EARTH/SPACE SCIENCE

This Earth/Space science course is designed to continue student investigations of the earth sciences that began in grades K-8 while providing students the experiences and necessary skills to have a richer knowledge base in earth/space science. This course is designed as a survey course of Earth/Space science while being foundational for in depth courses in advanced Earth/Space science courses or special topic courses. This course includes the major concepts of Earth's changes, materials, solar system, galaxies, and technology. Learning in these areas is through direct instruction, student research, cooperative projects, experiments, and demonstration.

MAJOR CONCEPTS-

- Earth Materials and Changes
- Earth and it's Solar System
- Galaxies
- Technology

Topics	**Earth Materials and Changes** ATMOSPHERE, CLIMATE, AND WEATHER COMPOSITION AND FEATURES FOSSILS AND GEOLOGIC TIME OBSERVATION OF THE EARTH FROM SPACE PROCESSES AND RATES OF CHANGE ROCK CYCLE WATER **Earth and it's Solar System** EARTH, SUN, AND MOON ENERGY SOLAR SYSTEM VIEW FROM EARTH **Galaxies** SIZE AND SCALE STARS AND GALAXIES UNIVERSE **Technology** DESIGN TECHNOLOGY TOOLS LOCAL AND GLOBAL ENVIRONMENTAL ISSUES CAREER TECHNICAL EDUCATION CONNECTIONS

Competencies	1. Students will Explain how winds and ocean currents are created on the Earth's surface. 2. Students will Explain how heat and energy transfer in and out of the atmosphere; and provide examples of how it is related to weather and climate. 3. Students will Describe how Earth's atmospheric composition has changed from the formation of the Earth through current time. 4. Students will Explain how Earth's features can affect wind and weather patterns by causing air to rise and increasing precipitation. 5. Students will Recognize that elements exist in fixed amounts and describe how they move through the solid Earth, oceans, atmosphere, and living things as part of geochemical cycles, such as the water, carbon and nitrogen cycles. 6. Students will Describe the conditions that enable the Earth to support life, such as the availability of water, the gravitational force, the electromagnetic field and the intensity of radiation from the Sun. 7. Students will Explain the theory of plate tectonics. 8. Students will Describe the movement of crustal plates and explain how the effects have altered the Earth's features. 9. Students will Identify and describe the methods used to measure geologic time, such as fossil identification, radioactive dating, and rock sequences. 10. Students will Relate how geologic time is determined using various dating methods (e.g., radioactive decay, rock sequences, fossil records). 11. Students will Provided with geologic data (including movement of plates) on a given locale, predict the likelihood for an earth event (e.g. volcanoes mountain ranges, islands, earthquakes, tides, tsunamis). 12. Students will Explain that the Earth is composed of interactive layers, which have distinct compositions, physical properties and processes. 13. Students will Relate plate movement to earthquakes and volcanic activity, and explain how it results in tectonic uplift and mountain building. 14. Students will Identify and describe the major external and internal sources of energy on Earth. 15. Students will Provide supporting geologic/geographic evidence that supports the validity of the theory of plate tectonics.

16. Students will Trace the development of the theory of plate tectonics.

17. Students will Explain how internal and external sources of heat (energy) fuel geologic processes (e.g., rock cycle, plate tectonics, sea floor spreading).

18. Students will Explain that throughout the rock cycle, the total amount of the material remains the same.

19. Students will Explain that water quality can be affected positively or negatively by outside sources

20. Students will Explain how the Earth, Moon and Sun were formed.

21. Students will Identify the Earth's major external source of energy as solar energy.

22. Students will Explain how the inclination of incoming solar radiation can impact the amount of energy Earth receives on any given surface area.

23. Students will Explain how gravitational force influenced the formations of the planets and their moons; and describe how these objects move in patterns under its continued influence.

24. Students will Explain how the Solar System formed from a giant cloud of gas and debris about 5 billion years ago.

25. Students will Recognize electromagnetic waves can be used to locate objects in the universe, and track their movement.

26. Students will Define a light year.

27. Students will Identify and describe the characteristics common to most stars in the universe.

28. Students will Describe the ongoing processes involved in star formation, their life cycles and their destruction.

29. Students will Explain the relationships between or among the energy produced from nuclear reactions, the origin of elements, and the life cycles of stars.

30. Students will Explain that current scientific evidence supports the Big Bang Theory as a probable explanation of the origin of the universe, and describe the theory.

31. Students will Explain the evidence that suggests the universe is expanding.

32. Students will Provide scientific evidence that supports or refutes the "Big Bang" theory of how the universe was formed.

	33. Students will Based on the nature of electromagnetic waves, explain the movement and location of objects in the universe or their composition (e.g., red shift, blue shift, line spectra). 34. Students will Explain how scientific theories about the structure of the universe have been advanced through the use of sophisticated technology (e.g., space probes and visual, radio and x-ray telescopes). 35. Students will Describe ways in which technology has increased our understanding of the universe. 36. Students will Understand that technology is designed with a particular function in mind; and principles of Earth Space science are useful in creating technology for the Earth space sciences. 37. Students will Describe the use and benefits of land-based light telescopes, radio telescopes, spectrophotometers, satellites, manned exploration, probes, and robots to the study of Earth Space Science. 38. Students will Explain how scientists study the Earth using computer-generated models and observations from both land-based sites and satellites; and describe the value of using these tools in unison. 39. Students will Differentiate between and provide examples of renewable and nonrenewable sources of energy; and explain the advantages and limitations of each. 40. Students will Describe the means for transforming a natural material, such as iron ore, into useful products during different historical periods, such as the Stone Age, Iron Age, Renaissance, the Industrial Period and the current Age of Information. 41. Students will Explain how the use of technologies at a local level, such as burning of fossil fuels for transportation or power generation, may contribute to global environmental problems. 42. Students will Explain the kinds of applications of knowledge and skills necessary for jobs/careers specific to Earth or space sciences.
	1. Students will understand the principles of the scientific method and how to apply them to answer questions and solve problems. 2. Students will understand that scientific progress is made by asking relevant questions, conducting careful investigations, and evaluating the validity of results.

Process Skills	3. Students will understand that energy and matter exist in multiple forms in all living and nonliving systems, and can flow within and between all systems. 4. Students will understand that technology is used to identify and address issues of daily life on a local and global scale. **5.** Students will understand that current and future learning skills and tools are needed to become active and productive citizens in our global community. 6. Students will understand that current and future learning skills and tools are needed to become active and productive citizens in our global community. 7. State a hypothesis and prediction based on available evidence and background information. 8. Select and use apparatus and material safely. 9. Compile and display data, evidence and information by hand and computer, in a variety of formats, including diagrams, flow charts, tables, graphs and scatter plots. 10. Create a culminating team project that demonstrates content knowledge and conceptual understanding and shows connections between science content and real-world settings. Realize that in science, the testing, revising, and occasional discarding of theories, new and old, never ends; this ongoing process leads to an increasingly better understanding of how things work in the world but not to absolute truth.

Sample Performance Assessment SPA #1	Student evidence demonstrates mastery of concepts, broad themes and proficiency standards. Student assessment is based on progress of individual mastery of set lesson objectives, research projects, power point presentations and in depth student response journals. Student completed and corrected lab assignments and assessment rubrics.

BUD CARLSON ACADEMY EARTH SCIENCE
MAJOR CONCEPT #1 -- The Earth and Earth materials, as we know them today, have developed over long periods of time, through constant change processes.

Topics	ATMOSPHERE, CLIMATE, AND WEATHER, COMPOSITION AND FEATURES, FOSSILS AND GEOLOGIC TIME, OBSERVATION OF THE EARTH FROM SPACE, PROCESSES AND RATES OF CHANGE, ROCK CYCLE, AND WATER.
Competencies	1. Students will understand the Earth's atmosphere, climate, and weather. 2. Students will understand Earth's composition and it's features. 3. Students will understand Earth's fossils and geologic time. 4. Students will observe the Earth from space. 5. Students will understand Earth's processes and it's rates of change. 6. Students will understand the rock cycle. 7. Students will understand Earth's water.
Knowledge/Skills	**ATMOSPHERE, CLIMATE, AND WEATHER:** Explain how winds and ocean currents are created on the Earth's surface. Explain how heat and energy transfer in and out of the atmosphere; and provide examples of how it is related to weather and climate. Describe how Earth's atmospheric composition has changed from the formation of the Earth through current time. Explain how Earth's features can affect wind and weather patterns by causing air to rise and increasing precipitation. **COMPOSITION AND FEATURES** Recognize that elements exist in fixed amounts and describe how they move through the solid Earth, oceans, atmosphere, and living things as part of geochemical cycles, such as the water, carbon and nitrogen cycles. Describe the conditions that enable the Earth to support life, such as the availability of water, the gravitational force, the electromagnetic field and the intensity of radiation from the Sun.

	Explain the theory of plate tectonics. Describe the movement of crustal plates and explain how the effects have altered the Earth's features. **FOSSILS AND GEOLOGIC TIME** Identify and describe the methods used to measure geologic time, such as fossil identification, radioactive dating, and rock sequences. Relate how geologic time is determined using various dating methods (e.g., radioactive decay, rock sequences, fossil records). **OBSERVATION OF THE EARTH FROM SPACE** Provided with geologic data (including movement of plates) on a given locale, predict the likelihood for an earth event (e.g. volcanoes mountain ranges, islands, earthquakes, tides, tsunamis). **PROCESSES AND RATES OF CHANGE** Explain that the Earth is composed of interactive layers, which have distinct compositions, physical properties and processes. Relate plate movement to earthquakes and volcanic activity, and explain how it results in tectonic uplift and mountain building. Identify and describe the major external and internal sources of energy on Earth. Provide supporting geologic/geographic evidence that supports the validity of the theory of plate tectonics. Trace the development of the theory of plate tectonics. Explain how internal and external sources of heat (energy) fuel geologic processes (e.g., rock cycle, plate tectonics, sea floor spreading). **ROCK CYCLE** Explain that throughout the rock cycle, the total amount of the material remains the same. **WATER** Explain that water quality can be affected positively or negatively by outside sources
Process Skills	Apply scientific theories and laws to new situations to generate hypotheses. Compile and display data, evidence and information by hand and computer, in a variety of formats, including diagrams,

	flow charts, tables, graphs and scatter plots Provide data and evidence on how folding in crustal plates can cause mountain ranges. Locate and collect reliable information for environmental investigations of many types. Create, use and evaluate models to understand environmental phenomena. Analyze technical writing, graphs, charts, and diagrams. Select and analyze information from various sources (including electronic resources, print resources, community resources) and personally collected data to answer questions being investigated. Create written reports and journals to share and communicate scientific ideas, plans, results, and conclusions resulting from observations and investigations. Create a multimedia presentation incorporating numeric symbolic and/or graphic modes of representation to share scientific ideas, plans, results, and conclusions. Pursue scientific inquiry such as observation, measurement, hypothesis formation and analysis, and value "habits of mind" such as persistence, accuracy, and collaboration. Collect, synthesize, and report information from a variety of points of view. Use key ideas of science to document and explain through an investigation the relationship between science and concepts. Describe how in evolutionary change, the present arises from the materials and forms of the past, more or less gradually, and in ways that can be explained. Explore how the movement of ocean floor plates under continental plates or two continental plates moving against each other can deform the earth's surface.
Sample Performance Assessment SPA #1	Student evidence demonstrates mastery of concepts, broad themes and proficiency standards. Student assessment is based on progress of individual mastery of set lesson objectives, research projects, power point presentations and in depth student response journals. Student completed and corrected lab assignments and assessment rubrics.

BUD CARLSON ACADEMY EARTH SCIENCE

MAJOR CONCEPT #2 -- The Earth is part of a solar system, made up of distinct parts, which have temporal and spatial interrelationships.

Topics	EARTH, SUN, AND MOON, ENERGY, SOLAR SYSTEM, VIEW FROM EARTH
Competencies	1. Students will understand the Earth, sun, and moon. 2. Students will understand Earth's various forms of energy. 3. Students will understand the solar system. 4. Students will participate in various views of the solar system from Earth.
Knowledge/Skills	**EARTH, SUN, AND MOON** Explain how the Earth, Moon and Sun were formed. **ENERGY** Identify the Earth's major external source of energy as solar energy. Explain how the inclination of incoming solar radiation can impact the amount of energy Earth receives on any given surface area. **SOLAR SYSTEM** Explain how gravitational force influenced the formations of the planets and their moons; and describe how these objects move in patterns under its continued influence. Explain how the Solar System formed from a giant cloud of gas and debris about 5 billion years ago. **VIEW FROM EARTH** Students should have regular access and use of data gathered by space based instruments.

Process Skills	Apply scientific theories and laws to new situations to generate hypotheses. Create a multimedia presentation incorporating numeric symbolic and/or graphic modes of representation to share scientific ideas, plans, results, and conclusions. Locate and collect reliable information for environmental investigations of many types. Create, use and evaluate models to understand environmental phenomena. Pursue scientific inquiry such as observation, measurement, hypothesis formation and analysis, and value "habits of mind" such as persistence, accuracy, and collaboration. Plan and conduct practical tests to solve problems or answer a question, collect and analyze data using appropriate instruments and techniques safely and accurately. Develop models and explanations to fit evidence obtained through investigations. Prepare multimedia presentations to share results of investigations, demonstrating a clear sense of audience and purpose. Create written reports and journals to share and communicate scientific ideas, plans, results, and conclusions resulting from observations and investigations. Model solutions to a range of problems in science and technology using computer simulation software.

Sample Performance Assessment SPA #1	Student evidence demonstrates mastery of concepts, broad themes and proficiency standards. Student assessment is based on progress of individual mastery of set lesson objectives, research projects, power point presentations and in depth student response journals. Student completed and corrected lab assignments and assessment rubrics.

BUD CARLSON ACADEMY EARTH SCIENCE

MAJOR CONCEPT #3 -- The origin and evolution of galaxies and the universe demonstrate fundamental principles of physical science across vast distances and time.

Topics	SIZE AND SCALE, STARS AND GALAXIES, UNIVERSE,
Competencies	1. Students will understand size and scale of the universe. 2. Students will understand stars and galaxies. 3. Students will understand the universe.
Knowledge/Skills	**SIZE AND SCALE** Recognize electromagnetic waves can be used to locate objects in the universe, and track their movement. Define a light year. **STARS AND GALAXIES** Identify and describe the characteristics common to most stars in the universe. Describe the ongoing processes involved in star formation, their life cycles and their destruction. Explain the relationships between or among the energy produced from nuclear reactions, the origin of elements, and the life cycles of stars. **UNIVERSE** Explain that current scientific evidence supports the Big Bang Theory as a probable explanation of the origin of the universe, and describe the theory. Explain the evidence that suggests the universe is expanding. Provide scientific evidence that supports or refutes the “Big Bang” theory of how the universe was formed. Based on the nature of electromagnetic waves, explain the movement and location of objects in the universe or their composition (e.g., red shift, blue shift, line spectra). Explain how scientific theories about the structure of the universe have been advanced through the use of sophisticated technology (e.g., space probes and visual, radio and x-ray telescopes).

Process Skills	Apply scientific theories and laws to new situations to generate hypotheses. Create a multimedia presentation incorporating numeric symbolic and/or graphic modes of representation to share scientific ideas, plans, results, and conclusions. Locate and collect reliable information for environmental investigations of many types. Create, use and evaluate models to understand environmental phenomena. Pursue scientific inquiry such as observation, measurement, hypothesis formation and analysis, and value "habits of mind" such as persistence, accuracy, and collaboration. Plan and conduct practical tests to solve problems or answer a question, collect and analyze data using appropriate instruments and techniques safely and accurately. Develop models and explanations to fit evidence obtained through investigations. Prepare multimedia presentations to share results of investigations, demonstrating a clear sense of audience and purpose. Create written reports and journals to share and communicate scientific ideas, plans, results, and conclusions resulting from observations and investigations. Model solutions to a range of problems in science and technology using computer simulation software.

Sample Performance Assessment SPA #1	Student evidence demonstrates mastery of concepts, broad themes and proficiency standards. Student assessment is based on progress of individual mastery of set lesson objectives, research projects, power point presentations and in depth student response journals. Student completed and corrected lab assignments and assessment rubrics.

BUD CARLSON ACADEMY EARTH SCIENCE

MAJOR CONCEPT #4 -- The growth of scientific knowledge in Earth Space Science has been advanced through the development of technology and is used (alone or in combination with other sciences) to identify, understand and solve local and global issues.

Topics	DESIGN TECHNOLOGY, TOOLS, LOCAL AND GLOBAL ENVIRONMENTAL ISSUES, CAREER TECHNICAL EDUCATION CONNECTIONS.
Competencies	1. Students will understand the impact and usefulness of technology. 2. Students will understand scientific tools. 3. Students will understand local and global environmental issues. 4. Students will understand the career technical education connections.
Knowledge/Skills	**DESIGN TECHNOLOGY** Describe ways in which technology has increased our understanding of the universe. Understand that technology is designed with a particular function in mind; and principles of Earth Space science are useful in creating technology for the Earth space sciences. **TOOLS** Describe the use and benefits of land-based light telescopes, radio telescopes, spectrophotometers, satellites, manned exploration, probes, and robots to the study of Earth Space Science. Explain how scientists study the Earth using computer-generated models and observations from both land-based sites and satellites; and describe the value of using these tools in unison. LOCAL AND GLOBAL ENVIRONMENTAL ISSUES Differentiate between and provide examples of renewable and nonrenewable sources of energy; and explain the advantages and limitations of each. Describe the means for transforming a natural material, such as iron ore, into useful products during different historical periods, such as the Stone Age, Iron Age, Renaissance, the Industrial Period and the current Age of Information. Explain how the use of technologies at a local level, such as burning of fossil fuels for transportation or power generation, may contribute to global environmental problems. CAREER TECHNICAL EDUCATION CONNECTIONS Explain the kinds of applications of knowledge and skills necessary for jobs/careers specific to Earth or space sciences.

Process Skills	Apply scientific theories and laws to new situations to generate hypotheses. Create a multimedia presentation incorporating numeric symbolic and/or graphic modes of representation to share scientific ideas, plans, results, and conclusions. Locate and collect reliable information for environmental investigations of many types. Create, use and evaluate models to understand environmental phenomena. Pursue scientific inquiry such as observation, measurement, hypothesis formation and analysis, and value "habits of mind" such as persistence, accuracy, and collaboration. Plan and conduct practical tests to solve problems or answer a question, collect and analyze data using appropriate instruments and techniques safely and accurately. Develop models and explanations to fit evidence obtained through investigations. Prepare multimedia presentations to share results of investigations, demonstrating a clear sense of audience and purpose. Create written reports and journals to share and communicate scientific ideas, plans, results, and conclusions resulting from observations and investigations. Model solutions to a range of problems in science and technology using computer simulation software

Sample Performance Assessment SPA #1	Student evidence demonstrates mastery of concepts, broad themes and proficiency standards. Student assessment is based on progress of individual mastery of set lesson objectives, research projects, powerpoint presentations and in depth student response journals. Student completed and corrected lab assignments and assessment rubrics.