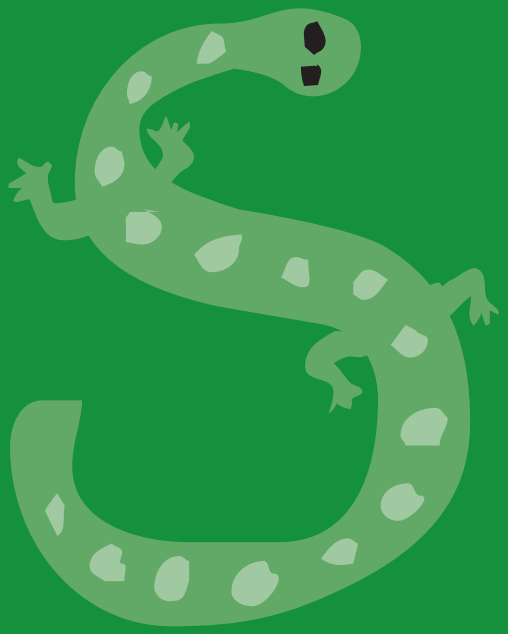
Life Science

Content Standard C:

As a result of the activities in grades K-4, all students should develop understanding of

- **The characteristics of organisms**
- **Life cycles of organisms**
- **Organisms and environments**



Content Summary

National Science Education Content Standards

K-4

Characteristics of organisms

Life cycles of organisms

Organisms and environments

5-8

Structure and function in living systems

Reproduction and heredity

Regulation and behavior

Populations and adaptions of organisms

9-12

The cell

Molecular basis of heredity

Biological evolution

Interdependence of organisms

Matter, energy, and organization in living systems

Behavior of organisms

Minnesota Graduation Standards

Primary Level

Direct Science Experience:

Understand basic science concepts through direct experience

Intermediate Level

Living and Non-living Systems:

Understand how individuals and objects interact in life, earth/space systems and physical systems

Middle Level

Living Systems:

Understand interactions and interdependence of living systems

High School Level

Concepts in Biology:

Understand biological concepts through investigation and analysis of cells, organisms, and ecosystems

Focus K-12

Grade	Early	Late
K-4	The focus of instruction for all students early in this grade range is on building understandings of biological concepts through direct experiences with living things, their life cycles, and their habitats.	The focus of instruction later in this grade range is on providing opportunities for all students to investigate how organisms live in their environments and developing a basic understanding of interdependence.
5-8	The focus of instruction for all students early in this grade range is on developing a basic understanding of the organization of living systems and an awareness of the diversity and interdependence among organisms.	The focus of instruction for all students later in this grade range is on developing an understanding of human biology, recognizing patterns in ecosystems and basic understandings about the cellular dimensions of living systems.
9-12	The focus of instruction in life science for all students at the high school level is on developing an understanding of cell structure and function, the relationship of matter and energy in biological systems, heredity, biological evolution, the behavior and interdependence of organisms and apply their understandings in a variety of situations.	The focus of instruction for students pursuing further study in life science is on providing opportunities to explore and expand their understandings of molecular genetics, biological evolution and interactions, the structure and function of living systems, natural ecosystems and apply their understandings in a variety of situations.

Close-up K-4

The focus of instruction for all students early in this grade range is on building understandings of biological concepts through direct experiences with living things, their life cycles, and their habitats.

An understanding of biological concepts begins through direct experience with living things. These experiences emerge from the natural questions that students ask and from teacher-directed exploration of familiar environments within the natural world. Student inquiries are organized around the characteristics of organisms, their basic needs, and their preferences for particular environments. Students become familiar with specialized structures by exploring a variety of plants and animals. Such study helps students distinguish between living and non-living objects, reduces reliance on anthropomorphic explanations, and illustrates that young organisms resemble their parents. Students learn about the characteristics and life cycles of organisms by regularly observing them in the environment and recording seasonal changes throughout the year as well as by raising and observing them in the classroom. They describe changes in organisms and note that organisms cause changes in the environment. Students explore habitats, organisms, and simple food chains through their work with terrariums, aquariums, and the local environment. They are able to understand the food link between two organisms. As students grow plants from seeds and raise insects, they begin to develop an understanding of the life cycles of living organisms. Students and teachers observe established science safety procedures.

The focus of instruction later in this grade range is on providing opportunities for all students to investigate how organisms live in their environments and developing a basic understanding of interdependence.

Assisted by their teacher, all students develop understandings about the association of organisms with their environments, the dependence of organisms on various aspects of the environment, and the behaviors that help organisms survive. Students learn that certain kinds of organisms do better in particular environments than others. Through their explorations students learn that the survival of organisms depends on the living and non-living environment as well as on their behavior. They collect data such as the numbers and kinds of plants and animals in a study site. Students also observe and record evidence of other animals from tracks, signs of browsing, and the presence of scat. Students extend their knowledge of the variety of plant and animal life cycles by growing plants and raising insects or other species to observe and record changes. During class discussions, students compare life cycles of plants and animals. Students and teachers observe established science safety procedures.

On Location K-4

Life science in the primary grades centers on students learning about the characteristics of organisms, their life cycles, and their environments. This lesson attempts to touch on all of them as an introduction to life science. Notice how the teacher works outdoors with his students, has them keep records, and introduces them to the skill of data collection.

In the fall, Mr. D has groups of students adopt a tree on or near the school site. Throughout the school year, students visit their tree regularly to observe and record visitors and changes. They collect twigs and leaves, and make bark rubbings. Simple picture keys are used to identify the trees, and the students read about their tree to find out what kinds of changes to expect and what kinds of animals may visit their tree.

By wrapping a string around the trunk of the tree, the students measure the circumference of the trunk and then make comparisons among their classmates' trees. They estimate the height of their tree and make drawings of the tree as it changes throughout the year. A scrapbook is kept by each group where they place their pictures, rubbings, leaves, and other artifacts and information they collect about their tree.

During the winter, they might see a squirrel eating the berries on the tree. These kinds of events lead them to ask about food sources of squirrels and other animals during the winter. In the spring, they eagerly anticipate changes in the tree as its buds swell, producing leaves and in some cases flowers and berries.

Mr. D also has developed tree backpacks that the students take turns taking home throughout the year. Some backpacks include a book about trees, materials and instructions for making recycled paper, a bird identification guide, and other activities that students can do with their parents. Other backpacks contain a tree identification guide and instructions for putting together a scrapbook of the leaves that students find in their neighborhood.

National Science Education Content Standards

K-4 Content Standard C

The Characteristics of Organisms

- Organisms have basic needs. For example, animals need air, water, and food; plants require air, water, nutrients, and light. Organisms can survive only in environments in which their needs can be met. The world has many different environments, and distinct environments support the life of different types of organisms.
- Each plant or animal has different structures that serve different functions in growth, survival, and reproduction. For example, humans have distinct body structures for walking, holding, seeing, and talking.
- The behavior of individual organisms is influenced by internal cues (such as hunger) and by external cues (such as a change in the environment). Humans and other organisms have senses that help them detect internal and external cues.

Life Cycles of Organisms

- Plants and animals have life cycles that include being born, developing into adults, reproducing, and eventually dying. The details of this life cycle are different for different organisms.
- Plants and animals closely resemble their parents.
- Many characteristics of an organism are inherited from the parents of the organism, but other characteristics result from an individual's interactions with the environment. Inherited characteristics include the color of flowers and the number of limbs of an animal. Other features, such as the ability to ride a bicycle, are learned through interactions with the environment and cannot be passed on to the next generation.

Organisms and their Environments

- All animals depend on plants. Some animals eat plants for food. Other animals eat animals that eat the plants.
- An organism's patterns of behavior are related to the nature of that organism's environment, including the kinds and numbers of other organisms present, the availability of food and resources, and the physical characteristics of the environment. When the environment changes, some plants and animals survive and reproduce, and others die or move to new locations.
- All organisms cause changes in the environment where they live. Some of these changes are detrimental to the organism or other organisms, whereas others are beneficial.
- Humans depend on their natural and constructed environments. Humans change environments in ways that can be either beneficial or detrimental for themselves and other organisms.

Minnesota Graduation Standards

Primary Level

Direct Science Experience:

Understand basic science concepts through direct experience.

What students should know:

1. Understand concepts related to everyday life:
   a. characteristic properties of objects (e.g., rocks, water, air, soil)
   b. patterns and how they repeat (e.g., phenology, motion of the sun across the sky)
   c. cycles (e.g., water, plant, life)
   d. how basic needs of organisms are met (e.g., space, food, light)
   e. response of organisms to changes in the environment (e.g., space, food, light)
2. Know how personal use of materials, energy and water impact the environment

What students should do:

1. Observe and describe characteristics of objects or phenomena
2. Measure changes that occur in objects or phenomena as a result of interaction
3. Sort and classify objects based on one or two properties
4. Display information using graphs (e.g., histograms, charts, pictures, narratives)
5. Describe how previously learned concepts apply to new situations

In Addition:

Performance package should include tasks from earth, life and physical science.