

**EarthComm Correlations to Missouri
Grades 9 - 12 Earth Systems Standards**

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| | V | PT | E | BG | RS | LU | O | SW | C | ER | MR | WR | AST | CC |
| I. Scientific Inquiry | | | | | | | | | | | | | | |
| A. Processes of Scientific Inquiry | | | | | | | | | | | | | | |
| 1. Investigations may involve mathematical procedures to interpret observations, make predictions, describe sets of data, and determine the validity and significance of experimental results. | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX |
| a. analyze experimental data to determine patterns, relationships, perspectives, and credibility use computer spreadsheets, graphing, and database programs to assist in quantitative analysis; and consider the possible effects of measurement errors on calculations | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX |
| 2. Publication and presentation of scientific work with supporting evidence and required for critique, review, and validation by the scientific community. The presentation of such work adds to the body of scientific knowledge and serves as background for subsequent investigations in similar areas. | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX |
| a. present arguments based on scientific investigations that include detailed procedures, graphs and tables, and conclusions; participate in follow-up discussions by responding to alternative positions | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX |
| 3. Controlling all variables that might influence an experiment is important. Sometimes it is not possible, for practical or ethical reasons, to control some conditions, but a wide range of observations of natural occurrences can reveal patterns. | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX |
| a. make systematic observations (nonexperimental) of natural objects or events to discern patterns, formulate explanations, support a thesis or make predictions | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX |
| 4. Technological tools and techniques extended human capabilities to perform investigations in more detail and with greater accuracy and precision. | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX |
| a. apply technological knowledge and skills to analyze and troubleshoot common mechanical and electrical systems, checking for possible causes of malfunction, and formulate and test logical and creative improvements that prevent future malfunction | | | | | | | | | | | | | | |
| B. Investigations | | | | | | | | | | | | | | |
| 1. The testing, revising, and occasional discarding of theories lead to increasingly better understanding, but not the absolute truth. New ideas, therefore, usually grow slowly from contributions by many investigators. | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX |
| a. formulate questions for scientific investigations that indicate conceptual insight and depth of understanding of the historical development of the idea or issue to be investigated | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX |

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| 2. Scientists attempt to improve objectivities of data observation and the academic integrity of their research by working in teams and seeking out possible sources of bias. | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX |
| a. recognize and practice academic integrity while conducting investigations and developing solutions, seeking out sources of personal bias in the design of investigations | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX |
| 3. The testing of a hypothesis requires a structured and rigorous investigative process. | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX |
| a. design and conduct a full scientific investigation including a comprehensive review of related literature: experimental design that is thoughtful and well-controlled, with adequate repeated trials; accurate measurement of data; some form of statistical treatment and display of data; thoughtful interpretation of data; and communication and defense of logical arguments supported by the findings | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX |
| II. Scientific Relevance | | | | | | | | | | | | | | |
| A. The Nature of Technology | | | | | | | | | | | | | | |
| 1. Social and economic forces, such as personal values, consumer acceptance, patent laws, the federal budget, current regulations, media attention, and economic competition strongly influence the direction of progress of science and technology. Progress in science and technology, on the other hand, often result in many ethical, legal, and public policy issues. | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| a. discuss the scientific, technological, and political aspects of major challenges to society. Describe how each of these aspects influences public policy formulation in dealing with the challenges | X | X | X | | X | XX | X | X | X | XX | XX | XX | X | XX |
| 2. Human beings have a huge impact on other species, their environments, and technology. These impacts include reducing the amount of habitat available, interfering with food sources, changing the temperature and chemical composition of their habitats, introducing foreign species, and altering organisms directly through selective breeding and genetic engineering. | X | | XX | | XX | XX | X | | | XX | XX | XX | XX | XX |
| a. analyze and evaluate how specific technological solutions may impact the environment in areas such as habitat loss, disruption of the food web, and temperature and chemical changes | X | | XX | | XX | XX | X | | X | XX | XX | XX | XX | XX |
| B. Historical Perspective | | | | | | | | | | | | | | |
| 1. Scientific theories are developed based on the body of knowledge that exists at any particular time. The driving force to find what is really true motivates scientists to test the validity of these theories and as a result the mysteries of nature are continuously probed and explained as new theories are created and old theories discarded. | X | XX | X | X | X | X | X | X | X | X | X | X | XX | X |
| a. identify and analyze theories that are currently being questioned, and compare them to new theories that have emerged to challenge the older ones | X | XX | X | X | X | X | X | X | X | X | X | X | XX | X |

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| 2. The history of scientific thought spanned many cultures and centuries. The early Egyptian, Greek, Chinese, and Arabic cultures are responsible for many scientific and mathematical ideas and technological inventions. Modern science is based on traditions of thought that came together in Europe about 500 years ago. All cultures now contribute to that tradition. | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| a. Identify and analyze various scientific concepts, inventions, and technological innovations that have been developed by different cultures from around the world; discuss the influence of prevailing contemporary thought on the acceptance of these concepts, inventions, and innovations by other scientists and society | XX | XX | XX | X | X | X | X | XX | X | X | XX | X | XX | X |
| C. Science as a Human Endeavor | | | | | | | | | | | | | | |
| 1. Scientists make mistakes like all people. Deliberate deceit, however, is rare and is likely to be exposed eventually by the scientific enterprise itself. | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| a. Identify, discuss, and respond thoughtfully to information from credible sources, such as scientists making claims in their areas of expertise, and from sources of questionable credibility, such as people whose own personal, institutional, or community interests are at stake | XX | X | X | X | X | X | X | X | X | X | X | X | X | X |
| 2. Research funding comes from various federal government agencies, industry, and private foundations. Research grant proposals are written to promote research that is relevant, well-designed, cost-efficient, and well-supported by previous research. | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| a. Analyze a scientific research grant proposal and defend or dispute, in an organized and convincing way, sections that promote the proposed research | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| V. Universe | | | | | | | | | | | | | | |
| A. Characteristics of the Solar System | | | | | | | | | | | | | | |
| 1. The current model of the universe was developed from evidence about its content and theoretical assumptions based upon mathematical and computer-simulated models. | | | | | | | | | | | | | XX | |
| a. present organized arguments and opinions about the various scientific theories on the formation of the universe | | | | | | | | | | | | | XX | |
| 2. Stars appear to go through a cycle of birth, development, and death. | | | | | | | | | | | | | XX | |
| a. use information about a star's characteristics to determine its age | | | | | | | | | | | | | XX | |
| 3. Because of the vast distances between objects in the universe, light may take billions of years to reach Earth. | | | | | | | | | | | | | XX | |
| a. explain the different units used to measure distances by astronomers and explain why they use them | | | | | | | | | | | | | XX | |
| B. Motions of the Universe | | | | | | | | | | | | | | |
| 1. Newton's conception of the universe established the idea that the laws which apply to processes that occur on the Earth also apply to the universe. | | | | | | | | | | | | | XX | |

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| a. evaluate information and products to determine the relationship of Newton's Laws in space and on Earth | | | | | | | | | | | | | XX | |
| 2. Gravitational laws explain planetary motions and tides. | | | | | | | | | | | | | XX | |
| a. develop a logical description of how gravitational laws explain the movement of planets and tides | | | | | | | | | | | | | XX | |
| C. Tools of Space Exploration | | | | | | | | | | | | | | |
| 1. Space exploration has expanded our knowledge of the universe and advanced the technological sophistication of our society. | | | | | | | | | | | | | X | |
| a. identify and explain ways society has benefited from the technologies developed through space exploration | | | | | | | | | | | | | X | |
| b. evaluate the economic impact of the space program | | | | | | | | | | | | | X | |
| VI. Earth Systems | | | | | | | | | | | | | | |
| A. Physical Systems | | | | | | | | | | | | | | |
| 1. Variations in the physical conditions and chemical composition of soil are a result of the type of rock from which it came, climate, the process by which it was deposited and biological activities. | | | | X | | XX | | | | | | | | |
| a. discover and evaluate the patterns and relationships of the soil to the origin of the local rock type, climate, process of deposition, and biological activity | | | | X | | XX | | | | | | | | |
| 2. Changes in the atmosphere can be caused by natural or human activities. | XX | | | | | XX | | X | | XX | X | | X | XX |
| a. identify and describe the scope of the impact of human activity on the atmosphere | XX | | | | | XX | | X | | XX | X | | | XX |
| 3. Variations in composition of the atmosphere and hydrosphere caused by natural activities affect all life on Earth. | XX | | | | X | XX | | X | | | | | | XX |
| a. investigate information on several natural disasters and predict possible reactions of plants, animals, and humans | XX | | | | X | XX | | X | | | | | | XX |
| b. use appropriate technology and other resources to locate, select, and organize information about natural disasters and their effect; develop strategies to predict occurrences and/or reduce or solve the resulting problems | XX | | | | XX | XX | | XX | | | | | | XX |
| B. Processes of Systems | | | | | | | | | | | | | | |
| 1. Elements cycle through the atmosphere, hydrosphere, lithosphere and biosphere. The movement of matter through the spheres is driven by Earth's internal and external sources of energy. | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| a. conduct research to develop and evaluate information on the movement of matter through a model ecosystem | | | | | | X | | | | X | | | | |
| 2. Crustal plate movement affects Earth's topography and provides evidence of a geologic time scale. | XX | XX | XX | XX | X | | | | | | | | | X |

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| a. using a variety of models and other resources, design and conduct an investigation to study earth's energy sources; apply the processes and knowledge learned to understanding changes in Earth's surface | XX | XX | XX | | X | | | | | | | | | X |
| b. use appropriate technology to locate, select, and organize information related to a plate movement; conduct research using a simulation of that event and evaluate the information | XX | XX | XX | | | | | | | | | | | X |
| c. identify the theories associated with major geological events and present the information in the form of a time line | X | X | X | | | | | | | | | | | X |
| 3. Circulation of air and water around Earth, driven by radiation energy from the Sun, causes weather phenomena and regional climate. | | | | | | | XX | XX | X | | | | | XX |
| a. discover and evaluate the patterns and relationships in the circulation of air and water around Earth, how they are driven by radiation energy from the Sun, and how this causes weather phenomena and regional climates | | | | | | | XX | XX | | | | | | XX |
| 4. Science technology has enhanced our ability to detect atmospheric changes resulting from interactions of Earth's systems. | XX | | | | | XX | XX | XX | X | | | | | XX |
| a. use appropriate technology to locate and select patterns of global and local weather and climate changes resulting from interactions of Earth's systems | XX | | | | | XX | XX | XX | X | | | | | XX |
| VIII. Ecology | | | | | | | | | | | | | | |
| A. Interactions | | | | | | | | | | | | | | |
| 1. No two species occupy the same niche in an ecosystem so that different species can coexist and help maintain the stability of that system. | | | | | | | | | | | | | | |
| a. observe and identify competitive and cooperative interrelationships among species of a local ecosystem | | | | | | | | | | | | | | |
| 2. Human decisions concerning the use of resources can alter the stability and biodiversity of ecosystems. | | | | | | | | | | XX | XX | XX | | |
| a. research the methods of obtaining fossil fuels and their impact on ecosystems | | | | | | | | | | XX | | | | |
| b. explain the possible consequences of a reduction in biodiversity | | | | | | | | | | | | | | |
| 3. Increased demand for natural resources require global cooperation and long-term planning to ensure the resource needs of successive generations will be met. | | | | | | | | | | X | X | X | | |
| a. compare the use of natural resources in developing countries to the use in industrialized nations | | | | | | | | | | X | X | X | | X |
| b. discuss how technology has provided a more efficient use of resources and extended their availability | | | | | | | | | | X | X | X | | |
| B. Changes | | | | | | | | | | | | | | |
| 1. Ecosystems are interconnected by biological, chemical and physical processes so that changes in one ecosystem can have local or global consequences. | X | X | X | X | X | X | X | X | X | X | X | X | X | X |

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| a. observe and identify biological, chemical or physical processes of one ecosystem that affects other ecosystems | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| 2. Overpopulation in an ecosystem can lead to depletion of resources and elimination of a species. | | | | | | | | | | X | X | | | |
| a. identify the density-dependent limiting factors of a population and discuss consequences of overpopulation | | | | | | | | | | | | | | |
| b. discuss how changes in one population in an ecosystem affects the population of another species in that ecosystem | | | | | | | | | | | | | | |
| c. identify the carrying capacity of an ecosystem and predict the limiting factors that will slow population growth | | | | | | | | | | | | | | |

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