



Grade 4 Science Curriculum Framework

Introduction

Science, Technology & Engineering, and Environmental Literacy & Sustainability (STEELS) Standards guide the study of the natural and human-made world through inquiry, problem-solving, critical thinking, and authentic exploration. This document displays a curriculum framework for **Grade 4 Science**. It is designed to focus curriculum and teaching, provide guidance for multiple approaches to curriculum development, encourage less reliance on textbooks as curriculum, and avoid activity-oriented teaching without focus/purpose.

Science Long Term Transfer Goals

In support of the Curriculum Framework, Long Term Transfer Goals (LTTG) provide the overarching practices that ground the foundation for a robust curriculum; thus, all curricula should relate to one or more of the LTTGs detailed below – as they highlight the effective uses of understanding, knowledge, and skill that we seek in the long run; i.e., what we want students to be able to do when they confront new challenges – both in and outside of school.

Students will be able to engage as scientifically literate members of a global society, using their learning to:

1. Approach science as a reliable and tentative way of knowing and explaining the natural world and designed world.
2. Weigh evidence and use scientific approaches to ask questions, investigate, and make informed decisions.
3. Make and use observations to analyze relationships and patterns in order to explain phenomena, develop models, and make predictions.
4. Evaluate systems, in order to connect how form determines function and how any change to one component affects the entire system.
5. Explain how the natural and designed worlds are interrelated and the application of scientific knowledge and technology can have beneficial, detrimental, or unintended consequences.

LIFE SCIENCE

Structure and Function						
Key Understanding	Driving Question	Standard	Science and Engineering Practices	Disciplinary Core Idea	Crosscutting Concepts	Vocabulary
Organisms have internal and external parts that help them live and grow.	How do the internal and external structures of an organism help it survive and grow?	3.1.4.A Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.	Engaging in Argument from Evidence Construct an argument with evidence, data, and/or a model.	Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.	Systems and System Models A system can be described in terms of its components and their interactions.	external structure internal structure
Information Processing						
Key Understanding	Driving Question	Standard	Science and Engineering Practices	Disciplinary Core Idea	Crosscutting Concepts	Vocabulary
An animal's brain processes different information it receives from its senses to respond to the environment.	How do animals use their senses and brain to respond to what is happening around them?	3.1.4.B Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.	Developing and Using Models Use a model to test interactions concerning the functioning of a natural system.	Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions.	Systems and System Models A system can be described in terms of its components and their interactions.	brain sensory receptor senses

PHYSICAL SCIENCE

Definitions of Energy						
Key Understanding	Driving Question	Standard	Science and Engineering Practices	Disciplinary Core Idea	Crosscutting Concepts	Vocabulary
The amount of energy an object has affects the speed of that object.	How can we use energy to change the speed of an object?	3.2.4.A Use evidence to construct an explanation relating the speed of an object to the energy of that object.	Constructing Explanations and Designing Solutions Use evidence (e.g., measurements, observations, patterns) to construct an explanation.	The faster a given object is moving, the more energy it possesses.	Energy and Matter Energy can be transferred in various ways and between objects.	energy speed
Conservation of Energy and Energy Transfer						
Key Understanding	Driving Question	Standard	Science and Engineering Practices	Disciplinary Core Idea	Crosscutting Concepts	Vocabulary
Energy can be transferred from place to place.	How does energy move from one place to another?	3.2.4.B Make and communicate observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.	Planning and Carrying Out Investigations Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. Asking Questions and Defining Problems Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships.	Energy can be moved from place to place by moving objects or through sound, light, or electric currents. Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result the air gets heated and sound is produced.	Patterns Similarities and differences in patterns can be used to sort, classify, and analyze simple rates of change for natural phenomena. Cause and effect relationships are routinely identified. Connections to Engineering, Technology, and Applications of Science Interdependence of Science, Engineering, and Technology Knowledge of relevant scientific concepts and research findings is important in engineering.	electric current energy transfer heat energy light energy sound energy

Relationship Between Energy and Forces						
Key Understanding	Driving Question	Standard	Science and Engineering Practices	Disciplinary Core Idea	Crosscutting Concepts	Vocabulary
When objects collide, energy changes.	In what ways does the energy of an object change when it collides with another object?	3.2.4.C Ask questions and predict outcomes about the changes in energy that occur when objects collide.	Constructing Explanations and Designing Solutions Apply scientific ideas to solve design problems.	<p>Energy can be moved from place to place by moving objects or through sound, light, or electric currents.</p> <p>Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result the air gets heated and sound is produced.</p> <p>When objects collide, the contact forces transfer energy so as to change the objects' motions.</p>	Energy and Matter Energy can be transferred in various ways and between objects.	collision energy

Energy in Chemical Processes and Everyday Life						
Key Understanding	Driving Question	Standard	Science and Engineering Practices	Disciplinary Core Idea	Crosscutting Concepts	Vocabulary
Devices can be designed to convert energy from one form to another.	How can we solve a problem by converting energy from one form to another?	3.2.4.D Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.	Constructing Explanations and Designing Solutions Apply scientific ideas to solve design problems.	<p>Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy.</p> <p>Energy in Chemical Processes and Everyday Life The expression “produce energy” typically refers to the conversion of stored energy into a desired form for practical use.</p> <p>Defining Engineering Problems Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.</p>	Connections to Nature of Science Science is a Human Endeavor. Most scientists and engineers work in teams. Science affects everyday life.	convert energy refine

Wave Properties						
Key Understanding	Driving Question	Standard	Science and Engineering Practices	Disciplinary Core Idea	Crosscutting Concepts	Vocabulary
The repeating pattern of a wave can move objects.	How do waves of energy move objects?	3.2.4.E Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.	Developing and Using Models Develop a model using an analogy, example, or abstract representation to describe a scientific principle.	Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave.	Patterns Similarities and differences in patterns can be used to sort, classify, and analyze simple rates of change for natural phenomena.	amplitude wave wavelength
Electromagnetic Radiation						
Key Understanding	Driving Question	Standard	Science and Engineering Practices	Disciplinary Core Idea	Crosscutting Concepts	Vocabulary
Objects in the world can be seen due to the light reflecting off them and entering the eyeball.	How does the reflection of light allow us to see objects?	3.2.4.F Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.	Developing and Using Models Develop a model to describe phenomena.	An object can be seen when light reflected from its surface enters the eyes.	Cause and Effect Cause and effect relationships are routinely identified.	reflection

Information Technologies and Instrumentation						
Key Understanding	Driving Question	Standard	Science and Engineering Practices	Disciplinary Core Idea	Crosscutting Concepts	Vocabulary
Many communication solutions include using patterns to transfer information.	How can we use patterns to send and receive information?	3.2.4.G Generate and compare multiple solutions that use patterns to transfer information.	Constructing Explanations and Designing Solutions Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.	Digitized information can be transmitted over long distances without significant degradation. High-tech devices, such as computers or cell phones, can receive and decode information—convert it from digitized to voice—and vice versa.	Patterns Similarities and differences in patterns can be used to sort and classify designed products.	transfer

EARTH & SPACE SCIENCE

The History of Planet Earth						
Key Understanding	Driving Question	Standard	Science and Engineering Practices	Disciplinary Core Idea	Crosscutting Concepts	Vocabulary
Rock layers can provide evidence that the Earth has changed over time.	How can the rock formations and fossils in rock layers tell the history of Earth?	3.3.4.A Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.	Constructing Explanations and Designing Solutions Identify the evidence that supports particular points in an explanation.	Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed.	Patterns Patterns can be used as evidence to support an explanation. Connections to Nature of Science Scientific knowledge assumes an order and consistency in natural systems. Science assumes consistent patterns in natural systems.	fossil types landscape marine rock formations rock layers

Earth Materials and Systems						
Key Understanding	Driving Question	Standard	Science and Engineering Practices	Disciplinary Core Idea	Crosscutting Concepts	Vocabulary
Weathering and erosion data can provide evidence of how Earth's surface has changed over time.	How can weathering and erosion data help to explain the changes in Earth's surface over time?	3.3.4.B Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.	Planning and Carrying Out Investigations Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon.	Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. Living things affect the physical characteristics of their regions.	Cause and Effect Cause and effect relationships are routinely identified, tested, and used to explain change.	erosion sediment vegetation weathering
Plate Tectonics and Large-Scale System Interactions						
Key Understanding	Driving Question	Standard	Science and Engineering Practices	Disciplinary Core Idea	Crosscutting Concepts	Vocabulary
Data from maps and models provide evidence to determine patterns of Earth's features.	How does evidence from maps help us find patterns in Earth's features?	3.3.4.C Analyze and interpret data from maps to describe patterns of Earth's features	Analyzing and Interpreting Data Analyze and interpret data to make sense of phenomena using logical reasoning.	The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth.	Patterns Patterns can be used as evidence to support an explanation.	landform

Natural Resources						
Key Understanding	Driving Question	Standard	Science and Engineering Practices	Disciplinary Core Idea	Crosscutting Concepts	Vocabulary
Natural resources provide the energy and fuel we use every day and the choices we make about using them can impact the environment.	Where does the energy we use come from? How does it affect our planet?	3.3.4.D Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.	Obtaining, Evaluating, and Communicating Information Obtain and combine information from books and other reliable media to explain phenomena.	Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not.	Cause and Effect Cause and effect relationships are routinely identified and used to explain change. Connections to Engineering, Technology, and Applications of Science Interdependence of Science, Engineering, and Technology Knowledge of relevant scientific concepts and research findings is important in engineering.	energy fossil fuel natural resource nonrenewable resource renewable resource
Natural Hazards						
Key Understanding	Driving Question	Standard	Science and Engineering Practices	Disciplinary Core Idea	Crosscutting Concepts	Vocabulary
Natural processes impact people, but there are many ways to lessen their effect.	How can different solutions make communities safer from earthquakes, floods, tsunamis, or volcanic eruptions?	3.3.4.E Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.	Constructing Explanations and Designing Solutions Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.	A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. Designing Solutions to Engineering Problems Testing a solution involves investigating how well it performs under a range of likely conditions.	Cause and Effect Cause and effect relationships are routinely identified, tested, and used to explain change.	blizzard earthquake flood hurricane tsunami volcanic eruption