

Fifth Grade

Essential Questions by Unit

Strand	Unit	Essential Questions
Strand 1 Matter & Energy	Water Cycle and Weather Earth, Sun and Moon Solar System	What makes up our world? What causes change in our physical world?
Strand 2 Force & Motion	Work and Simple Machines	How and why do objects move? What are the patterns of movement that affect our world?
Strand 3 Living Systems		
Strand 4 Ecology	Interactions among Organisms and Their Environment	How connected are all living things? How do living things change? Where does energy go?
Strand 5 Earth Systems	Water Cycle and Weather	How are parts of Earth (land, air and water) related? What is my impact on the world?
Strand 6 Universe	Earth, Sun, and Moon Solar System	How can patterns be used to describe the universe?
Strand 7 Scientific Inquiry	Inquiry	What type of questions can science answer? How can I investigate my ideas about nature?
Strand 8 Science, Technology & Human Activity	Science, Technology & Human Activity	How does science impact our life?

Fifth Grade Level Expectations

Strand 1: Properties and Principles of Matter and Energy

1. Changes in properties and states of matter provide evidence of the atomic theory of matter

C. Properties of matter can be explained in terms of moving particles too small to be seen without tremendous magnification

Scope and Sequence – Water Cycle and Weather

- Recognize how changes in state (i.e., freezing/melting, condensation/evaporation) provide evidence that matter is made of particles too small to be seen

D. Physical changes in the state of matter that result from thermal changes can be explained by the Kinetic Theory of Matter

Scope and Sequence – Water Cycle and Weather

- Classify matter as a solid, a liquid, or a gas, as it exists at room temperature, using physical properties (i.e., volume, shape, ability to flow)
- Predict the effect of heat energy on the physical properties of water as it changes to and from a solid, liquid, or gas (i.e., freezing/melting, evaporation/condensation)

I. Mass is conserved during any physical or chemical change

Scope and Sequence – Water Cycle and Weather

- Recognize the mass of water remains constant as it changes state (as evidenced in a closed container)

2. Energy has a source, can be transferred, and can be transformed into various forms but is conserved between and within systems

A. Forms of energy (sound and heat) have a source, a means of transfer and a receiver

Scope and Sequence – Earth, Sun, and Moon

- Identify sources of light energy (e.g., Sun, bulbs, flames)
- Recognize light can be transferred from the source to the receiver (eye) through space
- Identify the three things (light source, object, and surface) necessary to produce a shadow

Scope and Sequence – Solar System

- Recognize light can be transferred from the source to the receiver (eye) through space in straight lines
- Recognize how an object (e.g., moon, mirror, objects in a room) can only be seen when light is reflected from that object to the receiver (eye)

C. Electromagnetic energy from the Sun (solar radiation) is a major source of energy on Earth

Scope and Sequence – Water Cycle and Weather

- Recognize the Sun as the primary source of energy for temperature change on Earth
- Recognize energy is not lost but conserved as it is transferred and transformed

Strand 2: Properties and Principles of Force and Motion

2. Forces affect motion

A. Forces are classified as either contact forces (pushes, pulls, friction, buoyancy) or non-contact forces (gravity, magnetism), that can be described in terms of direction and magnitude

Scope and Sequence – Work and Simple Machines

- Identify the forces acting on a load and use a spring scale to measure the weight (resistance force) of the load

D. Newton's Laws of Motion explain the interaction of mass and forces, and are used to predict changes in motion

Scope and Sequence – Work and Simple Machines

- Describe how friction affects the amount of force needed to do work over different surfaces or through different media

F. Simple machines (levers, inclined planes, wheels and axles, pulleys) affect the forces applied to an object and/or direction of movement as work is done

Scope and Sequence – Work and Simple Machines

- Explain how work can be done on an object (force applied and distance moved) (No formula calculations at this level)
- Recognize simple machines change the amount of effort force and/or direction of force
- Compare the measures of effort force (measured using a spring scale to the nearest Newton) needed to lift a load with and without the use of simple machines
- Identify the simple machines in common tools and household items

Strand 4: Changes in Ecosystems and Interactions of Organisms with their Environments

1. Organisms are interdependent with one another and with their environment

A. All populations living together within a community interact with one another and with their environment in order to survive and maintain a balanced ecosystem

Scope and Sequence – Interactions among Organisms and their Environment

- Identify the ways a specific organism may interact with other organisms or with the environment (e.g., pollination, shelter, seed dispersal, camouflage, migration, hibernation, defensive mechanism)
- Recognize different environments (i.e., pond, forest, prairie) support the life of different types of plants and animals

D. The diversity of species within an ecosystem is affected by changes in the environment, which can be caused by other organisms or outside processes

Scope and Sequence – Interactions among Organisms and their Environment

- Identify examples in Missouri where human activity has had a beneficial or harmful effect on other organisms (e.g., feeding birds, littering vs. picking up trash, hunting/conservation of species, paving/restoring greenspace)

2. Matter and energy flow through an ecosystem

A. As energy flows through the ecosystem, all organisms capture a portion of that energy and transform it to a form they can use

Scope and Sequence – Interactions among Organisms and their Environment

- Classify populations of organisms as producers, consumers, or decomposers by the role they serve in the ecosystem
- Differentiate between the three types of consumers (herbivore, carnivore, omnivore)
- Categorize organisms as predator or prey in a given ecosystem

3. Genetic variation sorted by the natural selection process explains evidence of biological evolution

C. Natural selection is the process of sorting individuals based on their ability to survive and reproduce within their ecosystem

Scope and Sequence – Interactions among Organisms and their Environment

- Identify specialized structures and describe how they help plants survive in their environment (e.g., root, cactus needles, thorns, winged seed, waxy leaves)
- Identify specialized structures and senses and describe how they help animals survive in their environment (e.g., antennae, body covering, teeth, beaks, whiskers, appendages)
- Recognize internal cues (e.g., hunger) and external cues (e.g., changes in the environment) that cause organisms to behave in certain ways (e.g., hunting, migration, hibernation)
- Predict which plant or animal will be able to survive in a specific environment based on its special structures or behaviors

Strand 5: Process and Interactions of the Earth's Systems

1. Earth's Systems (geosphere, atmosphere, and hydrosphere) have common components and unique structures

B. The hydrosphere is composed of water (a material with unique properties) and other materials

Scope and Sequence – Water Cycle and Weather

- Classify major bodies of surface water (e.g., rivers, lakes, oceans, glaciers) as fresh or salt water, flowing or stationary, large or small, solid or liquid, surface or groundwater
- Relate the type of water body to the process by which it was formed

C. The atmosphere (air) is composed of a mixture of gases, including water vapor, and minute particles

Scope and Sequence – Water Cycle and Weather

- Recognize the atmosphere is composed of a mixture of gases, water, and minute particles

2. Earth's Systems (geosphere, atmosphere, and hydrosphere) interact with one another as they undergo change by common processes

E. Changes in the form of water as it moves through Earth's systems are described as the water cycle

Scope and Sequence – Water Cycle and Weather

- Describe and trace the path of water as it cycles through the hydrosphere, geosphere, and atmosphere (i.e., the water cycle: evaporation, condensation, precipitation, surface run-off/ groundwater flow)
- Identify the different forms water can take (e.g., snow, rain, sleet, fog, clouds, dew) as it moves through the water cycle

F. Constantly changing properties of the atmosphere occur in patterns which are described as weather

Scope and Sequence – Water Cycle and Weather

- Identify and use appropriate tools (i.e., thermometer, anemometer, wind vane, hygrometer, barometer, rain gauge, satellite images, weather maps) to collect weather data (i.e., temperature, wind speed and direction, relative humidity, air pressure, precipitation, cloud type and cover)
- Recognize and summarize relationships between weather data (e.g., temperature and time of day, cloud cover and temperature, wind direction and temperature) collected over a period of time

3. Human activity is dependent upon and affects Earth's resources and systems

A. Earth's materials are limited natural resources affected by human activity

Scope and Sequence – Water Cycle and Weather

- Explain how major bodies of water are important natural resources for human activity (e.g., food, recreation, habitat, irrigation, solvent, transportation)
- Describe how human needs and activities (e.g., irrigation, damming of rivers, waste treatment, sources of drinking water) have affected the quantity and quality of major bodies of fresh water
- Propose solutions to problems related to water quality and availability that result from human activity

Strand 6: Composition and Structure of the Universe and the Motion of the Objects Within It

1. The universe has observable properties and structure

A. The earth, sun, and moon are part of a larger system that includes other planets and objects

Scope and Sequence – Earth, Sun, and Moon

- Describe our Sun as a star because it provides light energy to the solar system
- Recognize the moon is a reflector of light

Scope and Sequence – Solar System

- Recognize the Earth is one of several planets within a solar system that orbits the Sun
- Recognize the moon orbits the Earth
- Recognize planets look like stars and appear to move across the sky among the stars

B. The Earth has a composition and location suitable to sustain life

Scope and Sequence – Solar System

- Describe physical features of the planet Earth that allows life to exist (e.g., air, water, temperature) and compare these to the physical features of the Sun, the moon, and other planets

2. Regular and predictable motions of objects in the universe can be described and explained as the result of gravitational forces

A. The apparent position of the Sun and other stars, as seen from Earth, change in observable patterns

Scope and Sequence – **Earth, Sun, and Moon**

- Illustrate and describe how the Sun appears to move slowly across the sky from east to west during the day

B. The apparent position of the moon, as seen from Earth, and its actual position relative to Earth change in observable patterns

Scope and Sequence – **Earth, Sun, and Moon**

- Illustrate and describe how the moon appears to move slowly across the sky from east to west during the day and/or night
- Observe the change in the moon's appearance relative to time of day and month over several months and note the pattern in this change

Scope and Sequence – **Solar System**

- Sequence images of the lit portion of the moon seen from Earth as it cycles day-to-day in about a month in order of occurrence (Do NOT assess cause of moon phases)

C. The regular and predictable motions of a planet and moon relative to the Sun explain natural phenomena on a planet, such as day, month, year, shadows, moon phases, eclipses, tides, and seasons

Scope and Sequence – **Earth, Sun, and Moon**

- Recognize there is a day/night cycle every 24 hours
- Describe the changes in length and position (direction) of shadows from morning to midday to afternoon
- Describe how the Sun's position in the sky changes the length and position of shadows

Scope and Sequence – **Solar System**

- Recognize the Earth rotates once every 24 hours
- Relate changes in the length and position of a shadow to the time of day and apparent position of the Sun in the sky, as determined by Earth's rotation
- Relate the apparent motion of the Sun, moon, and stars in the sky to the rotation of the Earth (Do not assess apparent motion of polar constellations)

Strand 7: Scientific Inquiry

1. Science understanding is developed through the use of science process skills, scientific knowledge, scientific investigation, reasoning, and critical thinking

A. Scientific inquiry includes the ability of students to formulate a testable question and explanation, and to select appropriate investigative methods in order to obtain evidence relevant to the explanation

Scope and Sequence - **All Units**

- Formulate testable questions and explanations (hypotheses)
 - Recognize the characteristics of a fair and unbiased test
 - Conduct a fair test to answer a question
 - Make suggestions for reasonable improvements or extensions of a fair test
- B. Scientific inquiry relies upon gathering evidence from qualitative and quantitative observations

Scope and Sequence - **All Units**

- Make qualitative observations using the five senses
- Determine the appropriate tools and techniques to collect data
- Use a variety of tools and equipment to gather data (e.g., hand lenses, magnets, thermometers, metric rulers, balances, graduated cylinders, spring scales)
- Measure length to the nearest centimeter, mass to the nearest gram, volume to the nearest milliliter, temperature to the nearest degree Celsius, weight to the nearest Newton
- Compare amounts/measurements
- Judge whether measurements and computation of quantities are reasonable

C. Evidence is used to formulate explanations

Scope and Sequence - **All Units**

- Use quantitative and qualitative data as support for reasonable explanations
 - Use data as support for observed patterns and relationships, and to make predictions to be tested
- D. Scientific inquiry includes evaluation of explanations (hypotheses, laws, theories) in light of scientific principles (understandings)

Scope and Sequence - **All Units**

- Evaluate the reasonableness of an explanation
 - Analyze whether evidence and scientific principles support proposed explanations
- E. The nature of science relies upon communication of results and justification of explanations

Scope and Sequence - **All Units**

- Communicate the procedures and results of investigations and explanations through:
 - ⇒ oral presentations
 - ⇒ drawings and maps
 - ⇒ data tables
 - ⇒ graphs (bar, single line, pictograph)
 - ⇒ writings

Strand 8: Impact of Science, Technology and Human Activity

1. The nature of technology can advance, and is advanced by, science as it seeks to apply scientific knowledge in ways that meet human needs

A. Designed objects are used to do things better or more easily and to do some things that could not otherwise be done at all

Scope and Sequence – **Work and Simple Machines**

- Design and construct a machine, using materials and/or existing objects, that can be used to perform a task (Assess Locally)

B. Advances in technology often result in improved data collection and an increase in scientific information

Scope and Sequence – All Units

- a. Describe how new technologies have helped scientists make better observations and measurements for investigations (e.g., telescopes, electronic balances, electronic microscopes, x-ray technology, computers, ultrasounds, computer probes such as thermometers)

C. Technological solutions to problems often have drawbacks as well as benefits

Scope and Sequence – All Units

- a. Identify how the effects of inventions or technological advances (e.g., complex machinery, technologies used in space exploration, satellite imagery, weather observation and prediction, communication, transportation, robotics, tracking devices) may be helpful, harmful, or both (Assess Locally)

2. Historical and cultural perspectives of scientific explanations help to improve understanding of the nature of science and how science knowledge and technology evolve over time

A. People of different gender and ethnicity have contributed to scientific discoveries and the invention of technological innovations

Scope and Sequence – All Units

- a. Research biographical information about various scientists and inventors from different gender and ethnic backgrounds, and describe how their work contributed to science and technology (Assess Locally)

3. Science and technology affect, and are affected by, society

A. People, alone or in groups, are always making discoveries about nature and inventing new ways to solve problems and get work done

Scope and Sequence - All Units

- a. Identify a question that was asked, or could be asked, or a problem that needed to be solved when given a brief scenario (fiction or nonfiction of people working alone or in groups solving everyday problems or learning through discovery)
- b. Work with a group to solve a problem, giving due credit to the ideas and contributions of each group member (Assess Locally)