EARTH SCIENCE COURSE PLAN

Sem 1 - 16 weeks

Unit 1 - The Universe and Solar System - 7 weeks
Unit 2 - Geologic History - 3 weeks
Unit 3 - Plate Tectonics - 6 weeks

Sem 2- 16 weeks

Unit 4 - Surface Interactions - 3 weeks
Unit 5 - Renewable and Nonrenewable Resources - 4 weeks
Unit 6 - Climate/Meteorology - 7 weeks
Unit 7 - -Natural Hazards - 2 weeks

COMMONALITIES WITH BIOLOGY

- Content folder > Unit folders > week folders
- One summative assessment per unit
- At least one discussion and one formative assessment per week
- Labs may be virtual or kitchen based

UNIT PLANS with COLORADO STATE STANDARDS

Each week is a complete lesson. The lesson structure is in the BCSC 5E format: Engage, Explore, Explain, Extend, Evaluate.

SEMESTER ONE

Unit 1 The Universe and Solar System - 7 weeks

Week/Topic/Colorado State Standards
1 - Nature of Science and Electromagnetic Spectrum ● Use the nature of science to determine evidence, law and theory. ● Critically evaluate strengths and weaknesses of a model which represents complex natural phenomena. ● Understand that all scientific knowledge is subject to new evidence and that the presence of reproducible results yields a scientific theory. ● How does the electromagnetic spectrum positively and negatively impact Earth's systems? ● Different types of telescopes have given us data about the universe, galaxy, and solar system. ● Analyze and interpret data - graph reading
2 - Beginnings of the Universe ● What influences Earth's position in the universe? ● How do we know the age of Earth, Sun and universe?
3 - The Sun and Stellar Classification ● Fusion is the most common source of energy in the universe, and it provides the basis of Earth's energy through fusion reactions in the Sun.
4 - Stellar Evolution Part 1: Star Birth ● Fusion is the most common source of energy in the universe, and it provides the basis of Earth's energy through fusion reactions in the Sun. Different types of telescopes have given us data about the universe, galaxy, and solar system. ● Analyze and interpret data - graph reading
5 - Stellar Evolution Part 1: Star Death ● Fusion is the most common source of energy in the universe, and it provides the basis of Earth's energy through fusion reactions in the Sun. Different types of telescopes have given us data about the universe, galaxy, and solar system. ● Analyze and interpret data - graph reading
6 - Sun Earth Moon System - Gravity ● Understand the physical laws that govern Earth are the same physical laws that govern the rest of the universe. ● Explain using evidence ● Newton's laws of motion and gravitation describe the relationships among forces acting on and between objects, their masses, and changes in their motion – but have limitations
7 - Sun Earth Moon System ● Understand the physical laws that govern Earth are the same physical laws that govern the rest of the universe. ● Explain using evidence

Unit 2 - Geologic History - 3 weeks

Week/Topic/Colorado State Standards
1 - Geologic Time ● How did the formation of Earth help shape its features today? ● Understand that all scientific knowledge is subject to new evidence and that the presence of reproducible results yields a scientific theory. ● Critically evaluate scientific claims in popular media and by peers regarding Earth's history, and determine if evidence presented is appropriate and sufficient to support the claims.
2 - Absolute vs Relative Time ● Geologic principles such as original horizontality, superposition, cross-cutting relationships, unconformities, and index fossils allow us to accurately interpret geologic history. ● Employ data-collection technology such as geographic mapping systems and visualization tools to gather and analyze data and scientific information about Earth's history. ● How can we interpret the geologic history of an area?
3 - Fossils ● Geologic principles such as original horizontality, superposition, cross-cutting relationships, unconformities, and index fossils allow us to accurately interpret geologic history. ● Critically evaluate scientific claims in popular media and by peers regarding Earth's history, and determine if evidence presented is appropriate and sufficient to support the claims.

Unit 3 - Plate Tectonics - 6 weeks

Week/Topic/Colorado State Standards
1 - Layers of the Earth and Continental Drift ● What drives plate motion? ● How have scientists “discovered” the layers of Earth? ● New conceptual interpretations of data and innovative geophysical technologies led to the current theory of plate tectonics. ● Recognize that the current understanding of plate tectonics has developed over time and become more sophisticated as new technologies have lead to new evidence.
2 - Seafloor Spreading ● What drives plate motion? ● New conceptual interpretations of data and innovative geophysical technologies led to the current theory of plate tectonics. ● Recognize that the current understanding of plate tectonics has developed over time and become more sophisticated as new technologies have lead to new evidence.
3 - Plate Boundaries ● How do the different types of plate boundaries create different landforms on Earth? ● What might happen to Earth’s landforms in the future?
4 - Seismic Waves ● New conceptual interpretations of data and innovative geophysical technologies led to the current theory of plate tectonics. ● Recognize that the current understanding of plate tectonics has developed over time and become more sophisticated as new technologies have lead to new evidence.
5 - Earthquakes ● Ask testable questions and make a falsifiable hypothesis about plate tectonics and design a method to find an answer. ● New conceptual interpretations of data and innovative geophysical technologies led to the current theory of plate tectonics. ● Recognize that the current understanding of plate tectonics has developed over time and become more sophisticated as new technologies have lead to new evidence.
6 - Volcanoes ● New conceptual interpretations of data and innovative geophysical technologies led to the current theory of plate tectonics. ● Recognize that the current understanding of plate tectonics has developed over time and become more sophisticated as new technologies have lead to new evidence.

SEMESTER TWO

Unit 4 - Surface Interactions - 3 weeks

Week/Topic/Colorado State Standards
1 - Topographic Maps ● Geologic, physical, and topographic maps can be used to interpret surface features ● Recognize that landform models help us understand the interaction among Earth's systems. ● Use remote sensing and geographic information systems (GIS) data to interpret landforms and landform impact on human activity ● Develop, communicate, and justify an evidence-based scientific explanation addressing questions regarding the interaction of Earth's surface with water, air, gravity, and biological activity ● Analyze and interpret data, maps, and models concerning the direct and indirect evidence produced by physical and chemical changes that water, air, gravity, and biological activity create
2 - Weathering and Erosion ● How do Earth's systems interact to create new landforms? ● What are positive changes on Earth's geosphere due to water, air, gravity, and biological activity? ● What are negative changes on Earth's geosphere due to water, air, gravity, and biological activity? ● Ask testable questions and make a falsifiable hypothesis about physical and chemical changes on the geosphere and use an inquiry based approach to find an answer. ● Evaluate negative and positive consequences of physical and chemical changes on the geosphere ● Use appropriate technology to help gather and analyze data, find background information, and communicate scientific information on physical and chemical changes. ● Analyze and interpret data, maps, and models concerning the direct and indirect evidence produced by physical and chemical changes that water, air, gravity, and biological activity create
3 - The Human Impact on the Environment ● Human activities such as agricultural practices have impacts on soil formation and soil loss.

Unit 5 - Renewable and Nonrenewable Resources - 4 weeks

Week/Topic/Colorado State Standards
1 - Energy Basics ● Matter can change form through chemical or nuclear reactions abiding by the laws of conservation of mass and energy ● What are the advantages and disadvantages of using different types of energy? ● How do humans use resources?
2 - Mineral resources ● Analyze and interpret data about the effect of resource consumption and development on resource reserves to draw conclusions about sustainable use ● Critically evaluate scientific claims in popular media and by peers, and determine if evidence presented is appropriate and sufficient to support the claims. ● How are resources used in our community? ● How can humans reduce the impact of resource use? ● How do humans use resources? ● Technologies have had a variety of impacts on how resources are located, extracted, and consumed. ● Technology development has reduced the pollution, waste, and ecosystem degradation caused by extraction and use.
3 - Renewable vs nonrenewable ● Infer assumptions behind emotional, political, and data-driven conclusions about renewable and nonrenewable resource use. ● How are resources used in our community? ● How can humans reduce the impact of resource use? ● How do humans use resources?
4 - Conserving resources ● Analyze and interpret data about the effect of resource consumption and development on resource reserves to draw conclusions about sustainable use ● Create a plan to reduce environmental impacts due to resource consumption ● Evaluate positive and negative impacts on the geosphere, atmosphere, hydrosphere, and biosphere in regards to resource use ● Develop, communicate, and justify an evidence-based scientific explanation regarding the costs and benefits of exploration, development, and consumption of renewable and nonrenewable resources ● How are resources used in our community? ● How can humans reduce the impact of resource use? ● How do humans use resources? ● Technology development has reduced the pollution, waste, and ecosystem degradation caused by extraction and use.

Unit 6 - Climate - 7 weeks

Week/Topic/Colorado State Standards
1 - Earth's Energy Balance and atmosphere ● How is climate influenced by changes in Earth's energy balance? ● How does climate change impact all of Earth's systems?
2 - Weather Factors ● Explain how a combination of factors such as Earth's tilt, seasons, geophysical location, proximity to oceans, landmass location, latitude, and elevation determine a location's climate ● Identify mechanisms in the past and present that have changed Earth's climate
3 - Local Climate Factors ● Explain how a combination of factors such as Earth's tilt, seasons, geophysical location, proximity to oceans, landmass location, latitude, and elevation determine a location's climate ● Identify mechanisms in the past and present that have changed Earth's climate
4 - Global Climate Factors including Oceans (El Nino, La Nina, circulation patterns) ● Explain how a combination of factors such as Earth's tilt, seasons, geophysical location, proximity to oceans, landmass location, latitude, and elevation determine a location's climate ● How can changes in the ocean create climate change? ● Examine how computer models are used in predicting the impacts of climate change. ● Identify mechanisms in the past and present that have changed Earth's climate
5 - Earth's Climate in the Past ● How have climates changed over Earth's history? ● Identify mechanisms in the past and present that have changed Earth's climate
6 - Human impact on climate ● Identify mechanisms in the past and present that have changed Earth's climate ● Human actions such as burning fossil fuels might impact Earth's climate. ● Technological solutions and personal choices such as driving higher mileage cars and using less electricity could reduce the human impact on climate. ● How have climate changes impacted human society?
7 - Evidence for Climate Change (putting it all together) ● Much of the data we receive about the ocean and the atmosphere is from satellites. ● Understand how observations, experiments, and theory are used to construct and refine computer models. ● Critically evaluate scientific claims in popular media and by peers regarding climate and climate change, and determine if the evidence presented is appropriate and sufficient to support the claims. ● Analyze the evidence and assumptions regarding climate change

● Interpret evidence from weather stations, buoys, satellites, radars, ice and ocean sediment cores, tree rings,cave deposits, native knowledge, and other sources in relation to climate change

Unit 7 - Natural hazards - 2 weeks

Week/Topic/Colorado State Standards
1 - Project ● Why are some natural hazards difficult to predict, while others are easier to predict? ● How are humans impacted by natural hazards? ● How can we prepare for natural hazards? ● How is climate change expected to change the incidence of natural hazards? ● Engineers must know the hazards of a local area and design for it such as building safe structures in zones prone to earthquakes, hurricanes, tsunamis, or tornadoes. ● Differing technologies are used to study different types of natural hazards. ● Natural hazard zones affect construction or explain why monitoring natural hazards through air traffic safety, evacuations, and protecting property is important. ● Science is used by disaster planners who work with the scientific community to develop diverse ways to mitigate the impacts of natural hazards on the human population and on a given ecosystem. ● Collaborate with local, national, and global organizations to report and review natural disaster data, and compare their conclusions to alternate explanations. ● Develop, communicate, and justify an evidence-based scientific explanation regarding natural hazards, and explain their potential local and global impacts ● Analyze and interpret data about natural hazards using direct and indirect evidence ● Make predictions and draw conclusions about the impact of natural hazards on human activity – locally and globally (DOK 2-3)
2 - Project ● Why are some natural hazards difficult to predict, while others are easier to predict? ● How are humans impacted by natural hazards? ● How can we prepare for natural hazards? ● How is climate change expected to change the incidence of natural hazards? ● Engineers must know the hazards of a local area and design for it such as building safe structures in zones prone to earthquakes, hurricanes, tsunamis, or tornadoes. ● Differing technologies are used to study different types of natural hazards. ● Natural hazard zones affect construction or explain why monitoring natural hazards through air traffic safety, evacuations, and protecting property is important. ● Science is used by disaster planners who work with the scientific community to develop diverse ways to mitigate the impacts of natural hazards on the human population and on a given ecosystem. ● Collaborate with local, national, and global organizations to report and review natural disaster data, and compare their conclusions to alternate explanations. ● Develop, communicate, and justify an evidence-based scientific explanation regarding natural hazards, and explain their potential local and global impacts ● Analyze and interpret data about natural hazards using direct and indirect evidence ● Make predictions and draw conclusions about the impact of natural hazards on human activity – locally and globally (DOK 2-3)