Course/Grade Level: Fifth Grade Earth Science Curriculum

S.5.1 Students will demonstrate abilities necessary to do the processes of scientific inquiry.

Students will…

S.5.1.1 ▲ identify questions that can be answered through scientific investigations. (5.1.1.1)

Instructional Example: explore properties and phenomena of various materials and generate testable questions to investigate.

S.5.1.2 ▲ design and conduct scientific investigations safely using appropriate tools, mathematics, technology, and techniques to gather, analyze, and interpret data. (5.1.1.2)

Instructional Examples:

- design and conduct an investigation on a question (example: What is the effect of light on plant growth?). Components of the investigation may include background and hypothesis, identification of variables (independent variable, dependent variable, variables to be held constant), list of materials, procedures, collection and analysis of data, and conclusions.
- given an investigative question, determine what to measure and how to measure
- display data collected from performing an investigation using tables, graphs, diagrams and other graphic organizers.

S.5.1.3 ▲ identify the relationship between evidence and logical conclusions. (5.1.1.3)

Instructional Examples:

- check data to determine: Was the question addressed? Was the hypothesis supported/not supported? Did this design work? How could this experiment be improved? What other questions could be investigated?
- look for patterns from the mean of multiple trials, such as the rate of dissolving relative to different temperatures
- use observations for inductive and deductive reasoning, such as explaining a person's energy level after a change in eating habits (e.g., uses Likert-type scale)
- state relationships in data, such as variables, which very directly or inversely

S.5.1.4 ▲ communicate scientific procedures, results and explanations. (5.1.1.4)

Instructional Example: individually present a report of investigations so that others understand it and can replicate the design

S.5.2 Students will apply different kinds of investigations to different kinds of questions and analyze how science advances through the interaction of new ideas, scientific investigations, skepticism, and examinations of evidence of varied explanations.

Students will…

S.5.2.1 develop questions and adapt (frame) the inquiry process to guide the appropriate type of investigation. (5.1.2.1)

Instructional Examples:

- after reading a science news article, identify variables and write an appropriate investigative question related to the topic of the article
- adapt an existing lab or activity to write a different question, identify another variable, and/or modify the procedure to guide a new investigation

S.5.2.2 differentiate between qualitative and quantitative data in an investigation. (5.1.2.2)

Instructional Example: observe a decomposing compost pile, and determine how to collect quantitative (numerical, measurable) data and qualitative (descriptive) data. Identify a question that produces quantitative data (e.g., Is the temperature constant throughout the compost pile?). Identify a question that produces qualitative data (e.g., Does the color of the compost pile change over time?). With the class, analyze all questions to classify as qualitative or quantitative.

S.5.2.3 after completing an investigation, generate alternative methods of investigation and/or further questions for inquiry. (5.1.3.1)

Instructional Example: Ask "What would happen if …?" questions to generate new ideas for investigation

S.5.2.4 ▲ evaluate the work of others to determine evidence which scientifically supports or contradicts the results, identifying faulty reasoning or conclusions that go beyond evidence and/or are not supported by data. (5.1.3.2)

Instructional Examples:

- examine and analyze a scientific breakthrough (such as a Hubble discovery) using multiple scientific sources
- explain how a reasonable conclusion is supported
- analyze evidence and data which supports or contradicts various theories (e.g., theory of continental drift, spontaneous generation, etc …)

S.5.3 Students will understand that the structure of the earth system is continuously changing due to earth's physical and chemical processes and understand past and present earth processes and their similarity.

Students will…

S.5.3.1 ▲ identify properties of the solid earth, the oceans and fresh water, and the atmosphere. (5.4.1.1)

Instructional Examples:

- classify rocks, minerals, and soil by properties
- compare heating and cooling over land and water
- compare the densities of salt and fresh water

S.5.3.2 ▲ model earth's cycles, constructive and destructive processes, and weather systems. (5.4.1.2)

Instructional Examples:

- create rock cycle and water cycle dioramas
- construct models of rock types using food. Peanut Brittle without the peanuts can illustrate a molten material crystallizing to form a solid substance similar to an igneous rock
- observe the effects of mechanical and chemical weathering on various rock types
- investigate local examples of weathering, erosion, and deposition

S.5.3.3 ▲ understand the earth processes observed today (including movement of lithospheric plates and changes in atmospheric conditions) are similar to those that occurred in the past; earth history is also influenced by occasional catastrophes, such as the impact of a comet or asteroid. (5.4.2.1)

Instructional Examples:

- make models which show how erosion and deposition has changed Earth's surface over time
- investigate how the Grand Canyon was formed and continues to change

S.5.4 Students will identify and classify stars, planets, and other solar system components.

Students will…

S.5.4.1 ▲ compare and contrast the characteristics of stars, planets, moons, comets, and asteroids. (5.4.3.1)

Instructional Examples:

- identify the sun as a star and compares its characteristics to those of other stars
- classify bright stars visible from earth by color, temperature, age, apparent brightness, and distance from earth
- create a graphic organizer to visualize comparisons of planets
- identify and classify characteristics of asteroids and comets

S.5.4.2 model spatial relationships of the earth/moon/planets/sun system to scale. (5.4.3.2)

Instructional Example: model the solar system to scale in a long hallway or school yard using rocks for rocky planets and balloons for gaseous planets. Designate a large object as the sun. Models the earth/moon/sun/system to scale with the question: If earth were the size of a tennis ball, how big would the moon be? How big would the sun be? How far apart would they be?

S.5.4.3 identify past and present methods used to explore space. (5.4.3.3)

Instructional Example: research ancient observations and explanations of the heavens and compares with today's knowledge and methods such as, how we learn about phenomena/objects we can't observe directly (e.g., spectral analysis to determine the chemistry of stars).

S.5.5 Students will model motions and identify forces that explain earth phenomena.

Students will…

S.5.5.1 ▲ demonstrate and model object/space/time relationships that explain phenomena such as the day, the month, the year, seasons, phases of the moon, eclipses, and tides. (5.4.4.1)

Instructional Examples:

- use an earth/moon/sun model to demonstrate a day, a month, a year, and the seasons
- model the relative positions of the sun, earth, and moon to create eclipses, phases of the moon, and tides.

S.5.5.2 describe how the angle of incidence of solar energy striking earth's surface affects the amount of heat energy absorbed at earth's surface. (5.4.4.2)

Instructional Example: place a piece of graph paper on the surface of a globe at the equator. Hold a flashlight 10 cm from the paper perpendicular to the globe. Mark the lighted area of the paper. Then, place the graph at high latitude. Again hold the flashlight perpendicular to the paper 10 cm from the paper. Compare the areas lit at the equator and at the high latitude, with the same amount of light energy. Identify where each lighted square of paper receives the most energy.

S.5.6 Students will demonstrate abilities of technological design and develop understandings of the similarities, differences, and relationships in science and technology.

Students will…

S.5.6.1 identify appropriate problems for technological design, design a solution or product, implement the proposed design, evaluate the product, and communicate the process of technological design. (5.5.1.1)

Instructional Examples:

- design a measurement instrument (e.g., weather instrument) for a science question that students are investigating
- design, create, and evaluate a product that meets the need or solves a problem in a student's life.

S.5.6.2 compare the work of various types of scientists and engineers. (5.5.2.1)

Instructional Example: complete a Venn Diagram to compare the process of scientists and engineers

S.5.6.3 evaluate benefits, risks, limitations and trade-offs of technological solutions. (5.5.2.2)

Instructional Example: select a technology to evaluate using a graphic organizer listing uses, limitations, and possible consequences

S.5.6.4 identify contributions to science and technology by many people and many cultures. (5.5.2.3)

Instructional Example: use a map of the world, mark the locations for people and events that have contributed to science

S.5.7 Students will understand scientific knowledge relative to personal health and safety.

Students will…

S.5.7.1 ▲ identify individual nutrition, exercise, and rest needs based on science and use a scientific approach to thinking critically about personal health, lifestyle choices, risks, and benefits. (5.6.1.1)

Instructional Examples:

- design, implement, and self-evaluate a personal nutrition and exercise program
- compare and contrast immediate benefits of eating junk food (high caloric , low nutritional foods) to long term benefits of a lifetime of healthy eating

S.5.7.2 evaluate risks and define appropriate actions associated with natural hazards. (5.6.3.2)

Instructional Examples:

- find news articles that show inadvisable risks taken in a natural hazard situation
- investigate appropriate safety procedures for dealing with various natural hazards (etc., tornados, floods, lightening, etc.)

S.5.8 Students will understand the impact of human activity on resources and environment.

Students will…

S.5.8.1 ▲ investigate the effects of human activities on the environment and analyze decisions based on the knowledge of benefits and risks. (5.6.2.1)

Instructional Examples:

- investigate the effects of repeatedly walking off the sidewalks. Discuss the implications for the environment.
- participate in an environmental study, such as stream monitoring

S.5.8.2 recognize patterns of natural processes and/or human activities that may cause and/or contribute to natural hazards. (5.6.3.1)

Instructional Example: see how channeling a stream may promote flooding downstream. Could use a County Conservation Commission's stream trailer to investigate the dynamics of a stream and the effects of human interaction with the stream.

S.5.9 Students will develop scientific habits of mind and research contributions to science throughout history.

Students will…

S.5.9.1 practice intellectual honesty, demonstrate skepticism appropriately, display open-mindedness to new ideas, and base decisions on evidence. (5.7.1.1)

Instructional Examples:

- analyze news articles to determine whether data/statistics presented adequately and objectively support conclusions that are made
- analyze data and recognize that a hypothesis not supported by data should not be perceived as a right or wrong answer
- attempt to replicate an investigation to support or refute a conclusion
- share interpretations that differ from currently held explanations on topics such as global warming and dietary claims. Evaluate the validity of results and accuracy of stated conclusions.

S.5.9.2 ▲ recognize that new knowledge leads to new questions and new discoveries, replicate historic experiments to understand principles of science, and relate contributions of men and women to the fields of science. (5.7.2.1)

Instructional Examples:

- discuss discoveries that replaced previously held knowledge, such as safety of Freon or saccharine use, knowledge concerning the transmission of AIDS, cloning, or Pluto's status as a planet
- research the contributions of men and women of science, and create a timeline to demonstrate the ongoing contributions of dedicated scientists across ethnic, religious, and gender lines (e.g., Galileo, Newton, Pasteur, Wegener, Mendel, darwin, Einstein, and the Curies)