

GRADE 3

GRADE 3 | UNDERSTANDING LIFE SYSTEMS

GROWTH AND CHANGES IN PLANTS

OVERVIEW

Growth and Changes in Plants focuses on the characteristics and requirements of plants and the ways in which plants grow. Students will observe and investigate a wide variety of local plants, from trees and mosses in their natural environment to flowers and vegetables grown at school or on farms, and will consider the impact of human activity on plants and their habitats. Students will also learn about the importance of plants as sources of oxygen, food, and shelter, and the need for humans to protect plants and their habitats.

In preparation for working with plants, it is important that students be able to identify practices that ensure their personal safety and the safety of others and to demonstrate an understanding of the importance of these practices. This includes knowing why they should not taste any part of a plant unless directed to do so by a teacher, and why they should wash their hands after handling plants or parts of plants.

This topic also provides opportunities for connecting to the Grade 3 social studies topic Canada and World Connections: Urban and Rural Communities. As students look at similarities and differences between regions, they can consider the kinds of plants that help to make a location unique. They can also consider the need to protect farmlands as plant habitats and as producers of food for living things. Connections can also be made with the Grade 3 social studies topic Heritage and Citizenship: Early Settlements in Upper Canada, as students look at the types of plants that were used both by Aboriginal people and the settlers, plants that were native to the area, and plants that were introduced by the settlers. Connections can also be made with another Grade 3 science and technology topic, Understanding Earth and Space Systems: Soils in the Environment.

Fundamental Concepts	Big Ideas
Systems and Interactions Sustainability and Stewardship	Plants have distinct characteristics. <i>(Overall expectations 2 and 3)</i> There are similarities and differences among various types of plants. <i>(Overall expectation 2)</i> Plants are the primary source of food for humans. <i>(Overall expectation 1)</i> Humans need to protect plants and their habitats. <i>(Overall expectation 1)</i> Plants are important to the planet. <i>(Overall expectation 1)</i>

OVERALL EXPECTATIONS

By the end of Grade 3, students will:

1. assess ways in which plants have an impact on society and the environment, and ways in which human activity has an impact on plants and plant habitats;
2. investigate similarities and differences in the characteristics of various plants, and ways in which the characteristics of plants relate to the environment in which they grow;
3. demonstrate an understanding that plants grow and change and have distinct characteristics.

SPECIFIC EXPECTATIONS

1. Relating Science and Technology to Society and the Environment

By the end of Grade 3, students will:

- 1.1 assess ways in which plants are important to humans and other living things, taking different points of view into consideration (*e.g., the point of view of home builders, gardeners, nursery owners, vegetarians*), and suggest ways in which humans can protect plants

Sample prompts: Plants provide oxygen and food that other living things need to survive. Plants use and store carbon dioxide, helping reduce the amount of this greenhouse gas in the atmosphere. Trees reduce humans' energy use in summer by providing cooling shade. Leaves, twigs, and branches of trees and shrubs block erosion-causing rainfall. Grass and shrubs prevent soil from washing away. Roots, leaves, and trunks provide homes for wildlife. Aboriginal people use plants for many medicines.

- 1.2 assess the impact of different human activities on plants, and list personal actions they can engage in to minimize harmful effects and enhance good effects

Sample prompts: When humans provide common house plants and blooming potted plants with an appropriate environment, they help fight pollution indoors. When humans plant trees, they benefit the environment in many different ways. When humans fill in wetlands to build houses, they destroy an important habitat that supports many plants. When humans pick wildflowers or dig them up to replant in their home gardens, they harm a natural habitat that supports many living things. When humans plant non-native plants and trees that need pesticides and/or a lot of water to survive, they drive out native plants and trees that are adapted to our climate and that provide habitat and food for native birds, butterflies, and mammals.

2. Developing Investigation and Communication Skills

By the end of Grade 3, students will:

- 2.1 follow established safety procedures during science and technology investigations (*e.g., avoid touching eyes when handling plants; never taste any part of a plant unless instructed to do so by the teacher*)
- 2.2 observe and compare the parts of a variety of plants (*e.g., roots of grass, carrot, dandelion; stem of cactus, carnation, tree; leaves of geranium, spider plant, pine tree*)
- 2.3 germinate seeds and record similarities and differences as seedlings develop (*e.g., plant quick-growing seeds – nasturtium, morning glory, sunflower, tomato, beet, or radish seeds – in peat pellets to observe growth*)
- 2.4 investigate ways in which a variety of plants adapt and/or react to their environment, including changes in their environment, using a variety of methods (*e.g., read a variety of non-fiction texts; interview plant experts; view DVDs or CD-ROMs*)
- 2.5 use scientific inquiry/experimentation skills (see page 12), and knowledge acquired from previous investigations, to investigate a variety of ways in which plants meet their basic needs
- Sample guiding questions:** How do plants meet their need for air, water, light, warmth, and space? What are different ways in which we can help plants meet their needs?
- 2.6 use appropriate science and technology vocabulary, including *stem, leaf, root, pistil, stamen, flower, adaptation, and germination*, in oral and written communication
- 2.7 use a variety of forms (*e.g., oral, written, graphic, multimedia*) to communicate with different audiences and for a variety of purposes (*e.g., make illustrated entries in a personal science journal to describe plant characteristics and adaptations to harsh environments*)

3. Understanding Basic Concepts

By the end of Grade 3, students will:

- 3.1 describe the basic needs of plants, including air, water, light, warmth, and space
- 3.2 identify the major parts of plants, including root, stem, flower, stamen, pistil, leaf, seed, and fruit, and describe how each contributes to the plant's survival within the plant's environment (*e.g., the roots soak up food and water for the plant; the stem carries water and food to the rest of the plant; the leaves make food for the plant with help from the sun; the flowers grow fruit and seeds for new plants*)
- 3.3 describe the changes that different plants undergo in their life cycles (*e.g., some plants grow from bulbs to flowers, and when the flowers die off the bulb produces little bulbs that will bloom the next year; some plants grow from germination of a seed to the production of a fruit containing seeds that are then scattered by humans, animals, or the wind so that new plants can grow*)
- 3.4 describe how most plants get energy to live directly from the sun (*e.g., plants turn the energy from the sun into food for themselves*) and how plants help other living things to get energy from the sun (*e.g., Other living things, which cannot "eat" sunshine, eat the plants to get the energy. They also get energy when they eat the animals that eat the plants.*)
- 3.5 describe ways in which humans from various cultures, including Aboriginal people, use plants for food, shelter, medicine, and clothing (*e.g., food – from rice plants; houses for shelter – from the wood of trees; medicines – from herbs; clothing – from cotton plants*)
- 3.6 describe ways in which plants and animals depend on each other (*e.g., plants provide food for energy; animals help disperse pollen and seeds, and provide manure that fertilizes the soil in which plants grow; plants need the carbon dioxide that animals breathe out, and animals need the oxygen that plants release into the air*)
- 3.7 describe the different ways in which plants are grown for food (*e.g., on farms, in orchards, greenhouses, home gardens*), and explain the advantages and disadvantages of locally grown and organically produced food, including environmental benefits
- 3.8 identify examples of environmental conditions that may threaten plant and animal survival (*e.g., extreme heat and cold; floods and/or droughts; changes in habitat because of human activities such as construction, use of gas-powered personal watercraft on lakes*)

GRADE 3 | UNDERSTANDING STRUCTURES AND MECHANISMS

STRONG AND STABLE STRUCTURES

OVERVIEW

Both people and animals build structures, and both people and animals need their structures to be strong and stable and to last a long time. Students need to understand the important distinction between strength (the capacity to withstand forces that tend to break an object or change its shape) and stability (the capacity to maintain balance and stay fixed in one position), and the ways in which these two properties affect the usefulness of a structure. Students will investigate the factors that affect a structure’s strength and stability, such as its shape and centre of gravity, and apply their learning as they design and build their own strong and stable structures.

Students in Grade 3 will encounter very few hazards in their designing and building activities. However, it is important that they be able to identify general practices that ensure their personal safety and the safety of others and to demonstrate an understanding of the importance of these practices. This includes knowing why work spaces should be kept tidy and uncluttered, and why it is important to follow instructions carefully.

Fundamental Concepts	Big Ideas
Structure and Function Matter	<p>A structure has both form and function. <i>(Overall expectations 1, 2, and 3)</i></p> <p>Structures are affected by forces acting on them. <i>(Overall expectations 1 and 3)</i></p> <p>Structures need to be strong and stable to be useful. <i>(Overall expectations 1, 2, and 3)</i></p>

OVERALL EXPECTATIONS

By the end of Grade 3, students will:

1. assess the importance of form, function, strength, and stability in structures through time;
2. investigate strong and stable structures to determine how their design and materials enable them to perform their load-bearing function;
3. demonstrate an understanding of the concepts of *structure*, *strength*, and *stability* and the factors that affect them.

SPECIFIC EXPECTATIONS

1. Relating Science and Technology to Society and the Environment

By the end of Grade 3, students will:

- 1.1 assess effects of strong and stable structures on society and the environment (*e.g., reliable load-bearing structures are essential in all areas of life for shelter, transportation, and many other everyday purposes; strong and stable structures can endure for long periods of time and provide a historical record of other societies and cultures; strong and stable structures can be hard to dispose of when their usefulness is ended and may then have a negative effect on the environment*)

Sample guiding questions: What are some structures that we see or use every day that we depend on to be strong and stable (*e.g., bicycle, table, airplane, bridge, tractor, skyscraper*)? What features of structures such as old covered bridges, heritage homes, the Pyramids, and the Parthenon have enabled them to still be standing today? What can we learn about strength, stability, form, and function from studying these structures?

- 1.2 assess the environmental impact of structures built by various animals and those built by humans

Sample guiding questions: What kinds of materials are used in human constructions (*e.g., bricks, cement, wood, adobe, clay/mud, ice/snow*)? In animal constructions? How do the purposes of animal structures compare to those of humans? What is the impact on the environment of a dam built by a beaver? Of a nest built by a tent caterpillar in a tree? Of an anthill built in a backyard? What is the impact of homes, shopping plazas, playgrounds, and bridges built by humans? What effects do traditional Aboriginal homes have on the environment?

2. Developing Investigation and Communication Skills

By the end of Grade 3, students will:

- 2.1 follow established safety procedures during science and technology investigations (*e.g., carry scissors and other cutting tools in a safe manner*)

- 2.2 investigate, through experimentation, how various materials (*e.g., paper and wood*) and construction techniques (*e.g., folding, adding layers, twisting/braiding, changing shapes*) can be used to add strength to structures
- 2.3 investigate, through experimentation, the effects of pushing, pulling, and other forces on the shape and stability of simple structures (*e.g., the effect of adding one or more struts on the strength of a tower; the effect of adding ties on the strength of a bridge; the effect of adding weight to the base of a tower on the stability of the tower*)
- 2.4 use technological problem-solving skills (see page 16), and knowledge acquired from previous investigations, to design and build a strong and stable structure that serves a purpose (*e.g., a place to store lunch bags, a place to put wet boots*)
- 2.5 use appropriate science and technology vocabulary, including *compression, tension, strut, ties, strength, and stability*, in oral and written communication
- 2.6 use a variety of forms (*e.g., oral, written, graphic, multimedia*) to communicate with different audiences and for a variety of purposes (*e.g., an oral report to the class on the results of experiments to strengthen materials*)

3. Understanding Basic Concepts

By the end of Grade 3, students will:

- 3.1 define a structure as a supporting framework, with a definite size, shape, and purpose, that holds a load (*e.g., a running shoe, a tepee, a bicycle, an igloo*)
- 3.2 identify structures in the natural environment (*e.g., a tree, a bees' nest/hive*) and in the built environment (*e.g., a totem pole, a fence, a pyramid, the CN Tower*)
- 3.3 identify the strength of a structure as its ability to support a load
- 3.4 identify the stability of a structure as its ability to maintain balance and stay fixed in one spot
- 3.5 identify properties of materials (*e.g., strength, flexibility, durability*) that need to be considered when building structures
- 3.6 describe ways in which the strength of different materials can be altered (*e.g., by folding, adding layers, twisting/braiding, changing their shape*)

- 3.7 describe ways to improve a structure's strength (*e.g., by using triangulation or cross-members*) and stability (*e.g., by lowering the centre of gravity*)
- 3.8 explain how strength and stability enable a structure (*e.g., bridge, tent*) to perform a specific function
- 3.9 describe ways in which different forces can affect the shape, balance, or position of structures (*e.g., a load may cause a cardboard box to buckle*)
- 3.10 identify the role of struts and ties in structures under load (*e.g., a strut is added to a wooden frame to resist compression that might cause its collapse; a tie is added to a roof truss to resist tension that might cause the roof to collapse from the weight of the shingles*)

GRADE 3 | UNDERSTANDING MATTER AND ENERGY

FORCES CAUSING MOVEMENT

OVERVIEW

There are two basic types of forces that cause movement. Contact forces involve direct interaction (pushes and pulls between surfaces that are in direct contact). Non-contact forces include magnetic and gravitational forces and involve interaction at a distance. In exploring the effects of forces, students will learn about ways in which forces, including forces in nature, cause objects to move. In addition, students will expand their understanding of control by designing and building devices that can use forces to create controlled movement. Opportunities must be provided for all students, including students with special education needs, to participate in these or comparable activities.

Explorations involving forces and movement may require students to manipulate materials (e.g., twist an elastic, bend paperclips). When working with materials in this manner, it is important that students are able to identify practices that ensure their personal safety and the safety of others and to demonstrate an understanding of the importance of these practices. This includes knowing why it is important to protect their eyes and faces from stretched or twisted materials, and their feet from loads that might drop.

Fundamental Concepts	Big Ideas
Energy Change and Continuity	<p>There are several types of forces that cause movement. (<i>Overall expectations 1, 2, and 3</i>)</p> <p>Forces cause objects to speed up, slow down, or change direction through direct contact or through interaction at a distance. (<i>Overall expectations 2 and 3</i>)</p> <p>Forces in nature, such as high winds or water, can have a significant impact on humans and the environment, and need to be regarded with respect. (<i>Overall expectations 1 and 3</i>)</p>

OVERALL EXPECTATIONS

By the end of Grade 3, students will:

1. assess the impact of various forces on society and the environment;
2. investigate devices that use forces to create controlled movement;
3. demonstrate an understanding of how forces cause movement and changes in movement.

SPECIFIC EXPECTATIONS

1. Relating Science and Technology to Society and the Environment

By the end of Grade 3, students will:

- 1.1 assess the effects of the action of forces in nature (natural phenomena) on the natural and built environment, and identify ways in which human activities can reduce or enhance this impact

Sample prompts: **Erosion:** Heavy rains and water run-off naturally erode soil. Humans make erosion happen faster by cutting down trees, removing shrubs and plants, and having too many animals on farmland. When soil is lost through erosion, it pollutes rivers, lakes, and other water systems. When soil is lost on farmlands, farmers cannot grow as many crops. Depleted soil produces crops that provide less nourishment to people. What action can humans take to help prevent erosion?

Landslides: Landslides can happen anywhere and are triggered by rains, floods, earthquakes, and other natural events. Humans contribute to landslides when they change the land to put in lawns, gardens, roads, and houses. Landslides can destroy houses, transportation routes, and utilities. They can cause flooding and pollute water. They can carry trees and plants away with them. What action can humans take to help prevent landslides?

- 1.2 assess the impact of safety devices that minimize the effects of forces in various human activities

Sample prompts: What are the costs and benefits of using seatbelts in cars, knee and elbow pads and wrist guards for roller blading, helmets for cycling and hockey, sport shoes designed for high impact sports like aerobics and basketball?

2. Developing Investigation and Communication Skills

By the end of Grade 3, students will:

- 2.1 follow established safety procedures during science and technology investigations (*e.g., use eye protection when twisting, bending, compressing, or stretching materials*)

- 2.2 investigate forces that cause an object to start moving, stop moving, or change direction (*e.g., release a wound-up elastic band to propel a toy vehicle; pull on a leash to stop a dog; hit a ball with a bat; hold papers on a refrigerator door using magnets*)

- 2.3 conduct investigations to determine the effects of increasing or decreasing the amount of force applied to an object (*e.g., using two magnets instead of one to pick up pins; changing the number of people on one side of a tug of war; rubbing a balloon ten times instead of five times on a wool sweater to create a static charge*)

- 2.4 use technological problem-solving skills (see page 16), and knowledge acquired from previous investigations, to design and build devices that use forces to create controlled movement (*e.g., an airplane propelled by hand or by an elastic band; a boat that holds paper clips and moves through water using magnets; a crane that lifts a load; a timed marble run*)

Sample guiding questions: What is the purpose of your device? What force(s) are being used? How does your device move? How do the force(s) control the movement? How might your device be improved?

- 2.5 use appropriate science and technology vocabulary, including **push, pull, load, distance,** and **speed,** in oral and written communication

- 2.6 use a variety of forms (*e.g., oral, written, graphic, multimedia*) to communicate with different audiences and for a variety of purposes (*e.g., give a demonstration to show how a device was constructed and how it performs; use a drawing to illustrate the design alterations needed to improve a device; describe with pictures and/or in writing the steps required to build a device*)

3. Understanding Basic Concepts

By the end of Grade 3, students will:

- 3.1 identify a force as a push or a pull that causes an object to move
- 3.2 identify different kinds of forces (*e.g., gravity – the force that pulls objects towards the earth; electrostatic force – the push or pull that happens with charged objects; magnetic force – the force of a magnet that attracts objects containing iron or nickel*)

- 3.3 describe how different forces (*e.g., magnetism, muscular force, gravitational force, friction*) applied to an object at rest can cause the object to start, stop, attract, repel, or change direction
- 3.4 explain how forces are exerted through direct contact (*e.g., pushing a door, pulling a toy*) or through interaction at a distance (*e.g., magnetism, gravity*)
- 3.5 identify ways in which forces are used in their daily lives (*e.g., magnetism – fridge magnet; gravity – a falling ball; friction – bicycle brakes*)

GRADE 3 | UNDERSTANDING EARTH AND SPACE SYSTEMS

SOILS IN THE ENVIRONMENT

OVERVIEW

Soil is not just dirt but an essential source of life and nutrients for many organisms, including humans. Soil provides a base for forests, fields, farms, and gardens and is necessary to many different kinds of animals and plants. Through investigations, students will learn that soils are composed of a variety of living and non-living things and earth materials; that there are different kinds of soil; and that the unique characteristics, composition, and condition of each soil type determine its capacity to sustain life. As they learn about the importance of soils, students will also learn about ways to maintain healthy soil conditions, including the process of composting.

When exploring different kinds of soils, students should be able to identify practices that ensure their personal safety and the safety of others and to demonstrate an understanding of the importance of these practices. This includes knowing why they should check collected soils for unsafe objects before beginning their investigations, and why they should always wash their hands after completing soil explorations.

Connections can be made with another Grade 3 science and technology topic, Understanding Life Systems: Growth and Change in Plants, as well as with the social studies topics for Grade 3 – Heritage and Citizenship: Early Settlements in Upper Canada, and Canada and World Connections: Urban and Rural Communities.

Fundamental Concepts	Big Ideas
Systems and Interactions	Soil is made up of living and non-living things. <i>(Overall expectations 1, 2, and 3)</i>
Change and Continuity	The composition, characteristics, and condition of soil determine its capacity to sustain life. <i>(Overall expectations 1, 2, and 3)</i>
Sustainability and Stewardship	Soil is an essential source of life and nutrients for many living things. <i>(Overall expectation 3)</i> Living things, including humans, interact with soils and can cause positive or negative changes. <i>(Overall expectation 1)</i>

OVERALL EXPECTATIONS

By the end of Grade 3, students will:

1. assess the impact of soils on society and the environment, and of society and the environment on soils;
2. investigate the composition and characteristics of different soils;
3. demonstrate an understanding of the composition of soils, the types of soils, and the relationship between soils and other living things.

SPECIFIC EXPECTATIONS

1. Relating Science and Technology to Society and the Environment

By the end of Grade 3, students will:

- 1.1 assess the impact of soils on society and the environment, and suggest ways in which humans can enhance positive effects and/or lessen or prevent harmful effects

Sample prompts: Poor soil affects both a plant's ability to take up the nutrients it needs and the quality of the nutrients that are passed from the plant to humans. Some soils do not provide any of the nutrients that are needed to support plant life (e.g., sand in the desert). Landslides can be caused in part by soil conditions and the type of soil in a particular area.
- 1.2 assess the impact of human action on soils, and suggest ways in which humans can affect soils positively and/or lessen or prevent harmful effects on soils

Sample prompts: Erosion caused by natural events such as heavy rain or waves and erosion caused by human actions affect soil conditions and cause water pollution. When houses and other buildings are constructed, trees and plants and the top or best layer of soil are often removed from the building site.

2. Developing Investigation and Communication Skills

By the end of Grade 3, students will:

- 2.1 follow established safety procedures during science and technology investigations (e.g., *wash hands after working with soil samples*)
- 2.2 investigate the components of soil (e.g., *non-living things such as pebbles and decaying matter; living things such as organic matter, bacteria, earthworms, and insects*), the condition of soil (e.g., *wet, dry*), and additives found in soil (e.g., *pesticides, fertilizers, salt*), using a variety of soil samples (e.g., *sand, clay, loam*) from different local environments, and explain how the different amounts of these components in a soil sample determine how the soil can be used
- 2.3 use scientific inquiry/experimentation skills (see page 12), and knowledge and skills acquired from previous investigations, to determine which type(s) of soil (e.g., *sandy soil, clay soil, loam*) will sustain life

Sample guiding questions: What question(s) are you trying to answer with your experiment? What do you predict will happen in your experiment? In what ways will you control the light and/or water? In what ways will you record your observations? What conclusions can you make from your observations? How would this information help someone else (e.g., a gardener)?
- 2.4 investigate the process of composting, and explain some advantages and disadvantages of composting (e.g., *set up a pop-bottle composter in the classroom, and observe what happens over time*)

Sample guiding questions: What is composting? Where does composting happen naturally? What are some good things about composting? Why might people not be able to or want to compost? What “ingredients” do we need to start a classroom composter? What things should not go into the composter? As the compost “cooks”, what changes do you notice? What happens to the things that we put into the classroom composter? How will we use our compost?
- 2.5 use appropriate science and technology vocabulary, including *clay, sand, loam, pebbles, earth materials, and soil*, in oral and written communication
- 2.6 use a variety of forms (e.g., *oral, written, graphic, multimedia*) to communicate with different audiences and for a variety of purposes (e.g., *record in words and pictures what happens when soil and water are shaken together in a container; prepare a display comparing the composition of soils from different locations*)

3. Understanding Basic Concepts

By the end of Grade 3, students will:

- 3.1 identify and describe the different types of soils (*e.g., Sandy soil is made up of minerals and tiny pieces of rock that have come from the erosion and weathering of rocks. It feels gritty and does not stick together well. Sandy soil drains easily and quickly after a rain and warms up quickly in the spring, but does not hold water and nutrients as well as clay soil, and is eroded more easily. Loamy soil is made up of sand, silt, and clay in relatively equal amounts. It sticks together better than sand but not as well as clay. Loamy soil holds water and nutrients well, and also drains well so that sufficient air can reach the roots. Clay soil is a very fine-grained soil that is plastic when wet but hard when dried. It feels slick and smooth. Clay soils have poor drainage and aeration.*)
- 3.2 identify additives that might be in soil but that cannot always be seen (*e.g., pesticides, fertilizers, salt*)
- 3.3 describe the interdependence between the living and non-living things that make up soil (*e.g., earthworms ingest the soil and absorb the nutrients, then their castings return the nutrients to the soil; the roots of plants use the soil as an anchor to keep the plants from blowing away*)
- 3.4 describe ways in which the components of various soils enable the soil to provide shelter/homes and/or nutrients for different kinds of living things (*e.g., microscopic bacteria and micro-organisms feed on decaying matter in the soil; roots of plants absorb minerals from the soil*)