

Age Specific Teaching for Life Sciences Lessons:

How Students in Each Grade Learn About the Natural World

Background

What do all of us have in common? A list of possibilities:

- 🌳 A love for the outdoors
- 🌳 The drive to get more kids outside
- 🌳 A strong desire to be in pretty, quiet places with lots of beautiful oak trees

But I can't help noticing that the list does not include "A background in teaching elementary school Science." Hopefully these documents will help us get up to speed or, at least, give us some inspiration. The first part is a detailed description of how elementary school Science teachers frame their lessons, why they do it that way, and the key terms that they use. I typed key terms in bold. The second part, the spreadsheet, is a quick reference of key terms broken down by grade level.

Here is my main discovery: science is taught to elementary school students in a formulaic, grade level-based approach. In other words, students learn a very specific set of information and key terms per grade level, and that knowledge builds on itself as they continue their education. This situation is partially due to an increase in standardized testing, and it is also due to the role a child's developmental stage plays in what they are capable of understanding.

Knowing what students are being taught in each grade will help us focus the content of our nature walks and frame it in terms that are pertinent to their classroom performance. Following these standards will also allow the students to see the 'real life' versions of things they learn about in Science class. To spur some ideas, I've written in little notes about possible ways to tie key words and concepts into KOP nature walks.

While doing research, I reviewed the California state standards for elementary Science classes developed by the California State Board of Education. The complete standards are available online (<http://www.cde.ca.gov/be/st/ss/documents/sciencestnd.pdf>). I can print them out for you if you do not have internet access. They are summarized on the spreadsheet.

Additionally, the Tulare County Office of Education (TCOE) let me look through the teachers' edition of grade level Science textbooks. The teachers' editions help the teachers engage the students with leading questions and activities. What's exceptionally helpful is that these editions are laden with teaching strategies based on the students' stage of development or, presumably, their grade level. If you would also like to look through their resources, let me know. I heavily reference the Macmillan/McGraw-Hill 2008 Teachers Edition textbooks for grades 1 – 3 in these documents.

Grade 1

Grade 1 Life Science classes focus on:

- 🌱 Observing plants
- 🌱 Comparing plants
- 🌱 Observing habitats
- 🌱 Observing interdependencies between plants and animals
- 🌱 Identifying what animals need to survive
- 🌱 Explaining and describing how different animals get what they need

Summary: Students in grade one are ready to focus on the favorable habitats (usually including air and soil), water, and energy supply (sunlight or food) that living organisms need to survive. Students will discuss the relationship between structural form and function.

Section 1: Learning about Plants

Key Words: **plant, seeds, leaves, roots, energy, habitat, flower, fruit**

Part A: What is a plant?

Applicable state standards:

- 1 LS 2.a.: Describe how plants are alike and different.
- 1 IE 4.b.: Explain how plants adapt to their habitat; record observations and data with pictures, numbers, or written statements.

Plant: “Just like you, plants are living things. Living things grow and change. **Seeds** from plants grow into new plants. The seeds will make a new plant that looks like the parent plant... Plants are living things that have **leaves**, are often **rooted** in the ground, and use **energy** from the Sun to make food.”

Questions for students about plants:

- What do all the plants you see have in common?
- How do you think animals use the plants?
- How are the plants different from one another?
- How are they the same?
- What is the shape of the **leaves**? How do they feel?
- How many **leaves** does each plant have?
- Do you see any **flowers** or **fruits** on the plants?
- How are the plants different from one another? How are they the same?
- Where do new plants come from?
 - o Possible Answer (PA): *New plants come from **seeds**.*
- How are plants like people?
 - o PA: *Plants and people both live, grow, change, and need food and water. Unlike people, plants can't move around, they have different parts than people, and they don't think or talk.*

KOP applications:

- have students observe and describe plants they see along the trail
- point out an oak leaf, then have them describe it (“lobes,” “rounded”, “brown”...)
- have students compare oak and sycamore leaves
- acorns
 - o point out that they are seeds
 - o ask students what seeds are
- have students point out and describe roots, leaves, seeds, flowers, and fruits they see

Part B: What do plants need?

Applicable state standards:

- I LS 2.b.: Students know both plants and animals need water, animals need food, and plants need light.
- I IE 4.e.: Make new observations when discrepancies exist between two descriptions of the same object or phenomenon.

Plant habitat: “Plants live almost everywhere on Earth. They have parts that help them live in different habitats. A **habitat** is a place where plants get what they need to live.”

Questions for students about plant habitats:

- What happens if a plant does not get water?
- What would happen if the plants got salty water?
- Do all plants need the same things to grow?
- What are four things plants need to live?
- Do some plants need a warm place to grow?
- Do some plants need a cool place to grow?
- Do some plants need a lot of water?
- Do some plants not need a lot of water?

KOP questions: you could keep asking them as you move around the preserve and qualities change

- Can you describe the habitat we are in right now?
 - o Is there a lot of light?
 - o How much water is there?
 - o Is it warm or cool?
- What are the plants like here? Are some tall? Are some short? Do some have **flowers**?
- Virgin’s bower habitat
 - o Shady
 - o Plenty of water
 - o Open space to extend their vines
- oak and sycamore habitat
 - o plenty of light—leaves grow up to get it
 - o lots of water from the river
- willow habitat
 - o lots of water from the river
 - o roots grow down to get water

- does virgin's bower need more or less light than valley oaks?

Part C: How do plants get energy?

Energy:

- "All living things need energy to live and grow. Energy gives plants and animals the power to do things. People eat food to get energy. Plants use sunlight to make the food they need."
- "Plants grow toward the Sun to help them make food. Some plants need a lot of sunlight to grow. Other plants can grow with only a little sunlight."
- "Energy gives plants the power to do things."

Questions for students:

- How do plants use sunlight?
 - o PA: *Plants need sunlight to make food and grow.*
- How do plants get **energy** in a different way than you do?
 - o PA: *Plants get their energy from sunlight.*
- What do plants' **habitats** tell you about the amount of sunlight they need?
- How do you get the **energy** to live and grow?
- Do **leaves** need sunlight to stay green?

KOP applications:

- Do oaks need energy to grow?
- Where do oaks get their energy?
- Why do oaks grow so tall?

Part D: What do different plant parts do?

Teaching strategy: Compare the parts between different species, such as the length of the roots or the size of the leaves

plant parts: "Different plant parts help a plant get what it needs to live. A plant uses its **leaves** to make food. Water and food pass through the **stem** of a plant. The **roots** hold a plant in the soil. They also take in **nutrients** from the soil. Nutrients help the plant grow. A plant's fruits have **seeds**. New plants can grow from these seeds."

leaves: use sunlight and air to make food

fruit: some flowers grow into fruit

Teaching strategy: Compare the parts between different species, such as the length of the roots or the size of the leaves

Questions about plant parts and energy:

- What parts do plants have?
 - o A: *Leaves, stems, roots, flowers, fruit, seeds*
- What do these parts do for the plant?
- Why do plants make **flowers**?

- What words would you use to describe **roots** [pointing out real roots]?
- Why does grass need **roots**?
- Will the **roots** keep growing once the plant is big?
- How are the plant parts of one species like or different than another species?

Section 2: Animals and their needs

Key words: **mammals, birds, reptiles, insects, shelter, gills, fins, herbivore, carnivore, teeth**

Part A: Types of animals

Applicable state standards:

- I LS 2.: Students learn...
 - o Plants and animals meet their needs in different ways.
- I LS 2.a.: Students...
 - o Sort and classify animals into groups
 - o Are introduced to vocabulary related to grouping animals
 - o Identify the characteristics of different animal groups
 - o Compare and contrast animals from different groups
- I LS 2.b.: Students...
 - o Observe and describe how they use their teeth to eat food
 - o Are introduced to vocab for describing animal diets
 - o Identify examples of herbivores and carnivores
 - o Compare and contrast tooth shape with what an animal eats
 - o Infer what an animal eats by the shape of its teeth

Animal: There are many different kinds of animals. They come in all shapes and sizes. Animals have different body coverings to help them live in their habitats.

Reptile: Reptiles are a group of animals that have dry skin covered with scales. Snakes, lizards, and alligators are all reptiles. Reptiles lay eggs. Most reptiles do not take care of their young.

Insect: Insects are animals that have three body parts and six legs. Ants and butterflies are both insects. Spiders are not insects. They have eight legs.

Mammal: Mammals are a group of animals with hair and fur. They take care of their young.

Bird: Birds are a group of animals that have feathers and take care of their young.

Questions for students:

- What is an animal?
- How are animals different from one another?
- How are different types of animals able to live in different types of places?
- What are some types of animals?
- Can you name some mammals and birds?
- What animals do you see?
- What do you notice about their skin coverings?
- What are some animals that are not mammals or birds?

- What are reptiles and insects?

KOP applications:

- Point out a bird
 - o What type of animal is that?
 - o How do you know it's a bird? *Feathers.*
- Point out a squirrel/other mammal
 - o What type of animal is that?
 - o Is it a mammal?
 - o How do you know? *Fur.*

Part B: What animals need to live

Shelter:

- a place where animals can live and be safe

Herbivore:

- an animal that eats only plants

Carnivore:

- an animal that only eats other animals

Teeth:

- Animals use their teeth to get the food they need.
- Animals that eat meat have sharp, pointed teeth.
- Animals that eat plants have large, flat teeth.
- People have both kinds of teeth which helps them eat both meat and plants.

Questions for students:

- Do all animals need the same things to live?
 - o *A: Animals are living things. They need food, water, and air. Animals live in different kinds of places. Some animals use trees or other plants for shelter. A shelter is a place where an animal can be safe.*
- How do animals get the things they need?
- How do animals move from place to place to get what they need?
- What kinds of places do other animals use for shelter?
- How do animals use their body parts to get what they need to live?
- How do animals use their **teeth**?
 - o *A: Animals use their teeth to get the food they need. Animals that eat meat have sharp, pointed teeth. These animals are carnivores. Animals that eat plants have large, flat teeth. These are herbivores. People have both kinds of teeth which helps them eat both meat and plants.*

KOP applications:

- the vine cave: have kids hide in it with you
 - o tell them to imagine they're a rabbit
 - o Could you use this shelter to hide?
 - o Who would you hide from?
- Point out that rabbits are herbivores because they eat plants

- Point out that hawks are carnivores because they eat rabbits and mice
 - o How can you tell a hawk is a carnivore? *Its beak is sharp.*

Part C: Animals live in different types of places

Adaptation:

- a special feature that helps an animal stay alive in its habitat

Forest:

- a place with lots of trees
- forest plants and animals have adaptations that help them get what they need.

KOP applications:

- At the meadow: What kind of habitat is this?
 - o *A field.*
- What adaptations do animals have in this field?
 - o *PA: Meadow larks fly to catch insects.*
 - o *Ground squirrels dig holes in the ground for shelter. The shelter lets them escape hawks and have a cool place to rest.*
 - o *Lizards are fast to escape hawks and other predators. They blend in with the grass and wood.*
- Under the trees: What kind of habitat is this?
 - o *A forest.*
- What adaptations do animals have in this forested habitat?
 - o *PA: Squirrels and birds blend in so hawks can't see them and eat them.*
 - o *Trees are tall to get the light.*
 - o *Undergrowth is able to survive in the forest shade.*
 - o *Hawks have keen eyesight to see prey*
- What is the KOP habitat like?
 - o **Forested sections:**
 - *Shady with canopy and undergrowth habitat*
 - *Canopy has light and places to roost and make nests.*
 - *The undergrowth has leaves and plants to eat. It also has places to hide.*
 - *The river brings water for animals and plants to drink.*
 - o **Meadow section:**
 - *Lots of sun.*
 - *Lots of grass.*
 - *Loose soil for burrowing.*
 - *Salty soil.*
- What types of animals do you think live on KOP?
 - o *PA: squirrels, hawks, coyotes, pocket gophers, insects, lizards...*

Part D: Plant and animal interdependencies

Pollen:

- a powder inside a flower that makes seeds
- animals, like bees, help carry pollen from flower to flower

Food chain:

- shows how energy passes through living things
- energy passes from the Sun to plants to herbivores to carnivores.

Questions for students:

- How do animals help plants grow?
- Can you think of plants that provide shelter for animals?
- What parts of animals help them catch other animals?

KOP applications:

- Examples of food chains on KOP:
 - o Field: *light* → *grass* → *rabbit* → *hawk*
 - o Forest: *light* → *elderberry* → *beetle*
 - o Forest: *light* → *leaves* → *rabbit* → *hawk*
 - o Forest: *light* → *plant with flowers* → *butterfly* → *frog* → *bird* → *hawk*
- Questions about food chains:
 - o What needs light to grow?
 - *Grass, trees, shrubs, plants*
 - o What needs rabbits to eat?
 - *Grass*
 - o What would happen if there were no rabbits?
 - *There would not be food for the hawks.*
 - o What would happen if there were no hawks?
 - *There would be too many rabbits.*
 - What would happen to the grass?
 - *It would get eaten up by too many rabbits.*

Grade 2

Grade Level 2 Life Science classes focus on:

- 🌱 Plants and animals have life cycles that are typical of their species
- 🌱 Students develop simple notions of inherited characteristics, variations within a species, and environmentally induced changes
- 🌱 These concepts form a foundation for understanding the concepts of genetics, evolution, and ecology in later grade levels

Section I: Plant life cycles

Part A: Plants and their parts

Objectives:

- Explain what a plant is
- Describe the parts of a plant

Applicable state standard:

- 2 LS 2.f.: Students know flowers and fruits are associated with reproduction in plants

How lessons meet the standard:

- students observe and compare parts of plants
- students describe the structure and function of the parts of plants
- students understand that plant parts look different to help the plants live in their environment
- students identify the parts of plants that are useful as food to people

Leaves:

- take in sunlight and air to make food

Stem:

- holds up the plant
- moves water and food

Roots:

- get water and minerals
- hold plant in ground
- store food

Flowers:

- make seeds
- come in different colors, shapes, sizes

Pollen:

- powder inside flower
- plants use pollen to make new plants

Fruit:

- comes from a flower
- seeds grow inside fruit

- fruit keeps seeds safe and helps them grow

Seed:

- can grow into a new plant
- grown inside a fruit

KOP applications:

- What does an oak leaf do?
- Why are the oak trees so tall?
- Why is the Himalaya blackberry so spiny?
- What does the tree's trunk do?
- What do the white roots' roots do for the plant?
- Point out a sapling: How did this sapling get here?
 - o *Pollen made the mother oak tree make a seed. The seed dropped into the good soil and got the water, sun, air and space it needs. The seed grew into this baby tree, a sapling.*

Part B: Flowers and fruits

Objectives:

- Explain how flowers make seeds
- Describe what seeds are like and how they move

Applicable state standard:

- 2 LS 2.f.: Students know flowers and fruits are associated with reproduction in plants

How lessons meet the standard:

- students carefully observe seeds
- students describe how flowers make seeds
- students observe and compare different kinds of seeds
- students describe ways animals help plants reproduce
- students identify what seeds need to grow

Flower:

- has parts that help it grow into fruits with seeds that make new plants
- loses its petals after pollen lands on its pistil and it begins to grow into a fruit

Stamen:

- part of the flower that makes pollen

Pollen:

- a sticky powder
- moved to different flowers by animals, wind, and water
- moved between stamen and pistil by animals (birds and bees), wind, or water

Pistil:

- takes in the pollen and makes seeds

Seeds:

- can grow into new plants
- need light, water, and food to grow

- have food inside them to help them grow
- seeds come in different shapes and sizes
- seeds have many parts

Seed coats:

- all seeds have them; they protect the seed and keep it from drying out

Questions for students:

- How do **flowers** make **seeds**?
 - o *A: Flowers have special parts so they can make new plants. The **stamen** of the flower makes **pollen**, a sticky powder. The **pistil** takes in the pollen and makes seeds. The seeds can grow into new plants.*
 - o *A: Animals such as birds and bees can move pollen from a stamen to a pistil. Wind and water can move pollen, too. After pollen lands on a pistil, the flower starts to lose its petals. The flower begins to grow into fruit with seeds.*
- Do you see any **seeds** on the preserve?
- What do **seeds** look like?
 - o *A: There are many different shapes and sizes of seeds.*
- What needs to happen for **seeds** to start growing?
 - o *A: Seeds need light, water, and food to grow. Seeds have food inside them to help them grow.*
- Do you see any **flowers**? What do the flowers look like?
- Do **seeds** have different parts?
 - o *A: Seeds have many parts. All seeds have seed coats which protect the seed. Seed coats also help keep the seeds from drying out. Some seeds also have hard shells.*
- How do you think **seeds** move?
 - o *A: If seeds did not move, plants would always grow in the same spot. Animals help move seeds to new places. Many animals eat fruit and later they leave the seeds in the fruit behind. Some animals, like squirrels, bury seeds and may not return to get them. Some seeds stick to the fur of animals. The seeds get a ride to a new place. Oceans and rivers can move seeds, too. Seeds fall into the water and they end up in new places. Wind can also move seeds. Some seeds are light enough for the wind to carry them far away.*

Part C: Plants grow and change

Objective: Identify the stages of a plant's life cycle

Applicable state standard:

- 2 LS 2.a.: students know that organisms reproduce offspring of their own kind and that the offspring resemble their parents and one another

How lessons meet the standard:

- students observe and compare seeds, seedlings, and adult plants
- students understand that seedlings have many traits of their parent plants
- students describe the stages in the life cycles of plants
- students conduct experiments to compare plant traits

Traits:

- the way plants and animals look and act
- young plants will have many of the same traits as parent plants
- they will have the same shape of flowers, petals, and leaves
- some plants might look a little different than their parent plants

Life cycle:

- shows how a living thing grows, changes, and make new living things
- is different for different types of plants and animals

KOP applications:

- What are some of the oak trees' traits?
 - o PA: leaf shape, color, bark pattern
- How will an acorn look when it grows up?
 - o A: *The acorn will grow to look like the oak trees.*
- What is a life cycle?
 - o A: *A life cycle shows how a living thing grows, changes, and makes new living things. The plant life cycle begins with a seed. It continues as plants make new plants.*
 - o A: *All plants follow the same life cycles as their parent plants. Different plants have different life cycles. Some plants live for just a few weeks. Other plants live for many years.*
- What is an oak tree's life cycle?
 - o PA: *Adult tree → acorn → seed sprout → seedling → adult...*
- Point out plants and ask what stage they are in their life cycle

Part D: Plants and their environments**Objectives:**

- Understand that roots grow down and leaves grow towards light to meet the plant's needs
- Explain how plants change to stay safe from wind and animals

Applicable state standard:

- 2 LS 2.e.: students know light, gravity, touch, or environmental stress can affect the germination, growth, and development of plants

How lessons meet the standard:

- students conduct experiments to observe and record root growth over time
- students know that roots grow down to get water and minerals for the plant
- students observe and understand that leaves grow toward light to make food for the plant
- students understand that plants change to live and stay safe in their environments

Stem:

- grows up toward light
- can bend toward light

Leaves:

- can bend toward light

Flowers:

- can turn toward light

Roots:

- always grow down toward to Earth to get the plant what it needs
- takes in food and water from the soil

Germinate:

- when a seed begins to grow
- the germinating seed's roots grow down to get what it needs, and its stem grows up towards the light

Questions for students:

- Where do plants get what they need?
 - o *A: From the Sun and the soil.*
- How can plants change to get what they need?
 - o *A: You know that plants need light to grow. Plant parts can move to get more light. The **stems** and **leaves** of a plant can bend toward light. **Flowers** can turn toward light, too.*
 - o *A: Some plants need soil to grow. They take in food and water from the soil. When a seed **germinates**, it begins to grow. The **roots** always grow down. It grows toward the Earth to get what it needs. The **stem** grows up towards the light.*
- How do roots grow to get nutrients and water from the soil?
 - o *A: They grow down.*
- What traits help plants keep their leaves?
 - o *A: They taste bad, have thorns, or are poisonous.*
- How do plants change if they don't have the best place to grow?
 - o *A: They grow deeper roots, longer stems, or bigger leaves.*

KOP applications:

- What direction do the oak trees' roots grow? Why?
- If you see a seedling or seed: What does germinate mean?
 - o *A seed germinates when it starts growing.*

Section 2: Animal Life Cycles**Part A: Kinds of Animals**

Objectives:

- Recognize the variety of animals in the world
- Explain how animals are classified

Applicable state standard:

- 2 LS 2.b.: Students know the sequential stages of life cycles are different for different animals, such as butterflies, frogs, and mice

How the lesson meets the standard:

- Students identify ways in which animals stay safe
- Students learn ways animals can be put into groups
- Students are introduced to vocabulary describing animal groups
- Students compare animals with backbones to animals without backbones
- Students compare animals with backbones and sort them into groups

Classification:

- scientists organize animals into several groups because there are so many of them
- animals are sorted by whether they have backbones or not

Amphibians:

- begin their lives in water
- have smooth, moist skin which helps them live on land and water

Reptiles:

- have scales
- are cold blooded
- need sunlight to stay warm
- lay eggs

Mammals:

- have hair or fur
- give birth to live young
- feed young with milk

Birds:

- feathers
- two wings
- two legs
- not all can fly

Fish:

- live in water
- breathe with body parts called **gills**
- have **fins** to help them swim

Questions for students:

- How do we classify animals?
 - o *Scientists classify animals into several groups. Some animals have backbones and some do not. Scientists classify them because there are so many of them.*
- How can we classify animals with backbones?
 - o *Amphibians, reptiles, mammals, birds, fish*
- How can we classify animals without backbones?
 - o *Some have hard shells and body coverings. This helps them stay safe. Some have no shells and soft bodies. They must use other ways to stay safe.*
- How can animals with no backbones stay safe?
 - o *Sting, hide, move fast*

KOP applications:

- Have you seen any mammals on KOP?

- What type of animal is a squirrel/hawk/bird?
- How do you know a squirrel is a mammal?
- Does a squirrel take care of its young?
 - o *Talk about milk, squirrel middens, etc.*

Part B: Mammals

Objective:

- compare how young animal offspring resemble their parents

Applicable state standard:

- 2 LS 2.a.: Students know that organisms reproduce offspring of their own kind and that the offspring resemble their parents and one another

How the lesson meets the standard

- Students compare baby mammals with adult mammals
- Students notice how mammals change as they grow
- Students compare baby mammals to their parents and siblings
- Students identify stages in the life cycles of mammals

Mammal **life cycle**:

- babies need mothers to live
- babies need milk
- babies grow and change into adults

Questions for students:

- What is a mammal's life cycle?
- How do mammals grow and change as they become adults?
- How are baby mammals and their parents alike and different?
 - o *They can look different (size, color)*
 - o *May eat the same things, etc*

KOP applications:

- What is a bird's life cycle?
- What is a squirrel's life cycle?
- Does a baby bird resemble its parents?
- Is a baby hawk the same color as its parents? (example)

Part C: Animals from Eggs

Objectives:

- Recognize that even animals in the same group may vary in appearance and behavior
- Explain how animal variation happens

Applicable state standard:

- 2 LS 2.a.: Students know that organisms reproduce offspring of their own kind and that the offspring resemble their parents and one another

How the lesson meets the standard:

- Students understand how birds keep eggs safe
- Students are introduced to vocabulary describing stage in a life cycle
- Students identify life cycles of egg-laying animals
- Students understand the differences between mammals and animals that lay eggs

Larva:

- difficult to determine what animal will become because does not resemble adult
- the life cycle stage after animal hatches from egg

Molting:

- young animals shed their shells as they grow bigger

Pupa:

- larva goes into dormant phase before becoming an adult
- does not eat

Life cycle:

- egg → larva → pupa → adult

KOP applications:

- How do birds keep their eggs safe?
- What's the difference between a bird and a squirrel?

Part D: Animal Traits

Objectives:

- Recognize that even animals in the same group may vary in appearance and behavior
- Explain how animal variation happens

Applicable state standard:

- 2 LS 2.d.: Students know there is variation among individuals of one kind within a population

How the lesson meets the standard:

- Students identify traits that help animals live in their environment
- Students compare animals to their population
- Students observe and compare animals in different populations

Trait:

- comes from parents
- the way an animal looks or acts

Population:

- group of the same kind of animal that lives near each other
- the same kind of animals in different populations may look different
- not all members look exactly the same or act the same

Questions for students:

- How do traits help animals?
 - o *Fur helps them blend in*
 - o *Long necks help them get leaves*

Grade 3

Grade Level 2 Life Sciences focuses on:

- 🌱 Explaining why animals and plants have certain parts in terms of survival and reproduction
- 🌱 Relating animal parts to their environment and habitat
- 🌱 Introducing the concepts of adaptation in plants and animals
- 🌱 The power of animals and people to change the environment

Section I: Adaptations in Land Environments

Vocabulary: environment, biome, climate, soil, hummus, structure, shelter, adaptation, forest, deciduous, mimicry, coniferous

Part A: Living things and their needs

Applicable state standards:

- 3 LS 3.a.: students know plants and animals have structures that serve different functions in growth, survival, and reproduction
- 3 LS 3.b.: students know examples of diverse life forms in different environments

How the lessons meet the standard:

- students investigate to find out what plants need to live
- vocabulary to describe environments
- compare different environments and animals/plants that live on them
- study plant parts and discuss their importance
- identify why animals have specific parts
- students introduced to concepts of adaptation in plants and animals

Environment:

- everything that surrounds a living thing
- made up of living and non-living things: plants, animals, water, air, sunlight

Biome:

- area of land or water with certain kinds of living or nonliving things
- each has a certain kind of climate and soil

Climate:

- the typical weather conditions of an area over time
- affects the living things that can survive in a biome

Soil:

- substance that covers the ground made of broken down rocks and hummus

Hummus:

- broken down plant and animal material
- adds nutrients to the soil
- soaks up rainwater and keeps the ground moist

Structure:

- part of a living thing that helps it get what it needs (roots, stems...)

Carbon dioxide:

- a gas found in the air
- plants need it

Nutrients:

- substances that help living things grow and stay healthy

Oxygen:

- a gas found in the air and water

Shelter:

- a place where animals can stay safe

Adaptation:

- a special feature or behavior that helps living things survive

Questions for students:

- What do plants need?
 - o *A: Plants all need water, sunlight, energy from food, CO₂, and nutrients.*
- Where do plants get what they need?
 - o *A: Plants get all of these things from their environment to survive even though they make their own food.*
- What do animals need?
 - o *A: All animals have the same basic needs. Animals need water, energy from food, and oxygen. Oxygen is a gas found in the air and water. Some animals also need shelter. Shelter is a place where animals can stay safe.*
- How do animals get what they need?
 - o *Animals have structures that help them meet their needs in their environment. Legs, wings, and beaks are examples of structures.*
 - o *Animals can't make their own food the way plants can. Instead, they must eat plants or other animals. Legs, fins, and wings help an animal move to find food. Beaks and tongues help animals catch and swallow food. They help animals drink water, too.*
 - o *Structures help animals breathe. Animals breathe to get oxygen. Many animals breathe with lungs. Lungs take oxygen from the air. Fish breathe by pushing water through their gills. Gills take oxygen from water.*

KOP applications:

- What is the biome we see at KOP?
 - o Woodland, forest, grassland
- What is the climate like?
 - o Cool and moist in winter, hot and dry in summer.
- What is the soil like at KOP?
 - o It is salty and alkaline in the field.
 - o The forest soil is full of nutrients from the mountains. (good place to bring up weathering processes)

Part B: Life in the forest

How the lessons meet state standards:

- students investigate whether a plant will grow toward light
- students learn what makes an area a forest and compare different types of forests
- students learn how plants and animals survive in a forest environment

Forest:

- a biome that has many different trees

Deciduous:

- lose leaves in the fall as temperatures get cooler
- helps them conserve energy

Mimicry:

- when one living thing imitates another's color or shape

KOP applications:

- Can you think of any animals that mimic other living things?
 - o *PA: squirrels mimic the color of tree bark for camouflage.*
 - o *Hawks and owls blend into the trees so their prey can't see them.*
- Why do they do that?
- What type of trees are valley oaks?
 - o *Deciduous.*
- Is there more than one type of tree in this forest?
 - o *Yes, valley oak and sycamore, among others.*

Section 2: Environments Change

Vocabulary: competition, pollution, reduce, reuse, recycle, habitat, ecosystem, population, community, extinct, fossil

Students learn that environments are constantly changing, and that these changes are caused either by natural forces, by members of the ecosystem, or by people. Some changes are beneficial and other changes are detrimental. Students conduct investigations to find out firsthand how changes in an ecosystem affect the plants and animals that live there.

Part A: Living things change their environment

How lessons meet state standards:

- students discover ways animals change their environments
- students discover ways people change environments

Competiton:

- a major course of environmental change
- the struggle among living things for food, water, and other needs
- ex: shrubs and trees compete for space, light, water; smaller plants may die

Questions for students:

- How do living things change their environment?

- *Every living thing changes its environment in some way. Spiders spin webs and birds build nests.*
- *Living things also change their environments in more noticeable ways. Bacteria, worms, and fungi live in the soil. They break down leaves and other plant material. They help add nutrients back in the soil. These living things make big changes that help the environment.*
- How do people change their environment?
 - *People change the environment through pollution or land stewardship. People help the environment if they produce less trash.*
 - *Applicable vocabulary: pollution, reduce, reuse, recycle*

KOP applications:

- Establish what competition is
 - *Ex: Imagine you had a big birthday cake in your house, and there's only one piece left. Would you try to get it before someone else did? Animals act that way, too.*
- Can you think of any living things on KOP that compete?
 - *The trees compete for sunlight.*
 - *The hawks compete for food.*
- How has competition shaped the way that KOP looks?
 - *If trees didn't have to compete for sunlight, they wouldn't grow as tall so that they could save energy. So competition has filled KOP with tall trees.*
 - *If hawks didn't have to compete for food, there would be more hawks than you can count. Since they do have to compete, the number of hawks is limited by the amount of food available for them. The hawks also have to be better at the other hawks at catching food, or they would not be able to get as much food.*

Part B: Changes affect living things

How lessons meet state standards:

- students are introduced to the ways environments change
- students discover impacts of natural disasters on environments
- students learn about environmental changes that cause animals to relocate
- students discover the environmental impact of introducing new species to an ecosystem

Habitat:

- a living thing's home
- if the habitat changes, then the living thing may no longer be able to survive there

Ecosystem:

- all the living and nonliving things that interact in an environment
- it can be any size (pond or ocean, etc)
- many populations of animals and plants live in an ecosystem

Population:

- all the members of a single type of living thing in an ecosystem
- changes to one population affect the whole community

Community:

- all the different populations in an ecosystem

Extinct:

- no more of that type of living things alive
- rising temperatures caused mass extinctions after last ice age

Questions for students:

- What are some ways environments change?
 - o *You know that living things change their environment. Weather and other things can also change environments. Lightning might start a grassland or forest fire. Too much rain might cause too much flooding.*
 - o *Some changes last a short time. A summer drought can turn a green meadow brown. Spring rain can make a desert bloom with flowers. Other changes can have long-lasting effects. Earthquakes, storms, and volcanic eruptions can cause sudden changes in an environment. The damage from such changes may last for years.*
 - o *Some living things can recover from harmful changes in their environment. Grassland grasses have roots that store food and moisture. The grasses survive and grow back quickly after a fire. However, trees in a forest may take hundreds of years to grow back after a fire.*
 - o *People often cause permanent changes. When large trees in old forests are cut down, those trees are gone forever. Rivers and lakes polluted by trash or chemicals may not recover unless people clean them up.*
- How do changes affect animals and plants?
 - o *When an environment changes, the plants and animals adapted to that environment can be harmed. If the changes last a long time, some animals may move to a new habitat. Some plants and animals have adaptations that help them survive change. Other plants and animals find a way to survive by changing their behavior. Living things that are not able to travel or change must die.*
- What can happen if a new animal moves into an ecosystem?
- Why can it be harmful to bring new plants into an ecosystem?
- What can happen if the environment suddenly changes?

KOP applications:

- What would happen to the animal habitat on KOP if we cut down all the trees?
 - o *There would be no homes for the animals.*
 - o *There would be no shade for us to walk or rest under.*
 - o *The soil would dry out too much for plants that need lots of water in the soil.*
 - o *The plants living under the trees would not have the shade they need.*
 - o *Less CO₂ would be absorbed from the air.*
- Can you name some populations that live on KOP?
 - o *Squirrel, redtail hawk, pocket gopher...*
- How are all the populations a community? How do they affect one another?
 - o *Through food chains and through the changes they bring to the ecosystem.*
- Describe the KOP ecosystem:
 - o *It is about 300 acres of valley oak woodland. It has patches of salty soil that grow grasses and stands of valley oaks that grow near the rivers. There is a lively animal community here of birds, mammals, and reptiles...*
- How do pocket gophers shape the ecosystem?

- *Yes, they loosen up the soil so plants can grow their roots in it better.*
- **How do hawks change the ecosystem?**
 - *Yes, they keep the rabbit population in control.*
- **How do people change the KOP environment?**
 - *They are land stewards who take care of the land by cleaning up trash and making KOP a nice habitat for plants and animals.*