



Curriculum Guide for 1st Grade SDP Science Teachers



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STATES OF MATTER



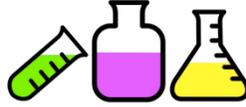
Please note: Pennsylvania & Next Generation Science Standards as well as Instructional Resources are found on the SDP Curriculum Engine

1st Grade Science Curriculum Term 1 (9/5-11/13/17)

Topic: Measurement and Tools: Thinking Like a Scientist

Duration: 9-10 Weeks

Performance Objectives



SWBAT:

- identify the purpose of various science tools (e.g., ruler, beaker, scale, thermometer) **IOT** determine which tool is appropriate for which type of measurement.
- identify standard and nonstandard units of measure **IOT** determine the length and height of objects.
- use a graduated cylinder or beaker **IOT** measure a liquid or object's volume.
- use a scale balance **IOT** determine an object's mass.
- read a thermometer **IOT** determine the temperature inside and outside and record a daily temperature log.
- identify physical properties (e.g., length, mass, volume, etc.) of solid matter **IOT** group objects by their properties.
- create a graph or table **IOT** organize and compare data that they collected.
- analyze a graph **IOT** answer questions relating to the data.
- collect data through various surveys **IOT** display the data in a graph.

Key Terms and Definitions

balance- A tool with a fulcrum in the middle used to compare two objects' weights

beaker - A container used by scientists, sometimes to measure liquids

chart- A visual display of information

data- A collection of facts or numbers from which conclusions may be drawn

hand lens- A type of magnifying glass held in your hand; it makes objects appear bigger

graduated cylinder- A tall narrow container with a volume scale used especially for measuring liquids

graphic organizers- Visual charts and tools used to represent and organize information

length- The measurement of an object from end to end

record- To write (something) down so that it can be used or seen again in the future

ruler- A tool used to measure distance in centimeters and inches

sort- To separate and arrange things according to likeness

scale - A tool used to measure the weight or mass of objects

mass- The amount of matter in an object

measure - To find the size or amount of something

nonstandard unit of measurement: A unit of measure expressed in terms of an objects such as a shoe, toothpick, paper clip, or penny (not commonly accepted as standard)

standard unit of measurement: A unit of measurement that everyone can use as a reference point to describe different objects (i.e., inches, feet, yards)

temperature – A measure of how hot or cold something is

thermometer- A tool used to measure the temperature

height- The distance that can be measured from the top to the bottom of an object

volume- A measure of how much space matter takes up

Essential Questions

What types of measurement can be used to describe an object?
Why is it important to know which measurement tool is good for which job?
How do we know which tool(s) to use to measure an object?
How can we display measurements (data) for other people to see?
How can measurements help us make decisions?
How do we have to organize our work to behave like a scientist?
How does studying the attributes/properties of objects help us to understand them, organize them, and answer questions about them?

Starting Points

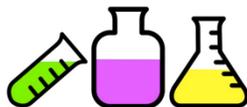
This unit should not be students' first introduction to measurement, measurement tools, or collecting and recording data, however this unit will provide students with many opportunities to reinforce and refine these science practices. Previously, students should have been exposed to different types of measurement (temperature, rain gauge, etc.) in the Kindergarten weather unit.

By the end of this unit, it will be particularly important that students can distinguish between finding temperature, length, volume, and weight/mass and know which tools to use for each type of measurement. Students should also be able to record and compare measurements and create visual representations (such as simple graphs) of data. Having students make predictions and estimates in regards to measurement, test their predictions, and form claims using the evidence they gathered is crucial to the development of science thinking. Using a KLEWS charts (see below) is one way to organize the learning, discovery, and questioning that happens throughout a lesson.

Where at all possible, teachers should teach the objectives for this unit within the context of other science content to reinforce the idea that measurement is a tool that scientists use when investigating, as opposed to just measuring something for the sake of measurement. If there a science topic about which a teacher is particularly passionate, he or she can feel free to incorporate it into this unit. Teachers can also revisit topics taught earlier in the year and/or extend this unit to math or other related subject lessons.

1st Grade Science Curriculum Term 2 (11/18-1/29/18)

Topic: Matter



Duration: 5 Weeks

Performance Objectives

SWBAT:

- classify objects based on their physical properties **IOT** communicate orally, pictorially, and in writing their observations whether it is a solid, liquid or gas.
- form a simple hypothesis and test it **IOT** classify which state of matter the object is.
- use the five senses **IOT** observe surroundings
- identify the specific properties of each state of matter **IOT** compare and contrast objects based on observations.
- safely manipulate tools both standard non- standard units of measuring **IOT** gather and organize data.
- identify and describe liquids, solids, and gases **IOT** identify and describe the changes each state of matter can go through.
- plan and carry out an investigation **IOT** test the idea that warming some materials causes them to change from solid to liquid and cooling causes them to change from liquid to solid.
- construct an argument and provide evidence **IOT** explain that some changes caused by heating and cooling can be reversed and some cannot.
- design an object build from a small set of pieces **IOT** solve a problem and compare solutions designed by peers given the same set of pieces.

Key Terms and Definitions

matter- Anything that has mass and takes up space

solid- An object that holds its shape

liquid- Flows and fills up the shape of any container

gas- Often invisible and can take the shape of their container.

definite- Always the same

properties- Characteristics or traits that an object has

melting- When a solid turns to a liquid from heat

boiling- When a liquid becomes a gas at the boiling point (100 degrees Celsius, 212 degrees Fahrenheit)

freezing- When a liquid turns into a solid (0 degrees Celsius, 32 degrees Fahrenheit)

evaporation- When liquid is becoming a gas, happens only on the surface of a liquid

cause and effect- The reason why something is happening and the results of it happening

evidence- Proof to support what you think

reverse- To do the opposite

problem solving- Thinking of solutions to an issue

solutions- Ways to solve, fix, or improve a problem

design- A plan or drawing to show the look and function of something

engineer- Someone who designs or builds things

construct- To build something

Essential Questions

What makes up our world?

How can the properties of matter be observed and measured?

What are some properties of matter and how do we observe them?

Can matter change?

How can one explain the structure, properties, and interactions of matter?

How can temperature affect the state that matter exists?

How do heating and cooling a substance cause changes that can be observed?

How does studying the attributes/properties of objects help us to understand them, organize them, and answer questions about them?

Starting Points

Prior to first grade, students will have practiced how to use their five senses in order to investigate, sort, and classify living and nonliving things. During the first quarter, students will be introduced to the concept of matter, which is anything that has mass and takes up space. Students will learn how to describe matter correctly and accurately both qualitatively using their five senses and quantitatively using simple tools to measure numeric value. Students will study the three most common states of matter, which are solids, liquids, and gases. Students will be able to identify each of their unique properties that are used to define those three examples of matter.

Topic: Waves: Light and Sound

Duration: 4 Weeks

Performance Objectives

SWBAT:

- identify and describe liquids, solids, and gases **IOT** identify and describe the changes each state of matter can go through.
- use matter and their five senses **IOT** observe and investigate sound waves through vibrations.
- identify the relationship between the properties of matter and light **IOT** investigate and observe whether light can pass through the particular object.
- use flashlights **IOT** create shadows with the use of solid matter
- demonstrate that matter can vibrate **IOT** explain that vibrating matter can make sound.
- plan and conduct investigations **IOT** provide evidence that vibrating materials can make sound.
- plan and conduct investigations **IOT** explain that for an object to be seen, light must be reflected off the object and enter the eye.
- make observations using flashlights **IOT** construct an evidence-based account that light travels from place to place.
- plan and conduct an investigation **IOT** redirect light beams using mirrors.

- determine the effect of placing objects made of different materials in a beam of light **IOT** explain their transparency.
- use tools and materials **IOT** design a device that uses light or sound to solve the problem of communicating over a distance.
- design and build a device **IOT** use light to communicate.

Key Terms and Definitions

matter- Anything that has mass and takes up space

solid- An object that holds its shape

liquid- Flows and fills up the shape of any container

gas- Often invisible and can take the shape of their container.

vibrate- Shaking back and forth

sound- What you hear when vibrations happen and sound waves travel to your ear

volume- How loud or soft a sound is

properties- Characteristics or traits that an object has

shadow- Made when an object blocks light

investigation- The process by which scientists try to answer a question about the world around them

energy- The ability to do work

waves- A traveling disturbance that moves through space and matter transferring energy from one place to another.

reflection- The return of light or sound off of a surface

light- The form of energy that makes it possible to see

light beam- A straight line of light coming from a light source

opaque- Does not let light through

transparent- Does let light through

translucent- Allows light, but not detailed images, to pass through

communicate- The act or process of using words, sounds, signs, or behaviors to express or exchange information or to express your ideas, thoughts, feelings, etc., to someone else

Essential Questions

How are waves used to transfer energy and information?

What makes a shadow and how can we redirect light?

What happens when materials vibrate?

Can light pass through all matter?

How does the speed of sound compare to the speed of light?

What causes sound and how can we produce loud and soft sounds?

How can we use light to communicate?

Starting Points

In the beginning of the quarter, students will have practiced how to use their five senses in order to investigate, sort, and classify living and nonliving things. Students will have been taught the

concept of matter, which is anything that has mass and takes up space. Students will have learned how to describe matter correctly and accurately both qualitatively using their five senses and quantitatively using simple tools to measure numeric value. Students will have studied the three most common states of matter, which are solids, liquids, and gases. In this part of the first quarter, students will use matter to develop understanding of the relationship between sound and vibrating materials as well as between the availability of light and ability to see objects. Using matter, students will investigate and ask questions about vibrations and illuminations. Sound energy is energy that can be heard, but only when matter is present to carry the vibration. Light energy is energy that can be seen and used to see the matter around us. It can be manmade or natural, like the light from the sun.

1st Grade Science Curriculum Term 3 (1/30-4/9/18)

Topic: Space Systems: Patterns and Cycles



Duration: 9 Weeks

Performance Objectives

SWBAT:

- explain how the parts of the solar system move individually **IOT** understand how the system works as a whole.
- describe what gravity is **IOT** explain the effects of gravity upon objects within our solar system.
- use observations of stars, moon, and sun in the day and night sky **IOT** describe patterns that can be predicted.
- use observations **IOT** compare the motion of the sun earth, and moon as it relates to time.
- use what they know about matter **IOT** describe what a given planet is made of and describe its composition.
- identify the order of the planets in the solar system **IOT** describe how proximity to the sun affects the planet's temperature (in most cases).
- describe why the moon appears to look different each night **IOT** explain moon phases.
- identify space patterns **IOT** explain the reasons for the seasons.
- describe what shadows are **IOT** hypothesize why most stars can be seen at night but not during the day.
- demonstrate an understanding of scientific reasoning, logic, and the nature of science **IOT** plan and conduct investigations in which data is collected, recorded, and analyzed.

Key Terms and Definitions

seasons- One of the four periods of the year (winter, spring, summer, fall)

sun- The earth's closest star and main source of natural light

moon- The earth's natural satellite

star- A bright ball of burning gas that is held together by gravity

observe-The act of seeing or taking notice of something carefully

describe- To write or tell about something observed using the senses
predict- To tell what you think is going to happen
changes- When something becomes different
system- A group of related parts that move or work together
motion- An act or process of changing place or position
Earth- The third planet from the sun that can support life
sunrise- The time when the sun appears above the horizon in the morning
sunset- The time when the sun appears below the horizon in the evening
sky- The space over the earth where the sun, moon, stars, and clouds appear
binoculars- A handheld optical instrument composed of two telescopes and a focusing device and usually having prisms to increase magnifying ability
telescope- A usually tubular optical instrument for viewing distant objects by means of the refraction of light rays through a lens or the reflection of light rays by a concave mirror
tools- A device used to accomplish a task
patterns- A collection of things occurring over and over with consistency
phases- The particular appearance of the moon at a given time
planet- One of the eight large objects revolving around the sun (Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune)
rotate- To turn around on an axis
orbit- To move or travel around something in a path
gravity- The force that pulls things to earth
hibernation- When an animal spends the winter months sleeping or resting
migration- When some animals move to another location for food, warmth, or breeding

Essential Questions

What is the universe, and what is earth's place in it?
How can one explain the structure, properties, and interactions of matter?
How can one explain and predict interactions between objects within systems?
What is the order of the planets beginning with the planet closest to the sun?
How does a planet's distance from the sun affect the temperature on the planet in most cases?
How do the parts of the solar system work together as a whole?
Why does the moon appear differently each night in the sky over a period of time?
How are we able to see the moon in the sky if it does not produce its own light?
What are the four seasons?
When do the seasons take place?
What causes the seasons to change?
What happens to some trees when the seasons change?
What patterns do you notice with the weather throughout the year?
What can you predict the weather will be like in each season and why?
Why are we able to see stars at night but not during the day?
How do the seasons affect living things and their surroundings?
How do some animals respond to the winter weather?

Starting Points

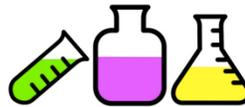
In Kindergarten, students will have used their senses and science tools to investigate the weather like a meteorologist. They will have gained experience thinking like a scientist about the world around them. They will have learned how to observe the weather, collect, and analyze data. Through those investigations, students will have a foundation of weather concepts such as temperature, precipitation, and various weather conditions. In the first quarter of first grade, students developed an understanding of solids, liquids, and gases; three types of matter. They also learned about the relationship between sound and vibrating materials as well as the relationship between the availability of light and ability to see objects. They learned that light energy is energy that can be seen and used to see the matter around us and that it can be manmade or natural. Students will be taking a deeper look into the sun, moon, planets, and other space patterns that affect the weather and seasons in this quarter. They will explore the reason for the different seasons, identify recurring cycles in space, and predict patterns based on what they observe. They will use their prior knowledge about light from the sun and apply it to new concepts regarding the change of seasons. They will also determine how the change in seasons affects living things, including humans. This information regarding light, space patterns, and matter will build their schema, or background knowledge, to prepare them to learn more about living things in the next unit.

1st Grade Science Curriculum Term 4 (4/10-6/15/18)

Topic: Living Things: Structures, Functions and Classification

Duration: 9-10 Weeks

Performance Objectives



SWBAT:

- utilize a scientific notebook **IOT** record predictions, questions, observations about data with pictures, numbers, or in words.
- use simple equipment and tools **IOT** gather data and extend their senses.
- observe animal behavior **IOT** explain why some animals migrate or hibernate in winter months.
- identify specific traits of an animal **IOT** explain how that trait helps it survive in its environment.
- examine the parts of living things **IOT** explain what their function is.
- identify an organism's external parts **IOT** explain how the organism uses these parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water, and air.
- identify the five animal classification groups **IOT** compare and contrast similarities and differences between each.
- use their observational skills to describe similarities and differences in the appearance of animals **IOT** classify different groups of animals. (Examples: size, shape, body coverings)
- distinguish between invertebrates and vertebrates **IOT** sort animals into two groups.

- observe various animal's body coverings **IOT** explain how each one helps the animal in its environment.
- observe various animals **IOT** identify and label major structures of animals such as arms, wings, legs, beaks, and claws.
- research a specific animal's adaptations and special features **IOT** be an expert on the animal and present the information to the rest of the class.
- identify the parts of a plant **IOT** explain how they help them survive and grow.
- identify the parts of a plant **IOT** draw, label, and describe these parts and their functions on a diagram.
- grow plants from seeds **IOT** describe the parts of a plant and their functions and compare them to other adult plants.
- use various materials **IOT** design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

Key Terms and Definitions

environment- A place where plants and animals live that has food, water, and air

habitat- The environment where an animal lives

hibernation- When an animal spends the winter months sleeping or resting

migration-When some animals move to another location for food, warmth, or breeding

adaptation- A special skill, behavior, or physical change which helps an animal to survive in its environment (Example: Meerkats have dark circles under their eyes so that they can see even in the bright sun.)

features- Special (unique) body parts that animal has that it uses to live (Example: An elephant has a large trunk that it uses like an arm or hand to pick things up

hooves- The hard parts of the feet of some animals (Example: A sheep has hooves to climb rocks.)

claws- The sharp, curved nails of some animals that they use to climb or catch their prey

camouflage- The ability for some animals to "hide" or blend in with an environment with their matching color

blubber- The thick layer of fat between the skin and muscles of some marine animals that help to keep them warm

structure- A part of an animal or plant

function- The special purpose of a specific part/ structure of an animal or plant

needs- Something that an animals must have in order to survive. (Example: food, water, shelter, etc.)

respond- How an animal acts when something happens.

mammals- Animals that are warm-blooded, give birth to live young, and have fur or hair (ex. giraffe, dog, whale)

reptiles- Animals that are cold-blooded; lay eggs on land (ex. snake, turtle, lizard)

amphibians- Animals that are cold-blooded; lay eggs in water (ex. frogs, toads)

fish- Animals with scales or bony plates, fins, and live in water (ex. sharks, clownfish)

birds- Animals with feathers, wings, bill, two legs, and lay eggs (ex. penguins, ostriches)

insects- An organism with three body parts, 2 antennae, and 6 legs

roots- The part of the plant that holds the plant in the ground and act as a sponge to soak up water and nutrients in the soil

stem- The part of the plant that holds the plant up straight and acts like a straw to carry the nutrients to other parts

leaves- The parts of the plant that absorb sunlight and use it to make food (photosynthesis)

flower-The part of the plant part that produces seeds

photosynthesis- The process by which plants turn the energy from sunlight into sugar (chemical energy) which they later use for food

Essential Questions

What affects do seasonal changes have on plants and animals?

What adaptations do some animals have to survive in their environment?

What are some similarities and differences between two given animal classification groups?

Compare and Contrast

What is the relationship between two given animal classification groups (i.e., birds and fish)?

What can you infer about a specific animal's eating habits by observing its teeth?

What can you infer about the way a specific animal moves by observing its body parts?

How do animals rely on their senses to survive?

How do its parts help a plant meet its needs?

How do humans adapt to cold weather compared with how some animals adapt?

What is an example of an animal's special feature and how does it help it survive?

Why do you think (a specific animal) has (a specific feature)? How does it help it to adapt to the environment?

Starting Points

In Kindergarten, students learned how to think and observe like a scientist using their five senses to make observations about living and nonliving things in order to compare and contrast similarities and differences. They began learning about how animals' features and adaptations help them survive in their environment. In the previous quarter, students were exposed to information about space systems and how these systems affect the weather and seasons. At the end of last quarter, students investigated why some animals hibernate and some migrate in the winter months. In this quarter, students will use the skills and information they learned in previous quarters to better understand living things, their structures, functions, and how they use the parts of their body to survive in their environment. Students will make observations and inferences about what animals eat by looking at their teeth and about how they move, communicate, and protect themselves by looking at their body parts. They will learn how to classify animals based on their physical characteristics and sort them into groups (mammals, fish, reptiles, birds, amphibians, and insects). They will also learn about the parts of plants and how each part plays an important role in the survival and growth of the plant. Focusing on an animal's structure, communication, and behavior will be an important foundation for future investigations about living things and their habitats, specifically in second grade.