Students will be able to...

- Students should be able to explain how convection transfers heat using models and diagrams.
- Students will use cross sections of Earth to show ray paths of seismic waves to infer layers.
- Students will be able to distinguish between oceanic and continental crust based on characteristics.
- Students will be able to use the average speed of P-wave to calculate travel time at various locations around the globe.
- Students will be able to tell where the most amount of damage will occur.

Topic: Unit 3: Plate Tectonics and Volcanoes

Topic Essential Question(s):

1. How do physical, chemical, and biological processes change the Earth's surface features?
2. How does heat transfer in the Earth?
3. What drives the plates to slide past each other, collide, or be created?
4. What surface features are created from the motion of plate tectonics and how?
5. How were the Hawaiian Islands formed and at what rate?
6. What are some catastrophic events that are caused by earthquakes and volcanoes?
7. What is the relationship between earthquake/volcanic eruption location and plate tectonic boundary?
8. How do volcanoes change the atmosphere, hydrosphere, and other Earth systems?

Topic Essential Understandings:

1. Earths elements move within and between the lithosphere, atmosphere, hydrosphere, and biosphere as part of geochemical cycles.
2. Heat transfers in the Earth by conduction, convection, and radiation.
3. Convective forces cause the plates to move.
4. Sea floor spreading is caused where new crust is created. Mid-ocean ridges are a series of undersea mountain ranges that wind around the earth.
5. Hawaiian Islands are located above a "hot spot" on the Pacific Plate which is moving north west at a rate of about 7-9 cm/year. As the Pacific Plate moves, lava keeps pushing up and creating new volcanoes.
6. Earthquakes can result in tsunamis, mass wasting, damage to human-made structures. Structures built on sediments are more vulnerable than those build on bedrock. Volcanism can cause temporary global cooling with secondary effects on the atmosphere, hydrosphere and biosphere.
7. Earthquakes and volcanoes are located along plate tectonic boundaries.
8. Volcanic eruptions emit dust and ash into the atmosphere that block sunlight resulting in lower temperatures both short and long term. Volcanoes emit carbon dioxide which is a greenhouse gas and contributes to global warming. Volcanic eruptions can result in mud flows affecting fauna and flora as well as starting wild fires.

Curriculum Standards:

SKILLS/BENCHMARKS:

E2.1 Earth Systems Overview The Earth is a system consisting of four major interacting components: geosphere (crust, mantle, and core), atmosphere (air), hydrosphere (water), and biosphere (the living part of Earth). Physical, chemical, and biological processes act within and among the four components on a wide range of time scales to continuously change Earth's crust, oceans, atmosphere, and living organisms. Earth elements move within and between the lithosphere, atmosphere, hydrosphere, and biosphere as part of geochemical cycles.
E2.1B Analyze the interactions between the major systems (geosphere, atmosphere, hydrosphere, biosphere) that make up the Earth.
E2.1C Explain, using specific examples, how a change in one system affects other Earth systems.
E2.2 Energy in Earth Systems Energy in Earth systems can exist in a number of forms (e.g., thermal energy as heat in the Earth, chemical energy stored as fossil fuels, mechanical energy as delivered by tides) and can be transformed from one state to another and move from one reservoir to another. Movement of matter and its component elements, through and between Earth's systems, is driven by Earth's internal (radioactive decay and gravity) and external (Sun as primary) sources of energy. Thermal energy is transferred by radiation, convection, and conduction. Fossil fuels are derived from plants and animals of the past, are nonrenewable and, therefore, are limited in availability. All sources of energy for human consumption (e.g., solar, wind, nuclear, ethanol, hydrogen, geothermal, hydroelectric) have advantages and disadvantages.
E2.2A Describe the Earth's principal sources of internal and external energy (e.g., radioactive decay, gravity, solar energy).
E2.2C Describe natural processes in which heat transfer in the Earth occurs by conduction, convection, and radiation.
E3.3 Plate Tectonics Theory The Earth's crust and upper mantle make up the lithosphere, which is broken into large mobile pieces called tectonic plates. The plates move at velocities in units of centimeters per year as measured using the global positioning system (GPS). Motion histories are determined with calculations that relate rate, time, and distance of offset geologic features. Oceanic plates are created at mid-ocean ridges by magmatic activity and cooled until they sink back into the Earth at subduction zones. At some localities, plates slide by each other. Mountain belts are formed both by continental collision and as a result of subduction. The outward flow of heat from Earth's interior provides the driving energy for plate tectonics. **E3.3A** Explain how plate tectonics accounts for the features and processes (sea floor spreading, mid-ocean ridges, subduction zones, earthquakes and volcanoes, mountain ranges) that occur on or near the Earth's surface.
E3.3B Explain why tectonic plates move using the concept of heat flowing through mantle convection, coupled with the cooling and sinking of aging ocean plates that results from their increased density.
E3.3C Describe the motion history of geologic features (e.g., plates,Hawaii) using equations relating rate, time, and distance.
E3.3d Distinguish plate boundaries by the pattern of depth and magnitude of earthquakes.
E3.4 Earthquakes and Volcanoes Plate motions result in potentially catastrophic events (earthquakes, volcanoes, tsunamis, mass wasting) that affect humanity. The intensity of volcanic eruptions is controlled by the chemistry and properties of the magma. Earthquakes are the result of abrupt movements of the Earth. They generate energy in the form of body and surface waves.

Knowledge/Content

Students will know ...

Vocabulary:
aging ocean plates, atmosphere, biosphere, chemical composition, continental collision, convection, core, crust, density, driving energy, driving force, earthquakes, explosivity, geologic features, geosphere, global positioning system, hydrosphere, lithosphere, magma, mantle convection, mid-ocean ridges, molten rock, mountain belts, mountain ranges, oceanic plates, plate boundaries, plate collision, plate tectonics theory, pressure, radioactive decay, sea floor spreading, subduction zones, tectonic plates, thermal energy, transform faults, upper mantle, and volcanoes

Skills/Processes

Students will be able to...

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E3.4A Use the distribution of earthquakes and volcanoes to locate and determine the types of plate boundaries. **E3.4B** Describe how the sizes of earthquakes and volcanoes are measured or characterized. **E3.4C** Describe the effects of earthquakes and volcanic eruptions on humans. **E3.4e** Explain how volcanoes change the atmosphere, hydrosphere, and other Earth systems.		

Topic: The Earth in Space and Time

Topic Essential Question(s):

1. What does the universe look like?
2. How did the universe form?
3. How do we know how old the universe is?
4. How does the sun affect life on Earth?
5. How does the sun produce energy?
6. What caused the solar system to form?
7. How old is the Earth?
8. How did life begin on Earth?

Topic Essential Understandings:

1. Our solar system is located in the Milky Way galaxy.
2. The Sun is responsible for life on Earth
3. The Sun makes its own energy.
4. The Sun is active and causes disturbances on Earth.
5. The solar system formed from dust and gas.
6. Rocks are dated by radioactive decay.
7. Life on Earth required an atmosphere with oxygen.
8. Determine time sequence using fossils.

Curriculum Standards: SKILLS/BENCHMARKS:

E5.1A Describe the position and motion of our solar system in our galaxy and the overall scale, structure, and age of the universe.

E5.2A Identify patterns in solar activities (sunspot cycle, solar flares, solar wind).

E5.2B Relate events on the Sun to phenomena such as auroras, disruption of radio and satellite communications, and power grid disturbances.

E5.2C Describe how the Sun produces energy.

E5.3A Explain how the solar system formed from a nebula of dust and gas in a spiral arm of the Milky Way Galaxy about 4.6 Ga (billion years ago).

E5.3B Describe the process of radioactive decay and explain how radioactive elements are used to date the rocks that contain them.

E5.3C Relate major events in the history of the Earth to the geologic time scale.

E5.3D Describe how index fossils can be used to determine time sequence.

- E1.2C Develop an understanding of a scientific concept by accessing information from multiple sources. Evaluate the scientific accuracy and significance of the information.

Knowledge/Content Students will know ...

- Scientists estimate the age of the universe to be 13.7 billion years old.
- Our solar system is located in a Spiral galaxy known as the Milky Way galaxy and is rotating about its center.
- There are patterns in solar activities such as sunspot cycles, solar flares, and solar wind.
- The Sun causes auroras, disruption of radio and satellite communications, and power grid disturbances.
- How the Sun produces energy by nuclear fusion.
- How the solar system formed from a nebula of dust and gas about 4.6 billion years ago.
- How the process or radioactive decay works and how radioactive elements are used to date rocks that contain radioactive elements.
- How index fossils are used to determine time sequence.

Skills/Processes

Students will be able to...

- Model where our solar system is in our galaxy and its motion.
- See sunspots using instruments.
- Know that sunspots affect radio and satellite communications while also causing power grid disturbances.
- Use models to demonstrate how the Sun creates energy.
- Create a document showing the stages of solar system formation.
- Use charts and graphs, students will make predictions on the age of rocks based on the radioactive elements contained in those rocks.
- Investigate major events in the history of the Earth by internet, text book, or other source to create a presentation about geologic time scale.
- Create an index fossil time line to help determine time sequence.