The Early Science Framework

Core Ideas

Life Science

1. Molecules To Organisms (Living things are made up of smaller parts *that serve different purposes*)
    A. All *living things* (organisms) have external body parts and they are used in different ways.
        i. Children can observe and classify external parts of various living things
            a) Ears help things hear while eyes help things see
            b) Shells protect turtles from predators
    B. Animals have body parts that each serve a purpose helping animals to grow and survive
        i. Children can learn and identify form and function of different body parts that help animals survive
            a) The webbed feet of ducks helps them swim faster
            b) Ears amplify sounds, which alerts animals of where predators are
            c) Fur helps regulate body temperature so animals don't get too cold in the winter
    C. Plants have different parts that help them survive, grow and produce more plants
        i. Children can identify the form and function different parts of plants
            a) Roots help trees absorb/take in water
            b) Seeds help plants produce more plants
            c) Leaves absorb the sunlight and turn towards the sun to get enough sunlight to survive
    D. Living things grow and change in a predictable/linear way
        i. Children can observe and predict the way livings things will grow over time
            a) Babies learn to crawl before they learn how to walk
            b) Caterpillars must cocoon before they become a butterfly
    E. Adult living things (plants and animals) can reproduce and some of these living things act in certain ways to protect their young
        i. Children can learn how living things produce young and the behaviors adults use to protect their young
            a) Seeds that come from fruit trees can be planted to grow new plants

        b) Dogs stay very close to their newborn puppies to protect them and give them milk
        c) Moms and dads put kids in car seats when they drive to keep them safe if there is an accident
    F. All living things (plants and animals) need food to live and grow and there are different ways that living things get their food
        i. Children can learn how and what plants and animals need in order to survive
            a) Plants need both water and light to live and grow
            b) Bunnies need to eat plants and drink water in order to live and grow
2. Ecosystems (Living things interact/use their environment to survive)
    A. Animals use their surroundings to find food, water, and shelter in a favorable temperature
        i. Children can learn about the different environments animals need to live in
            a) Animals eat plants that grow in their surroundings or other animals that live in their environment
            b) Birds use twigs from their surroundings to build nests
            c) Raccoons drink water from lakes, rivers, or ponds that they find in their environment
    B. Many materials living things us to survive are later used again by other living things
        i. Children can learn about different materials that are recycled in the animal kingdom.
            a) Hermit crabs find shells to live inside which are originally made by mollusk (e.g. clams, mussels, snails, slugs)
            b) Birds use feathers and fur of other animals to make their nests soft and warm for their babies
            c) Fish use sunken ships as shelter and protection from open water predators
    C. Animals use their senses to find food and water and they use their body parts to gather, catch, and eat their food.
        i. Children can identify what senses animals would need to find food/water and what body parts animals need to eat the food
            a) Squirrels use their sense of smell to find nuts. Then, they use their mouth to gather acorns, take them back to their nest, and store them in trees or bury them in the ground to provide food through the winter

b) Hawks using their amazing eyesight to spot prey from high up in the sky
c) Bats find their food in the dark through echolocation which allows them to hear the echo of a noise they make and it helps them detect what insects are ahead of them and which way they are flying

D. Plants depend on air, water, minerals (in the soil), and light to grow
    i. Children can learn how plants use all of these things to help them grow
        a) Flowers use sunlight and minerals in the soil as food to help them grow, air to and water to

E. Some living things can move around while others cannot
    i. Children can identify what living things have the ability to move
        a) Birds can fly, dogs can walk, caterpillars can crawl, but flowers and trees can't change their location

F. Plants depend on other living things for pollination or to move their seeds around and survive better in various locations due to different needs of water, minerals, and sunlight
    i. Children can observe and predict how different living things contribute to pollination and what kinds of plants need to live in certain environments
        a) Hummingbirds and bees are good pollinators for flowers because their foreheads rub up against the flower as they collect nectar (which they use for food) and as they move from flower to flower they transfer the pollen
        b) Dandelions start off as a yellow flower and then turns into white fluffy seeds that get blown away in the wind to grow other dandelions
        c) Cacti live well in dry desert climates because they absorb water in the moist seasons and store it to use during droughts. They use sunlight to grow and have a prickly outer skin so predators don't like to eat it.

G. The places where plants and animals live often changes, sometimes this occurs rapidly and other times it occurs over time
    i. Children can learn about cyclical seasonal changes, natural disasters, and other long term slow changes to the environment
        a) Ponds and rivers freeze over in the winter and have running water in the summer
        b) Beavers can dame up the rivers and cause lakes to form over long periods of time
        c) Natural disasters like forest fires, earthquakes, and volcanos can rapidly change the landscape of an environment

H. If living things cannot maintain a favorable temperature or find enough food, water, or air they may die
    i. Children can learn about the amount of materials things need to stay alive
        a) Plants cannot survive if it is too hot or too cold
        b) Bears hibernate during the winter to conserve energy because there isn't enough food around to survive
        c) Birds migrate south to warmer weather during the winter because they cannot survive in the cold weather

I. Living things sometimes live in groups that help them obtain food, defend themselves, and cope with changes. These groups can vary in size.
    i. Children can learn about the various functions of groups
        a) Fish travel in large groups so they look like a larger fish to predators and they have a better chance at survival if they aren't the only target
        b) Wolves hunt in packs which allows them to take down larger prey
        c) Penguins huddle together to keep warm during the winter in Antartica

3. Heredity and Traits (Living things have features that are similar or slightly different from each other)
    A. Individuals of the same kind of plant or animal are recognizable as similar but can vary in many ways (Living things have characteristics that can be similar or different)
        i. Children can observe and classify characteristics
            a) Babies inherit eye, hair, and skin color from their parents
            b) Small dogs and large dogs look very different but are still dogs because they have similar traits (e.g. four legs, fur, etc.)
    B. Young living things look a lot like their parents and living things of the same species but not exactly the same
        i. Children can identify similarities and differences in young living things vs older living things
            a) Baby chicks are more fluffy than adult chickens but have beaks, talons, and a body structure similar to their parents
            b) Saplings are much smaller than a full-grown tree and are usually different colors but they still have roots, leaves, a trunk etc.
4. Biological Evolution
    A. Some plants and animals that used to live on Earth no longer do but other living things resemble them
        i. Children can learn what living things no longer live on earth/are extinct and can identify what current living things look like them
            a) Lizards resemble certain types of dinosaurs

b) Elephants resemble wooly mammoths

B. Living things can only survive when there is enough food, water, and reasonable temperature/shelter for them to thrive
    i. Children can learn the conditions for survival for different plants and other living things.
        a) Plants can only survive under certain conditions and those conditions can be varied and highlighted with experiments (temperature, access to water and sunlight, size of pot or container they sit in)
        b) Class pets like lizards, bugs, or fish can highlight the conditions needed for survival of these animals

Physical Science

1. Matter and its Interactions (What things are made of and how they affect each other).
    A. Materials have different defining properties (attributes)
        i. Children can observe visible and tactile properties of materials
            a. E.g. Materials can be hard, soft, smooth, rough, heavy, light
    B. Materials can be described and classified by their properties.
        i. Children can use their senses to describe and classify (Looking, smelling, touching, tasting, hearing)
            a. E.g. Identifying salt from sugar by tasting it
            b. E.g. Identify smooth vs rough rocks by touching them
        ii. Children can extend their senses by using observational tools
            a. E.g. Use a magnifying glass to examine the details of a leaf
            b. E.g. Use a telescope to look at the moon
    C. Materials can be weighed, and their size can be described and measured.
        i. Children can use measurement tools to draw conclusions about materials
            a. E.g. Use a balance scale to determine if one rock is heavier than another
            b. E.g. Use a ruler to measure if one plant is taller than another
    D. Materials can exist in different states (e.g. solid, liquid, gas)
        i. Children can observe the characteristics of materials in different states
            a. E.g. A toy block is a solid
            b. E.g. Milk is a liquid
            c. E.g. Steam is a gas (so is fog)
    E. The states of materials can change depending on temperature
        i. Children can manipulate the state of a material through temperature
            a. E.g. Water is a liquid at room temperature
            b. E.g. Water is a solid when frozen

c. E.g. Water is a gas when very hot

F. Heating or cooling a substance may cause changes that can be observed and these changes can be reversible but sometimes they are not

i. Children can cause changes to a material and attempt to reverse it

a. Freezing water and melting an ice cube (reversible).

b. Baking a cake, making popcorn or burning wood (irreversible).

G. The states, properties, and reactions of materials can be described and predicted

i. Children can describe, predict and draw conclusion about different materials (i.e. mixing of materials, predicting behaviors of materials)

a. Adding soap to water makes foamy bubbles

b. Certain objects sink and others float

c. A plant that receives water and sunlight will grow while one that doesn't will not

H. Some materials are natural and others are man made

i. Children can observe and describe the characteristic of man-made vs. natural materials

a. A tree is natural while a wooden chair is man-made

b. A blue berry is natural while a fruit roll up man-made

I. Different materials are suited for different purposes

i. Children can attempt to use different materials for different jobs and see what works best

a. Plastic is used to make umbrellas because it repels water and is light weight

b. Metal is used to make spoons because it is hard, washable and long lasting

c. Wood is used to burn for fire because it burns slowly and makes a bright and hot flame

J. A great variety of objects can be built up from a small set of pieces

i. Children can build large structures from small pieces, as well as, take large things apart and examine its smaller pieces

a. Build/take apart blocks towers

b. Put together/take apart puzzles

c. Take apart simple toys (i.e. wind-up toys, simple machines) to examine how they work

2. Motion and Stability (How things move or stay where they are)

A. Objects/materials pull or push each other when they collide or are connected.

i. Children can apply forces to different objects/materials and observe how they react

a. A wagon can be pulled by a rope that is tied to it
b. A mom pushes their baby in a stroller

B. Pushes and pulls can have different strengths and directions.
   i. Children can apply different kinds of forces (i.e. strong, weak, down, up ect.) to objects/materials and observe the reaction
      a. A teacher can push a child hard on the swing for them to go high and soft for them to stay low.
      b. A teacher can make a sling shot from large elastic resistance bands and launch objects (rolled up socks and other soft materials) in different directions at different speeds

C. Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it.
   i. Children can manipulate the motion of objects/materials
      a. If pushed a ball will roll until it hits a wall or other object, which will cause it to stop or change direction.
      b. If a wagon is rolling down a hill and you pull it, it will either stop or come back up the hill depending on the strength of the pull

D. Gravity exerts a pulling force on all objects close to it.
   i. Children can observe the effects of gravity on different objects/materials
      a. If you drop something it falls to the ground and not up in the air
      b. When you jump you come back down to the ground
      c. If you throw something up in the air it comes back down

E. Certain objects have a magnetic force and attract certain materials and not others.
   i. Children can observe magnetic forces by putting magnets close to different objects/materials
      a. A magnet will attract paper clips and other metal objects/materials
      b. A magnet will not attract paper or other non-metal objects/materials

F. An object moves depending on the effects of multiple pushes and pulls.
   i. Children can apply multiple forces to objects/materials and observe the reaction
      a. In a game of tug of war if both teams pull equally they will stay still but if one time pulls harder the rope will be pulled in their direction

b. If a marble is rolling down a ramp and it collides with a solid object (i.e. a marker or a glue stick) it will continue to roll but in a different direction

3. Energy (what powers our world!)
    A. Motion, light and sound are all forms of energy and they can be transferred in different ways.
        i. Children can observe different forms of energy with their senses
            a. You can see the light of a flashlight
            b. You can hear the sound of a drum
            c. You can feel the motion of riding a tricycle
    B. Objects can change in shape or temperature by the transfer of energy
        i. Children can observe or create changes in materials by transferring energy
            a. Jumping up and down will make you warm when it is cold in the classroom
            b. Bread rises in the oven and changes shape
    C. Energy produces electricity, moving or heating objects, and creating light.
        i. Children can learn about alternative forms of energy and how they are created
            a. A windmill transfers the motion of the wind into electricity
            b. A solar panel transfers the light of the sun into electricity
    D. Naturally occurring food and fuel provide energy for most animal life.
        i. Children can learn about the different sources of food and fuel that humans and animals use
            a. Animals eat food for energy
            b. People burn wood and coal for heat
4. Waves and their Applications (Light and sound move through waves!)
    A. Waves are regular patterns of motion and can be made in water by moving across the surface and it moves up and down.
        i. Children can learn to create and identify waves in different forms
            a. Talk about waves at the beach
            b. Make own waves at the water table
    B. Sound can make things vibrate and vibrating things can make sound
        i. Children can observe and create the vibrations that make sound
            a. Touch a speaker while it is playing music and feel the vibration
            b. Hit a symbol with a stick and hear the sound and see it vibrate
    C. Objects can be seen only when light is available to illuminate them and very hot objects reflect light.
        i. Children can observe the effects of light and the relationships between heat and light

a. Turn of the lights in the classroom and notice that you can't see anything
b. Turn off a lamp and notice that you can still see the glow of the filament of the light bulb in the dark because it's still hot

D. Some materials block light and create shadow on a surface beyond them.
i. Children can explore light beams and blocking them to observe the effects
a. Making shadow puppets on the wall with a flashlight
b. Observing shadows of children outside and how they change when children move their bodies

E. Mirrors and prisms can be used to redirect a light beam.
i. Children can redirect light with different materials and observe the effects
a. Redirect light with a magnifying glass and follow the light beam
b. Redirect light with a mirror and follow the light beam
c. Shine a light into a prism and observe the colors of the rainbow

F. People use their senses to learn about the world around them.
i. Children can use their senses to observe and draw conclusions about their world
a. Eyes detect light
b. Ears detect sound
c. Tongue detects taste
d. Nose detects smells
e. Touch detects vibrations and textures

G. People use a variety of devices to communicate information over long distances.
i. Children can explore different devices for communication and draw conclusions about why we use these devices
a. Using two cans connected by a tight string to talk from far away
b. Using a bull horn or megaphone to amplify sounds
c. Talking about the use of flares or light messages (SOS for emergency) for people to communicate distress

Earth and Space Science

1. Earth's place in the universe (Patterns and cycles of the sun, moon, stars and earth)
A. The sun, moon, and stars move in predictable patterns.
i. Children can observe, describe, and predict the patterns of the sun, moon, and stars

a. The sun is visible during the day and not at night
b. The moon is visible at night and not during the day
c. The stars are visible at night and not during the day

B. Observational tools (i.e. telescopes) make it possible to see many more stars and planets and observe them and the moon in greater detail.
    i. Children can observe stars planets and the moon in greater detail using a telescope
        a. Class trip to the planetarium or other place that has a telescope
        b. Getting images from the internet of stars planets and the moon as seen through a telescope

C. The pattern of sunrise and sunset changes depending on the season
    i. Children can observe, record, describe, and predict the seasonal patterns of sunrise and sunset
        a. The sun rises later and sets earlier during the winter season resulting in less hours of daylight
        b. The sun rises earlier and sets later during the summer season resulting in more hours of daylight
        c. Record the time of sunrise and sunset during different seasons and calculate the hours of daylight and compare them

D. Certain events on Earth occur in cycles and others have a beginning and an end.
    i. Children can observe that some events happen repeatedly and others do not
        a. Events like day and night, the tide coming in and out, and the waxing and waning moon happen in cycles
        b. Events like volcanic eruptions, mud slides, and tornados have an beginning and an end

E. Certain events on Earth happen very quickly and others happen over a long period of time (too long for someone to observe).
    i. Children can observe events that happen quickly and learn about events that happen too slowly to be observed
        a. Events like an earth quake or a flash of lightning happen quickly
        b. Events like the growth of a large tree or the formation of the grand canyon happen too slowly to be observed

2. Earth's Systems (How things work on Earth)
    A. Wind and water can change the shape of the land.
        i. Children can observe different landscapes and learn how they are effected by wind and water.

        a. Rivers erode the land and rocks around them and leave canyons, valleys, and caves when they dry up
        b. Wind and small rocks break down large rock formations and mountains over time causing landslides and changing the landscape

B. Landforms, together with the materials on the land and water, provide homes for living things.
    i. Children can observe what types of places have more and less animal life and draw conclusions about why that might be
        a. Animals live in caves and places with many trees or large rocks because they provide shelter
        b. Animals live in places where there are rivers, streams, lakes and ponds because they provide fresh water to drink
        c. Less animals live in extreme climates (extremely hot like a dessert or extremely cold like Antarctica)

C. Maps show where things are located and one can map the shapes and kinds of land and water in any area.
    i. Children can use maps to explore their environment and create maps from what they observe
        a. Follow a map on a nature walk to arrive at a destination
        b. Create a map of the classroom and use it for a treasure hunt

D. Water is found in the ocean, rivers, lakes and ponds and each of them have defining characteristics.
    i. Children can identify and describe properties of different water formations and learn to differentiate them.
        a. Oceans are very large, have waves and salt water
        b. Rivers have flowing water (usually fresh water) and connect to a lake, sea or ocean
        c. Lakes are large bodies of water surrounded by land
        d. Ponds are small bodies of still water

E. Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather and to notice patterns over time.
    i. Children can observe and record the weather, draw conclusions about how the weather affects their lives, and identify patterns in weather over time (seasons).
        a. Recording the weather and temperature each day on a calendar
        b. Talking about activities you can and cannot do with certain weather (e.g. cannot go outside to play when it is raining; you

can only go skiing when there is snow; you can only fly a kite when it is windy)

c. Discuss patterns in weather (e.g. warmer in the summer; colder in the winter; more rain in the summer; snow only in the winter)
d. Discuss characteristics of seasons (e.g. flowers bloom in spring; leaves turn colors and fall in autumn)

3. Earth and Human Activity (How people and the world interact)
    A. People need water, air, and resources from the land, and they try to live in places that have things they need. Humans use natural resources for everything they do.
        i. Children can observe the things they use in their lives and where they come from and what they are made of (i.e. food and materials), as well as, discuss things that people in other places use to live.
            a. Search around the classroom and identifying what things are made of and which things are made of natural materials
            b. Fishermen live near the ocean where they can fish
            c. Farmers live in places with rich soil and plenty of water
            d. People use wood to make shelter and burn for heat
            e. Minerals like iron and copper come from the earth and are used to make pot and pans and silverware
    B. Some kinds of severe weather are more likely than others in a given region. Weather scientists forecast severe weather so that communities can prepare for and respond to these events.
        i. Children can learn about natural disasters and where they are more common and what communities do to prepare for them.
            a. Earth quakes are common in California, they cause the earth to shake and communities build special buildings that can withstand them
            b. Hurricanes are common in Florida, they are extremely fast and powerful winds and communities board up their windows and evacuate the area if they know a very strong one is coming
    C. Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impact on the land, water, air, and other living things.
        i. Children can observe trash and other human waste in their environment and learn how it affects the water, air, and animals around them. Children can also learn ways to reuse and recycle materials.

a. Observe litter in different places (the woods, the beach, a river, around the school)
b. Animals are affected by litter (i.e. they can eat it and get sick; they can get caught in it; they can be injured by it)
c. Exhaust from cars are factories pollutes the air
d. Human waste and chemicals get into the water and make it dirty (and in some countries undrinkable) (i.e. oil spills, sewage waste, litter and trash)
e. Observe ways people reduce waste (i.e. hand dryers instead of paper towels; reusable shopping bags instead of plastic ones; using washable plates and utensils instead of paper and plastic disposables)
f. Observe ways people recycle (i.e. putting paper and plastic goods into the recycle bin instead of the trash can; using recycled materials for class projects like plant a small plant in a plastic milk jug; start a compost pile and use it to fertilize the class garden)

Engineering and Technology

1. Engineering, Technology, Science and Society
    A. People encounter questions about the natural world every day. There are many types of tools produced by engineering that can be used in science to help answer these questions through observation or measurement.
        i. Children can learn how people have used engineering tools to observe and measure to answer questions.
            a. People use telescopes to learn more about the moon and the stars.
            b. People use sonar wave to measure how deep the ocean is (the time it takes for a sound wave to travel to the bottom and back)
    B. Observations and measurements are also used in engineering to help test and refine design ideas.
        i. Children can design their own ideas and use observational and measurement tools to refine and improve their designs.
            a. Build paper airplanes and observe which models work best and measure different aspects of it so you can build more
            b. Build small boats or rafts and observe which materials and designs are most effective for transporting small objects
    C. People depend on various technologies in their lives; human life would be very different without technology.

i. Children can observe and gather information on what technologies they use in their lives and think about how their lives would be different without those things.
    a. They ride a car or bus to get to school (without that technology they would have to walk and it would take much longer)
    b. The classroom has a heater and an air conditioner so they can have a controlled temperature (without that technology they would be very cold or very hot during class for much of the year)
    c. They have light bulbs and electricity in their school and home (without those it would be dark and they would have to light candles to see)

D. Every human-made product is designed by applying some knowledge of the natural world and is built by using materials derived from the natural world.
    i. Children can observe how man made things imitate nature in their design and are made of natural materials.
        a. The design of an airplane imitates the design of a bird (large wings, long thin body, small legs for landing) and airplanes are made from metals that come from the earth
        b. Fins for swimming imitate the webbed feet of different animals (like a seal or a frog) and are made out of rubber which comes from the earth

E. Developing and using technology has impacts on the natural world.
    i. Children can learn about the impacts of technology on the world and draw conclusion about the importance of being aware of these impacts.
        a. When the technology for fishing or hunting becomes too efficient you can endanger or eliminate a species of animals (American buffalo) or you can take away its food supply (overfishing can harm shark and dolphin populations)
        b. When the demand for wood and paper get too high we can cut down too many trees and leave animals without homes and damage our air because trees create the oxygen that we breath