Science Curriculum Map: 4th Grade

Overview

Domain	SUSD Curriculum	Standards	Quarter	Duration
Science Safety and Science Processes	Science Safety and Science Processes SUSD Science Safety Agreements	Science Safety Science and Engineering Practices	1st Quarter	1 week
Physical Science and **Earth and Space Science**	FOSS **Energy** NextGen	4.P4U1.1 4.P4U1.2 4.P2U1.3 4.P4U3.4 4.E1U1.5	Any	11 weeks
Earth and Space Science and **Life Science**	FOSS **Soils, Rocks and Landforms** NextGen	4.E1U1.5 4.E1U1.6 4.E1U1.7 4.L4U1.11	Any	9 weeks
Earth and Space Science and **Life Science**	FOSS **Water and Climate** NextGen	4.E1U1.6 4.E1U1.8 4.E1U3.9 4.E1U2.10 4.L4U1.11	Any	10 weeks

Science Curriculum Map: Grade 4

Domain: Science Safety and Science Process Skills	Quarter:	Time Frame:
Science Safety and Science Process	**1st**	**1-2 weeks**

Essential Questions:

How do scientists collect and organize their data as part of a scientific process?
What are lab safety rules and why are they important?

Crosscutting Concepts and Background Information for Educators:

Science Processing:
The new vision calls for students to engage in multifaceted science and engineering practices in more complex, relevant, and authentic ways. The science and engineering practices describe a robust process for how scientists investigate and build models and theories of the natural world or how engineers design and build systems. Rather than a linear process from hypothesis to conclusion, these practices reflect science and engineering as they are practiced and experienced. As students conduct investigations, they engage in multiple practices as they gather information to solve problems, answer their questions, reason about how the data provide evidence to support their understanding, and then communicate their understanding of phenomena.

Safety Expectations:
While there are no specific standards that address laboratory or field safety, it is a required part of science education to instruct and guide students in using appropriate safety precautions for all investigations. Reducing risk and preventing accidents in science classrooms begins with planning that meets all local, state, and federal requirements, including Environmental Protection Agency (EPA) and Occupational Safety and Health Administration (OSHA) requirements for safe handling and disposal of laboratory materials. The following four steps are recommended for carrying out a hazard and risk assessment for any investigation:

1) Identify hazards. Hazards may be physical, chemical, health, or environmental.
2) Evaluate the type of risk associated with each hazard.
3) Instruct students on all procedures and necessary safety precautions in such a way as to eliminate or reduce the risk associated with each hazard.
4) Prepare for any emergency that might arise despite all the required safety precautions.

Key Concepts:	Key Vocabulary:
• Science Process Skills (Observations, Measurements, Recording Data) • 3-Dimensional Teaching and Learning (Science and Engineering Practices, Crosscutting Concepts, Core Ideas -See Below)	CER (Claim, Evidence, and Reasoning) Science notebooking Questioning

• Lab Safety • Setting up interactive notebooks • Diverse people making contributions to scientific innovations • Science-related career opportunities • Benefits and risks of technology and designing solutions	Measuring (metric system) Analyzing Data-Qualitative & Quantitative Organizing Data Inferring Observing Investigating Concluding Material safety Common safety symbols Collaborating Communicating

Arizona State Standards:

Arizona Science Standards are written using Three Dimensional Teaching and Learning. The standards are color-coded to show these 3 dimensions. They are as follows:

Science and Engineering Practices:

Asking questions (for science) and defining problems (for engineering):

- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using mathematics and computational thinking
- Constructing explanations (for science) and designing solutions (for engineering)
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information

Crosscutting Concepts:

- Patterns
- Cause and effect
- Scale, Proportion, and Quantity
- Systems and System Models
- Energy and Matter
- Structure and Function
- Stability and Change

Core Ideas:

Physical Science

- PS2: Motion and Stability: Forces and Interactions
- PS3: Energy
- PS4: Waves and Their Applications in Technologies for Information Transfer

Life Science

- LS4: Biological Evolution: Unity and Diversity

Earth and Space Science

- ESS1: Earth's Place in the Universe
- ESS2: Earth's Systems
- ESS3: Earth and Human Activity

Domain: Physical Science	Quarter:	Time Frame:
Energy	**Any**	**11 Weeks**

Essential Questions:

How does energy transfer between systems?
How can one explain and predict interactions between objects and within systems of objects (magnets, circuits)?
How does energy travel, transfer, change forms, and how is it conserved?
How does energy transfer in a complete circuit?
What materials transfer electricity?
What affects magnetic force?
What is the effect on the force of attraction between two magnets as the distance between them changes?
What causes electromagnetism and how can we use it to transfer energy?
How does energy transfer between objects?
What happens when objects collide?
What do waves have to do with energy?
How does light travel?

Arizona Science Standards

Crosscutting Concepts:
Patterns, Cause and Effect, Scale, Proportion and Quantity**; Systems and System Models**; **Energy and Matter**; Structure and Function; **Stability and Change**

4.P4U1.1 Develop and use a model to demonstrate how a system transfers energy from one object to another even when the objects are not touching.
- Energy is transferred from one object, which is an energy source or resource, to another.
- Energy is present whenever there are moving objects, sound, light, or heat. (4.P4U1.2)

4.P4U1.2 Develop and use a model that explains how energy is moved from place to place through electric currents.
- Energy is present whenever there are moving objects, sound, light, or heat. (4.P4U1.1)
- Energy can be moved from place to place by moving objects or through sound or light, or electric currents.

Boundary: At this grade level, no attempt is made to give a precise or complete definition of energy.
- 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.

● Light also transfers energy from place to place.

4.P2U1.3 Develop and use a model to demonstrate magnetic forces.
● Magnetic forces between a pair of objects do not require that the objects be in contact. The size of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other**.**

4.P4U3.4 Engage in argument from evidence on the use and impact of renewable and nonrenewable resources to generate electricity.
● The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use.
● 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.

4.E1U1.5 Use models to explain seismic waves and their effect on the Earth.
● Earthquakes cause seismic waves, which are waves of motion in Earth's crust.
● Energy originates from the sun and from Earth's interior. Transfers of energy and the movements of matter can cause physical changes among Earth's materials and living organisms.
● Local, regional, and global patterns of rock formations reveal changes over time due to Earth forces, such as earthquakes. (4.E1U1.7)

Key Concepts:

- Electrical energy can be transformed into heat, light, sound, and motion
- Relationship between energy and magnetism
- Types and components of circuits
- Energy transfer and how it is stored
- Role of conductors and insulators during energy transfer
- Renewable and nonrenewable resources and their use as energy resources and the advantages and disadvantages of alternative energy sources
- Diverse people making contributions to scientific innovations
- Science-related career opportunities
- Benefits and risks of technology and designing solutions

Key Vocabulary:

Circuit	Conduct
Conductors	Charged particles
Insulators	Electrical energy
Magnets	Closed circuit
Poles	Open circuit
Attract	Electromagnet
Repel	Fossil fuels
Series circuits	Solar energy
Parallel circuits	Geothermal energy
Magnetic field	Non-renewable energy
Static electricity	Renewable energy
Current electricity	Electricity
Batteries	D-cell
Sound	Light
Heat	Filament
transfer	Radiate

	energy	sound
	convert	stored energy
	dam	turbine generator
	digested	burned

Domain: Earth and Space Science, Life Science	Quarter:	Time Frame:
Soils, Rocks and Landforms	**Any**	**9 Weeks**

Essential Questions:

How does the surface of our Earth change?
What role does water have in changing the Earth's surface?
How and why is Earth constantly changing?
How do the Earth's surface processes and human activities affect each other?
How do Soils form?
How do erosion and deposition impact landforms?
What do the location of fossils in rock layers tell us about past life on Earth?
How do environmental changes impact organisms?
What factors cause species to adapt and survive or go extinct over time?
What might reduce the impact of catastrophic Earth surface events?
What events can change Earth's surface quickly?
What are natural resources and what is important to know about them?
How do people use natural resources to make or build things?

Arizona Science Standards

Crosscutting Concepts:
Patterns, Cause and Effect, Scale, Proportion and Quantity**; Systems and System Models**; **Energy and Matter**; Structure and Function; **Stability and Change**

4.E1U1.5 Use models to explain seismic waves and their effect on the Earth.
● Earthquakes cause seismic waves, which are waves of motion in Earth's crust.
● Energy originates from the sun and from Earth's interior. Transfers of energy and the movements of matter can cause physical changes among Earth's materials and living organisms.
● Local, regional, and global patterns of rock formations reveal changes over time due to Earth forces, such as earthquakes. (4.E1U1.7)

4.E1U1.6 Plan and carry out an investigation to explore and explain the interactions between Earth's major systems and the impact on Earth's surface materials and processes.

● Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather.

● 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.

● Rainfall helps 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. (4.E1U1.7)

4.E1U1.7 Develop and/or revise a model using various rock types, fossil location, and landforms to show evidence that Earth's surface has changed over time.

● 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. (4.E1U1.5)

● Rainfall helps 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. (4.E1U1.6)

● Earth has changed over time. Understanding how landforms develop, are weathered (broken down into smaller pieces), and erode (get transported elsewhere) can help infer the history of the current landscape.

4.L4U1.11 Analyze and interpret environmental data to demonstrate that species either adapt and survive or go extinct over time.

● When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die.

● Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments.

● For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.

Key Concepts:	Key Vocabulary:	
● Slow processes: erosion, deposition, and weathering ● Rapid processes: earthquakes, volcanoes, floods ● Erosion caused by wind, water, gravity, ice (glaciers)	Erosion Deposition Weathering Physical weathering Chemical weathering	Glaciers Sediment Floods Volcanoes Core

• Sources of water: groundwater, surface water, atmospheric water, glaciers • Water's distribution on Earth • Change in the atmosphere due to volcanic eruptions and forest fires • Diverse people making contributions to scientific innovations: Inge Lehman and Alfred Wegener's contribution to knowledge of earthquakes • Science-related career opportunities: structural engineers re: earthquakes • Benefits and risks of technology and designing solutions re: predicting earthquakes and volcanoes	Acid rain Delta Canyon Valley Meander Abrasion Rock formations Geosphere Atmosphere Shapes landforms Mantel Fault Earthquakes Root wedging Ice wedging Earthquakes System models Hydrosphere Biosphere Rainfall

Domain: Earth and Space Science	Quarter:	Time Frame:
Water and Climate	**Any**	**6-8 Weeks**

Essential Questions:

How and why is Earth constantly changing?
How does Earth interact with air and water?
How does water change as it heats and cools?
What is weather and how is it measured?
How do organisms respond to changing environmental conditions?
How does surface area affect evaporation?
How do we describe different climates?
How do people deal with natural hazards?
How do environmental changes impact organisms?
What factors cause species to adapt and survive or go extinct over time?

Arizona Science Standards

Crosscutting Concepts:

Patterns, Cause and Effect, Scale, Proportion and Quantity**; Systems and System Models**; **Energy and Matter**; Structure and Function; **Stability and Change**

4.E1U1.6 Plan and carry out an investigation to explore and explain the interactions between Earth's major systems and the impact on Earth's surface materials and processes.

● Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather.

● 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.

● Rainfall helps 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. (4.E1U1.7)

4.E1U1.8 Collect, analyze, and interpret data to explain weather and climate patterns.

● Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next.

● Climate describes the ranges of an area's typical weather conditions and the extent to which those conditions vary over years.

4.E1U3.9 Construct and support an evidence-based argument about the availability of water and its impact on life.

● Nearly all of Earth's available water is in the ocean. Most freshwater is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere.

● About two-thirds of the surface of the Earth is covered by liquid water, which is essential to life.

4.E1U2.10 Define problem(s) and design solution(s) to minimize the effects of natural hazards.

● A variety of hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts.

4.L4U1.11 Analyze and interpret environmental data to demonstrate that species either adapt and survive or go extinct over time.

● When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die.

● Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments.

● For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.

Key Concepts:	Key Vocabulary:
• Water reacts differently with different materials • Water moves downhill • Sun's energy drives weather • Regional weather varies with seasons • Climate is typical weather that occurs in a region • Weather has natural hazards • Weather is measured using tools and observations • Evaporation is related to the temperature, surface area, and moving air • Diverse people making contributions to scientific innovations • Science-related career opportunities • Benefits and risks of technology and designing solutions • Measuring change in weather • Understanding Weather Maps • Comparing weather conditions in various locations	Weather Climate Global warming Meteorologist Climatologist Thermometer Anemometer Barometer Wind vane Pressure Air pressure Precipitation Wind Front Low pressure system Cold front High pressure system Warm front Clouds Cumulus Cirrus Stratus Nimbus Cumulonimbus Thunderstorm Snowstorm Tornado Vortex Hurricane Monsoon Earthquake Blizzard Temperature Degrees Fahrenheit Celsius humidity Vapor Fog Rain Snow Atmosphere Evaporation Condensation Precipitation