Science Curriculum Map: 5th 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 **Mixtures and Solutions** NextGen	5.P1U11.1 5.P1U11.2	Any	10 weeks
Earth and Space Science and **Physical Science**	FOSS **Earth and Sun** NextGen	5.P1U1.1 5.P2U1.3 5.E2U1.7 5.E2U1.8	Any	6 weeks
Life Science	FOSS **Environments** NextGen	5.L3U1.9 5.L3U1.10 5.L4U3.11 5.L4U3.12	Any	9 weeks
Physical Science and Engineering	FOSS **Variables and Design** NextGen	5.P3U1.4 5.P3U2.5 5.P4U1.6	Any	6 weeks

Domain: Science Safety and Science Process Skills	Quarter:	Time Frame:
Science Safety and Science Process	**1st**	**1 week**

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 Informations for Educators:

Crosscutting Concepts:

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

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 Expectation:

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) • 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	CER (Claim, Evidence, and Reasoning) Science notebooking Questioning 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

Core Ideas:

Physical Science

- PS1: Matter and Its Interactions
- PS2: Motion and Stability: Forces and Interactions
- PS3: Energy
- PS4: Waves and Their Applications in Technologies for Information Transfer

- **Life Science**
- LS1: From Molecules to Organisms: Structures and Processes
- LS2: Ecosystems: Interactions, Energy, and Dynamics
- LS3: Heredity: Inheritance and Variation of Traits
- LS4: Biological Evolution: Unity and Diversity

- **Earth and Space Science**
- ESS1: Earth's Place in the Universe
- ESS2: Earth's Systems

• Scale, Proportion, and Quantity • Systems and System Models • Energy and Matter • Structure and Function • Stability and Change	• ESS3: Earth and Human Activity

Domain: Physical Science	Quarter:	Time Frame:
Mixtures and Solutions	**Any**	**10 Weeks**

Essential Questions:

How can the structure, properties, and interactions of matter be explained?
How do substances combine or change (react) to make new substances?
How can reactions be characterized and explained?
What is the best way to explain a phenomenon for which you have incomplete information?
How can we use models to explain phenomena?
How can solutions made with the same substances be distinguished one from another?
How can the property of solubility be used to identify a substance?
What observations serve as evidence of a chemical reaction?

Arizona Science Standard

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

5.P1U1.1 Analyze and interpret data to explain that matter of any type can be subdivided into particles too small to see and, in a closed system, if properties change or chemical reactions occur, the amount of matter stays the same.
● Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means.
● The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish.
● No matter what reaction or change in properties occurs, the amount of matter does not change. (5.P1U1.2)
Boundary: At this grade level, mass and weight are not distinguished and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.

5.P1U1.2 Plan and carry out investigations to demonstrate that some substances combine to form new substances with different properties and others can be mixed without taking on new properties.
● When two or more different substances are mixed, a new substance with different properties may be formed. Other substances simply mix without changing permanently and can often be separated again.
Boundary: At this grade level, mass and weight are not distinguished and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.

Key Concepts:	Key Vocabulary:	
● Matter is made of molecules ● Mixtures versus compounds ● Physical change ● Chemical change ● Diverse people making contributions to scientific innovations ● Science-related career opportunities ● Benefits and risks of technology and designing solutions	Molecules Atoms Matter Particles Substances Liquid Gas Solid	Properties Mixtures Solution Compound Matter Physical changes Chemical Changes Evaporates

Domain: Earth and Space Science, Physical Science	Quarter:	Time Frame:
Earth and Sun	**Any**	**6 Weeks**

Essential Questions:

How do Earth's geosphere, hydrosphere, atmosphere, and biosphere interact to create a sustainable environment for life?
What is the universe, and what is Earth's place in it?
What are the predictable patterns caused by the Earth's movement in the solar system?
What goes on in stars?
How can one explain and predict interactions between objects and within systems of objects?
How can one predict an object's continued motion, changes in motion or stability?
What do shadows tell us about daily patterns involving the Earth/Sun system?
What objects do we observe in our solar system and how do they move in relation to each other?
What do we see outside our system?
What is Earth's atmosphere and what does it have to do with weather?
How does Earth's atmosphere heat up?
How is water distributed over Earth's surface and atmosphere? How does it move? What is the effect of Earth?

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

5.E2U1.7 Develop, revise, and use models based on evidence to construct explanations about the movement of the Earth and Moon within our solar system.
● The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the Sun and Moon at different times of the day, month, and year.

5.E2U1.8 Obtain, analyze, and communicate evidence to support an explanation that the gravitational force of Earth on objects is directed toward the planet's center.
● Gravity is the universal attraction between all objects, however large or small, although it is only apparent when one of the objects is very large.
● The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. (5.P2U1.3)

5.P1U1.1 Analyze and interpret data to explain that matter of any type can be subdivided into particles too small to see and, in a closed system, if properties change or chemical reactions occur, the amount of matter stays the same.
● Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means.

● The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish.
● No matter what reaction or change in properties occurs, the amount of matter does not change. (5.P1U1.2)
Boundary: At this grade level, mass and weight are not distinguished and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.

5.P2U1.3 Construct an explanation using evidence to demonstrate that objects can affect other objects even when they are not touching.
● All objects have an effect on other objects without being in contact with them. In some cases the effect travels out from the source to the receiver in the form of radiation (e.g. visible light).
● Electric, magnetic, and gravitational forces between a pair of objects do not require that the objects be in contact.
● The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. (5.E2U1.8)

Key Concepts:	Key Vocabulary:
Moon's appearance changes Earth's rotation causes day and night Revolution versus rotation Gravity keeps objects in space Space exploration Solar system Celestial bodies Planetary characteristics Apparent movement of the Sun and stars Human Impact and Solutions on the Environment Possible Strengths and Weaknesses of Proposed Solutions Force of gravity Force of friction Effects of forces on an object Diverse people making contributions to scientific innovations Science-related career opportunities Benefits and risks of technology and designing solutions	Earth Sun Moon Lunar cycle Rotation Revolution Gravity Celestial objects Exploration Planets Solar system Asteroids Comet Star Shooting star Meteor Shadow Force Motion Gravity Friction

	Cause motion Halt motion Directional change

Domain: Life Science	Quarter:	Time Frame:
Environments	**Any**	**9 Weeks**

Essential Questions:

How are characteristics of one generation passed to the next?
How can individuals of the same species and even siblings have different characteristics?
How do organisms live, grow, respond to their environment and reproduce?
How (and why} do organisms interact with their environment and what are the effects of these interactions?
How do the structures of an organism allow it to survive in its environment?
How do organisms sense and interact with their environment?
What are the roles of organisms in a food chain?
How does food affect a population in its home range?
What is the optimum environment related to organism and population survival?
What are some benefits of having variation within a population?
What environmental conditions result in the best growth and survival of different plants?
How do structures of plans function to support the survival of the organisms in a particular environment?
What are some examples of plant adaptations?

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

5.L3U1.9 Obtain, evaluate, and communicate information about patterns between the offspring of plants, and the offspring of animals (including humans); construct an explanation of how genetic information is passed from one generation to the next.
- Many characteristics of organisms are inherited from their parents.
- Different organisms vary in how they look and function because they have different inherited information.

5.L3U1.10 Construct an explanation based on evidence that the changes in an environment can affect the development of the traits in a population of organisms.

● Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment. (5.L4U3.12)

● The environment also affects the traits that an organism develops. Differences in where they grow or in the food they consume may cause organisms that are related to end up looking or behaving differently.

5.L4U3.11 Obtain, evaluate, and communicate evidence about how natural and human-caused changes to habitats or climate can impact populations.

● Populations of organisms live in a variety of habitats and change in those habitats affects the organisms living there.

● Changes in an organism's habitat are sometimes beneficial to it and sometimes harmful. For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.

5.L4U3.12 Construct an argument based on evidence that inherited characteristics can be affected by behavior and/or environmental conditions.

● Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing.

● Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment. (5.L3U1.10)

Key Concepts:	Key Vocabulary:
● Transfer of genetic material ● Effects of natural and human causes on the environment ● Diverse people making contributions to scientific innovations ● Science-related career opportunities ● Benefits and risks of technology and designing solutions ● Characteristics involve both inheritance and environment	organisms inherited characteristics adapted characteristics environment consumer ecosystem resources biological habitat populations

Domain: Physical Science	Quarter:	Time Frame:

Variables and Design	Any	6 Weeks

Essential Questions:

How can understanding variables help scientists make sense of phenomena and engineers design solutions to problems?
How can we design a controlled experiment?
How can we describe and measure motion in a system?
How does the engineering design process help us solve problems?
What is a balanced force? Explore how balanced forces result in no change in an object's motion.
How do unbalanced forces affect motion? Investigate how unbalanced forces cause changes in an object's speed or direction?
How does energy transfer occur when objects move?
Where does energy go when an object is in motion?

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

5.P3U1.4 Obtain, analyze, and communicate evidence of the effects that balanced and unbalanced forces have on the motion of objects.
● Each force acts on one particular object and has both a strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. (5.P3U2.5)
Boundary: Qualitative and conceptual, but not quantitative addition of forces are used at this level.
● Objects in contact exert forces on each other.
● How quickly an object's motion is changed depends on the force acting and the object's mass. The greater the mass of an object, the longer it takes to speed it up or slow it down. (5.P3U2.5)
Boundary: At this grade level, mass and weight are not distinguished and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.

5.P3U2.5 Define problems and design solutions pertaining to force and motion.
● Each force acts on one particular object and has both a strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. (5.P3U1.4)
Boundary: Qualitative and conceptual, but not quantitative addition of forces are used at this level.
● The patterns of an object's motion in various situations can be observed and measured; when past motion exhibits a regular pattern, future motion can be predicted from it.
Boundary: Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some

quantities need both size and direction to be described is developed.
● How quickly an object's motion is changed depends on the force acting and the object's mass. The greater the mass of an object, the longer it takes to speed it up or slow it down. (5.P3U1.4)

5.P4U1.6 Analyze and interpret data to determine how and where energy is transferred when objects move.
● The faster a given object is moving, the more energy it possesses.
● Energy can be moved from place to place by moving objects.
● When objects collide, the contact forces transfer energy so as to change the objects' motions.
● 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.

Key Concepts:	Key Vocabulary:	
● Understanding Variables ● Designing a Controlled Experiment ● Describing and Measuring Motion ● Engineering Design Process ● Balanced Forces/Unbalanced Forces ● Energy Transfer during Motion	controlled experiment dependent variable distance engineer final independent variable initial motion position reference point scientist system variables x-axis y-axis	brainstorm constraint criteria efficiency evaluate model prototype evaluate independent variable position prediction scientist system theory variable friction