

GRADE 4

GRADE 4 | UNDERSTANDING LIFE SYSTEMS HABITATS AND COMMUNITIES

OVERVIEW

This strand focuses on habitats, the natural communities that depend on them, and the impacts that changes to habitats can have on interrelationships among plants and animals within these communities. Students will learn that living things (including humans) rely on other living things for the energy and resources they need to live. They will also investigate factors that alter various habitats and communities, including those factors that occur naturally and those that result from human action. Care must be taken to ensure that all students, including students with special education needs, have comparable opportunities to explore the natural world.

When assessing human impacts on habitats and communities, students must be given opportunities to consider human actions from a variety of viewpoints: for example, from the perspective of the developer who wants to build low-cost housing on a woodlot, people who are concerned about the destruction of a natural habitat, families who will benefit from affordable housing, and people in the community who have used the woodlot carefully for leisure activities. Thoughtful consideration of various viewpoints, as well as the scientific evidence of the environmental costs and risks, will enable students not only to look for ways in which people might come to agreement on how to minimize the negative impacts of their actions, but also to make more informed decisions about personal choices.

Caring for living things in the classroom helps students to learn about their habitats. It is important that students be able to identify practices that ensure their own personal safety and the safety of others and to demonstrate an understanding of these practices. This includes knowing why it is important to wash their hands before and after handling animals, and to properly clean and maintain the environment for any plants and animals kept in the classroom.

This topic provides opportunities for making connections to the Grade 4 social studies topic Canada and World Connections: Canada's Provinces, Territories, and Regions.

Fundamental Concepts	Big Ideas
Systems and Interactions Sustainability and Stewardship	<p>Plants and animals are interdependent and are adapted to meet their needs from the resources available in their particular habitats. <i>(Overall expectations 1, 2, and 3)</i></p> <p>Changes to habitats (whether caused by natural or human means) can affect plants and animals and the relationships between them. <i>(Overall expectations 2 and 3)</i></p> <p>Society relies on plants and animals. <i>(Overall expectations 1 and 2)</i></p>

OVERALL EXPECTATIONS

By the end of Grade 4, students will:

1. analyse the effects of human activities on habitats and communities;
2. investigate the interdependence of plants and animals within specific habitats and communities;
3. demonstrate an understanding of habitats and communities and the relationships among the plants and animals that live in them.

SPECIFIC EXPECTATIONS

1. Relating Science and Technology to Society and the Environment

By the end of Grade 4, students will:

- 1.1 analyse the positive and negative impacts of human interactions with natural habitats and communities (*e.g., human dependence on natural materials*), taking different perspectives into account (*e.g., the perspectives of a housing developer, a family in need of housing, an ecologist*), and evaluate ways of minimizing the negative impacts

Sample issues: (a) Humans depend on natural habitats and communities for many things, including food, building materials, clothing, and medicine. Natural habitats also help to purify our air and water. In spite of this dependency, however, we are destroying some of the habitats and communities that we depend on. How can we continue to draw benefits from the natural environment and still ensure that it is there to benefit future generations? (b) Urban development provides housing for an expanding population, but it also destroys natural habitats, causing some species to die off locally or go elsewhere and enabling other species to multiply rapidly. When scarce farmland is used for development, we lose family farms and a way of life, as well as local sources of fresh food and important open spaces. To lessen such impacts, we need to think of alternative ways of meeting our needs. Some cities work with developers to conserve green spaces. Others are starting to concentrate expansion within their existing boundaries instead of spreading beyond them. How is development affecting natural habitats in your community, and what is being done to protect them?

- 1.2 identify reasons for the depletion or extinction of a plant or animal species (*e.g., hunting, disease, invasive species, changes in or destruction of its habitat*), evaluate the impacts on the rest of the natural community, and propose possible actions for preventing such depletions or extinctions from happening

Sample issues: (a) Deforestation for land development, as well as hunting, trapping, and increased tourism, have had an impact on the wolf population in Ontario. Despite recent laws designed to protect them, wolves in Ontario still face many threats. What other animals and plants would be affected by their destruction, and what can we do to help them survive? (b) A plant called American ginseng has commonly been used as a traditional medicine and may be useful in preventing colds and treating diabetes and other diseases. Because of harvesting, timber extraction, and the clearing of land for agriculture and development, American ginseng is on the endangered species list in Ontario. It is a long-lived perennial herb, but slow-growing, so replenishing its population will take time. How can we protect the wild plant? What might be some alternative ways of getting the plant without taking it from the wild?

2. Developing Investigation and Communication Skills

By the end of Grade 4, students will:

- 2.1 follow established safety procedures for working with soils and natural materials (*e.g., wear gloves when handling soils to set up a working terrarium*)
- 2.2 build food chains consisting of different plants and animals, including humans

- 2.3 use scientific inquiry/research skills (see page 15) to investigate ways in which plants and animals in a community depend on features of their habitat to meet important needs (*e.g., beavers use water for shelter [they build their lodges so the entrance is under water], food [cattails, water lilies, and other aquatic plants], and protection [they slap their tails on the water to warn of danger]*)
- 2.4 use scientific inquiry/research skills (see page 15) to create a living habitat containing a community, and describe and record changes in the community over time
- Sample guiding questions:** What factors need to be considered when setting up your habitat (e.g., location for container; creating the right climate, light, and humidity)? What equipment and materials (e.g., a container of the correct size, appropriate plant material and/or animals) will you need to create a habitat that meets the needs of the community it supports? What did you learn from your initial observations about meeting the needs of living things? What modifications, based on your observations, need to be made to keep the habitat healthy?
- 2.5 use appropriate science and technology vocabulary, including **habitat, population, community, adaptation, and food chain**, 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., use presentation software to show the steps one might follow to set up and maintain a terrarium*)
- 3.3 identify factors (*e.g., availability of water or food, amount of light, type of weather*) that affect the ability of plants and animals to survive in a specific habitat
- 3.4 demonstrate an understanding of a community as a group of interacting species sharing a common habitat (*e.g., the life in a meadow or in a patch of forest*)
- 3.5 classify organisms, including humans, according to their role in a food chain (*e.g., producer, consumer, decomposer*)
- 3.6 identify animals that are carnivores, herbivores, or omnivores
- 3.7 describe structural adaptations that allow plants and animals to survive in specific habitats (*e.g., the thick stem of a cactus stores water for the plant; a duck's webbed feet allow it to move quickly and efficiently in water*)
- 3.8 explain why changes in the environment have a greater impact on specialized species than on generalized species (*e.g., diminishing ice cover hampers the ability of polar bears to hunt seals, their main food source, and so the polar bear population in some areas is becoming less healthy and may begin to decrease; black bear habitat has been heavily disrupted by human encroachment, but because black bears are highly adaptable omnivores that eat everything from insects to garbage generated by humans, their numbers have been increasing*)
- 3.9 demonstrate an understanding of why all habitats have limits to the number of plants and animals they can support
- 3.10 describe ways in which humans are dependent on natural habitats and communities (*e.g., for water, medicine, flood control in wetlands, leisure activities*)

3. Understanding Basic Concepts

By the end of Grade 4, students will:

- 3.1 demonstrate an understanding of habitats as areas that provide plants and animals with the necessities of life (*e.g., food, water, air, space, and light*)
- 3.2 demonstrate an understanding of food chains as systems in which energy from the sun is transferred to producers (plants) and then to consumers (animals)

GRADE 4 | UNDERSTANDING STRUCTURES AND MECHANISMS

PULLEYS AND GEARS

OVERVIEW

This strand helps students broaden their understanding of simple machines by looking at two special kinds of wheels: pulleys and gears. Students will learn that pulleys and gears can transfer motion from one object to another, transform one kind of motion into another, change the speed and direction of an object's motion, and change the amount of force needed to move an object. They will identify how these devices are used to improve everyday life, learn about mechanical advantage, and apply what they have learned through investigations of their own design.

Pulleys and gears are so much a part of daily life that it would be easy to overlook their impact. As students learn about the mechanics of these simple machines, consideration should also be given to how different groups might view these devices. A physically challenged person who gains some freedom and independence by using elevators, for example, may have a different perspective from the person who is able to use stairs. When students consider issues from perspectives other than their own, they begin to see how biases develop and, in turn, learn to form their own opinions on relevant issues.

It is important that students be able to identify and demonstrate an understanding of practices that ensure their own personal safety and the safety of others when designing, building, and testing devices that use pulleys and gears. This includes knowing why long hair should be tied back and loose jewellery removed when working with pulleys and gears, and why pulleys and gears need to be securely fastened before testing them with a load.

Connections can be made to the Grade 4 social studies topic Heritage and Citizenship: Medieval Times. Students can see that simple machines have been in use for a very long time, and can compare the forms of energy used to operate machines today with those used to operate machines in the past.

Fundamental Concepts	Big Ideas
Systems and Interactions Energy	<p>Pulleys and gears change the speed, direction, and motion of, and force exerted on, moving objects. (Overall expectations 2 and 3)</p> <p>Pulleys and gears make it possible for a small input force to generate a large output force. (Note: Grade 4 students need to understand mechanical advantage only in its qualitative sense). (Overall expectation 1)</p> <p>Gears are specialized wheels and axles that are used daily in many machines. (Overall expectations 1, 2, and 3)</p>

OVERALL EXPECTATIONS

By the end of Grade 4, students will:

1. evaluate the impact of pulleys and gears on society and the environment;
2. investigate ways in which pulleys and gears modify the speed and direction of, and the force exerted on, moving objects;
3. demonstrate an understanding of the basic principles and functions of pulley systems and gear systems.

SPECIFIC EXPECTATIONS

1. Relating Science and Technology to Society and the Environment

By the end of Grade 4, students will:

- 1.1 assess the impact of pulley systems and gear systems on daily life

Sample issues: Elevators and other lifting devices use pulley and gear systems; they allow people with physical challenges to have equal access to all floors of a building. Bicycles use gears; they provide us with transportation and exercise. Snowmobiles, VCRs, and joysticks use pulleys and/or gears; they provide us with leisure activities. Clothes dryers and clotheslines, sewing machines, and windshield wipers on cars and trucks use pulleys and/or gears. However, many of these mechanisms require power to operate.

- 1.2 assess the environmental impact of using machines with pulleys and gears, taking different perspectives into account (*e.g., the perspectives of a car driver or cyclist, someone who is physically challenged, the owner of a multi-floor building*), and suggest ways to minimize negative impacts and maximize positive impacts

Sample issues: (a) Escalators run all the time, using large amounts of electrical energy. (b) A clothesline and a clothes dryer, which use pulleys or gears, are both used to dry clothes. Using a clothes dryer is faster than drying clothes on a line, but the environmental impact of the dryer is greater because it uses electricity or natural gas. (c) Gears reduce the effort needed to pedal a bicycle, but riding a bicycle still requires more effort and takes longer than driving a car to the same destination. However, the bicycle is more environmentally friendly because it does not use fossil fuel.

2. Developing Investigation and Communication Skills

By the end of Grade 4, students will:

- 2.1 follow established safety procedures for working with machinery (*e.g., check to ensure that pulley systems are firmly attached to a secure support before operating them; be aware that changing a larger gear wheel to a smaller one will change the speed at which the mechanism moves*)

- 2.2 use scientific inquiry/experimentation skills (see page 12) to investigate changes in force, distance, speed, and direction in pulley and gear systems

Sample guiding questions: What happens when the number of pulleys in a system is increased? When the number is decreased? How does the force required to raise a load change when the number of pulleys is changed? How does the distance over which the force is exerted change? What happens when you change the size of one of the wheels in a gear system? What gear system will you use to change the direction of the motion?

- 2.3 use technological problem-solving skills (see page 16) to design, build, and test a pulley or gear system that performs a specific task

Sample problems: Design, build, and test a mechanism that will raise and lower a flag. Design, build, and test a changing billboard. Design, build, and test a model elevator that could be used in a barn. Design, build, and test a model drawbridge for a castle.

- 2.4 use appropriate science and technology vocabulary, including **pulley**, **gear**, **force**, and **speed**, in oral and written communication

- 2.5 use a variety of forms (*e.g., oral, written, graphic, multimedia*) to communicate with different audiences and for a variety of purposes (*e.g., write a set of instructions for setting up a pulley system*)

3. Understanding Basic Concepts

By the end of Grade 4, students will:

- 3.1 describe the purposes of pulley systems and gear systems (*e.g., to facilitate changes in direction, speed, or force*)
- 3.2 describe how rotary motion in one system or its components (*e.g., a system of pulleys of different sizes*) is transferred to another system or component (*e.g., a system of various gears*) in the same structure
- 3.3 describe how one type of motion can be transformed into another type of motion using pulleys or gears (*e.g., rotary to linear in a rack and pinion system, rotary to oscillating in a clock pendulum*)

- 3.4 describe, using their observations, how gears operate in one plane (*e.g., spur gears, idler gears*) and in two planes (*e.g., crown, bevel, or worm gears*)
- 3.5 distinguish between pulley systems and gear systems that increase force and those that increase speed
- 3.6 identify pulley systems (*e.g., clotheslines, flagpoles, cranes, elevators, farm machinery*) and gear systems (*e.g., bicycles, hand drills, can openers*) that are used in daily life, and explain the purpose and basic operation of each
- 3.7 explain how the gear system on a bicycle works (*e.g., by using the largest gear on the front chain ring and the smallest gear on the rear wheel, we can move quickly along a flat surface*)
- 3.8 identify the input components that drive a mechanism and the output components that are driven by it (*e.g., the pedals on a bike are the input component; the rear wheel is the output component*)

GRADE 4 | UNDERSTANDING MATTER AND ENERGY

LIGHT AND SOUND

OVERVIEW

Students will become familiar with the properties of light and sound by investigating and observing how these forms of energy interact with various objects in the environment. Materials can be used to transmit, reflect, or absorb light and sound. By exploring the factors that affect sound and light, students will discover ways in which they can be controlled. Students will begin to apply this knowledge by constructing simple auditory and optical devices and by examining the impact of technologies related to sound and light on our everyday lives, including their use of energy. It is necessary to provide opportunities for students with special education needs to participate in these or comparable activities.

When gathering information to make informed choices, students must be encouraged to look beyond their own place in the world and consider the opinions and feelings of others. As they study innovations related to light and sound, students should consider, for example, how their use of personal music players affects those around them. By considering the feelings and well-being of others, students will begin to make personal choices that are fair and equitable.

It is important that students be able to identify and demonstrate an understanding of practices that ensure their own personal safety and the safety of others. For example, when conducting experiments with sound and sound-producing devices, students need to know why safe volume levels must be observed. When conducting experiments with light and light-producing devices, students need to know why sunlight reflected from a mirror should be aimed away from people's eyes and from materials that might be ignited.

Fundamental Concepts	Big Ideas
Energy	<p>Light and sound are forms of energy with specific properties. (<i>Overall expectations 2 and 3</i>)</p> <p>Sound is created by vibrations. (<i>Overall expectations 2 and 3</i>)</p> <p>Light is required to see. (<i>Overall expectation 3</i>)</p> <p>Technological innovations involving light and sound have an impact on the environment. (<i>Overall expectation 1</i>)</p>

OVERALL EXPECTATIONS

By the end of Grade 4, students will:

1. assess the impact on society and the environment of technological innovations related to light and sound;
2. investigate the characteristics and properties of light and sound;
3. demonstrate an understanding of light and sound as forms of energy that have specific characteristics and properties.

SPECIFIC EXPECTATIONS

1. Relating Science and Technology to Society and the Environment

By the end of Grade 4, students will:

- 1.1 assess the impacts on personal safety of devices that apply the properties of light and/or sound (*e.g., UV-coated lenses in sunglasses, safety eyes on garage door openers, reflective material on clothing, ear plugs, backup signals on trucks and cars, MP3 players, cellphones*), and propose ways of using these devices to make our daily activities safer

Sample prompts: (a) It is important to be physically active in our daily lives. Walking, skateboarding, rollerblading, and bicycling are all good forms of exercise that take place outside. When taking part in these activities we should be sure to wear sunglasses that protect our eyes from the sun and wear clothing marked with reflective material so we can be seen by motorists. (b) Using MP3 players or cellphones while walking, riding, or driving can prevent us from hearing warning noises or divert our attention from approaching dangers. (c) Ear plugs can protect our ears from excessive noise from lawn mowers and power tools.

- 1.2 assess the impacts on society and the environment of light and/or sound energy produced by different technologies, taking different perspectives into account (*e.g., the perspectives of someone who has to walk on the street late at night, a cottage owner, a person who is hearing impaired, manufacturers of and merchants who sell MP3 players*)

Sample issues: (a) Streetlights increase visibility and make areas safer for people to move about in the city at night. However, they use large amounts of electrical energy and contribute to light pollution that obscures the features of the night sky. Also, birds may be disoriented by lights from tall buildings and may be killed when they hit the buildings. (b) Items like gasoline-powered lawn mowers and leaf blowers make work easier, and items like jet skis provide enjoyment to the user. However, these technologies also create noise pollution. (c) Advances in electronic technology have allowed us to develop hearing aids for people who might never have been able to hear well without them. However, these same advances have allowed us to create powerful

sound systems and devices like personal music players that can be played at volume levels that annoy others and are potentially damaging to human hearing.

2. Developing Investigation and Communication Skills

By the end of Grade 4, students will:

- 2.1 follow established safety procedures for protecting eyes and ears (*e.g., use proper eye and ear protection when working with tools*)
- 2.2 investigate the basic properties of light (*e.g., conduct experiments to show that light travels in a straight path, that light reflects off of shiny surfaces, that light refracts [bends] when passing from one medium to another, that white light is made up of many colours, that light diffracts [bends and spreads out] when passing through an opening*)
- 2.3 investigate the basic properties of sound (*e.g., conduct experiments to show that sound travels, that sound can be absorbed or reflected, that sound can be modified [pitch, volume], that there is a relationship between vibrations and sound*)
- 2.4 use technological problem-solving skills (see page 16) to design, build, and test a device that makes use of the properties of light (*e.g., a periscope, a kaleidoscope*) or sound (*e.g., a musical instrument, a sound amplification device*)
- Sample guiding questions:** How might you use what you know about sound or about light and mirrors in your device? Which properties of light or sound will be most useful to you in your device? What challenges might you encounter, and how can you overcome them?
- 2.5 use scientific inquiry/research skills (see page 15) to investigate applications of the properties of light or sound (*e.g., careers where knowledge of the properties of light and/or sound play an important role [photography, audio engineering]; ways in which light and/or sound are used at home, at school, and in the community; ways in which animals use sound*)
- 2.6 use appropriate science and technology vocabulary, including *natural, artificial, beam of light, pitch, loudness, and vibration*, 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., create a song or short drama presentation for younger students that will alert them to the dangers of exposure to intense light and sound*)

3. Understanding Basic Concepts

By the end of Grade 4, students will:

- 3.1 identify a variety of natural light sources (*e.g., the sun, a firefly*) and artificial light sources (*e.g., a candle, fireworks, a light bulb*)
- 3.2 distinguish between objects that emit their own light (*e.g., stars, candles, light bulbs*) and those that reflect light from other sources (*e.g., the moon, safety reflectors, minerals*)
- 3.3 describe properties of light, including the following: light travels in a straight path; light can be absorbed, reflected, and refracted
- 3.4 describe properties of sound, including the following: sound travels; sound can be absorbed or reflected and can be modified (*e.g., pitch, loudness*)
- 3.5 explain how vibrations cause sound
- 3.6 describe how different objects and materials interact with light and sound energy (*e.g., prisms separate light into colours; voices echo off mountains; some light penetrates through wax paper; sound travels further in water than air*)
- 3.7 distinguish between sources of light that give off both light and heat (*e.g., the sun, a candle, an incandescent light bulb*) and those that give off light but little or no heat (*e.g., an LED, a firefly, a compact fluorescent bulb, a glow stick*)
- 3.8 identify devices that make use of the properties of light and sound (*e.g., a telescope, a microscope, and a motion detector make use of the properties of light; a microphone, a hearing aid, and a telephone handset make use of the properties of sound*)

GRADE 4 | UNDERSTANDING EARTH AND SPACE SYSTEMS

ROCKS AND MINERALS

OVERVIEW

The study of rocks and minerals introduces students to the science of geology. By examining different types of rocks and minerals found in the earth’s crust, students will learn that the unique characteristics and properties of rocks and minerals are a result of how they were formed. Such properties determine possible uses. It is important that students become aware of how human uses of rocks and minerals not only alter the landscape but also affect the environment in various other ways.

Because rocks and minerals are such an integral part of our lives, it may be hard for students in Grade 4 to see the issues clearly. It would be very easy for their viewpoint to be skewed as they come to realize the impacts associated with just one person’s yearly use of these natural resources (including impacts from mining, manufacturing, use, and disposal). Therefore, it is critical that they be given opportunities to look at the issues from the standpoint of all stakeholders: mining companies, communities where the mines are located, manufacturers, those who are dependent on the natural environment, and people who benefit from the use of the products – the students and their families. In communities where mining or related manufacturing processes provide the livelihood for parents of many students, teachers must be sensitive to the feelings of all students when discussing the costs and benefits of using everyday objects and products made from rocks and minerals.

It is important that students be able to identify and demonstrate an understanding of practices that ensure their own personal safety and the safety of others. For example, students need to know that some places might be unsafe for collecting their rock samples (e.g., a construction site) and that they need to wear eye protection when conducting investigations (e.g., when chipping samples).

Fundamental Concepts	Big Ideas
Change and Continuity	Rocks and minerals have unique characteristics and properties that are a result of how they were formed. <i>(Overall expectations 2 and 3)</i>
Sustainability and Stewardship	The properties of rocks and minerals determine society’s possible uses for them. <i>(Overall expectations 1 and 2)</i>
Structure and Function	Our use of rocks and minerals affects the environment. <i>(Overall expectation 1)</i>

OVERALL EXPECTATIONS

By the end of Grade 4, students will:

1. assess the social and environmental impacts of human uses of rocks and minerals;
2. investigate, test, and compare the physical properties of rocks and minerals;
3. demonstrate an understanding of the physical properties of rocks and minerals.

SPECIFIC EXPECTATIONS

1. Relating Science and Technology to Society and the Environment

By the end of Grade 4, students will:

- 1.1 assess the social and environmental costs and benefits of using objects in the built environment that are made from rocks and minerals

Sample issues: (a) Quarried stone, sand, and gravel are used to make concrete. We need the strength and long life that concrete gives to roads and buildings, but making concrete uses a lot of natural resources and energy. (b) Aluminum is used to make soft drink containers and trash cans. It can be recycled many times, and recycling uses much less energy than making aluminum from ore. (c) One person uses 5.4 kilograms of salt per year on food and another 180 kilograms a year for other things, such as de-icing roads and sidewalks in winter. We need salt in our diet, but when we use it excessively on our roads and sidewalks, it causes damage to cars, water, and plants. (d) Clay is used to make plates and mugs, bricks for buildings, and kitty litter, but clay is mined. The products made from it break down at rates that are similar to those for other rocks.

- 1.2 analyse the impact on society and the environment of extracting and refining rocks and minerals for human use, taking different perspectives into account (*e.g., the perspectives of mine owners, the families of the miners, Aboriginal communities, the refinery workers, manufacturers of items who need the refined rocks and minerals to make their products, residents who live in communities located near refineries and manufacturing facilities and who are concerned about the environment*)

Sample issues: (a) Surface mining is used to extract rocks and minerals for eventual human use. It is less hazardous for humans than underground mining, but it has a greater impact on the surface landscape, including the removal of significant amounts of rich topsoil. Efforts are being made by mining companies to reclaim land where mines and quarries have been closed. Mined-out quarries can be filled with water and used for recreational purposes. When a mine is closed, the topsoil that had been removed can be replaced and native species replanted. (b) The smelting process is necessary to extract the

metals contained in some ores that can then be made into products for human use. But the process produces waste materials, including gases that contribute to climate change, acid rain, and smog.

2. Developing Investigation and Communication Skills

By the end of Grade 4, students will:

- 2.1 follow established safety procedures for outdoor activities and for working with tools, materials, and equipment (*e.g., use scratch and streak test materials for the purposes for which they are intended; when working outdoors, leave the site as it was found*)
- 2.2 use a variety of tests to identify the physical properties of minerals (*e.g., hardness [scratch test], colour [streak test], magnetism*)
- 2.3 use a variety of criteria (*e.g., colour, texture, lustre*) to classify common rocks and minerals according to their characteristics
- 2.4 use scientific inquiry/research skills (see page 15) to investigate how rocks and minerals are used, recycled, and disposed of in everyday life (*e.g., nickel and copper are made into coins; coins that are out of circulation can be melted down and the metal can be used for making other things; calcium [from limestone], silicon [from sand or clay], aluminum [from bauxite], and iron [from iron ore] are made into cement that is used for roads and buildings; concrete can be returned to cement and concrete production facilities, and can be recycled; rocks from quarries are used for garden landscaping, and these rocks can be reused; marble is used for countertops and statues*)

Sample guiding questions: Where might we find products made from rocks and minerals in our daily life? How might you find out other ways in which rocks and minerals are used in everyday items? Why might some people and groups have concerns about the use of some of these rocks and minerals? What might be some alternative materials that could be used instead of the rocks and minerals? How are some of the items made from rocks and/or minerals disposed of when they are no longer useful? Which minerals can be recycled or reused in other products?

- 2.5 use appropriate science and technology vocabulary, including **hardness**, **colour**, **lustre**, and **texture**, 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., use a graphic organizer to show how rocks and minerals are used in daily life*)

3. Understanding Basic Concepts

By the end of Grade 4, students will:

- 3.1 describe the difference between rocks (composed of two or more minerals) and minerals (composed of the same substance throughout), and explain how these differences determine how they are used
- 3.2 describe the properties (*e.g., colour, lustre, streak, transparency, hardness*) that are used to identify minerals
- 3.3 describe how igneous, sedimentary, and metamorphic rocks are formed (*e.g., Igneous rocks form when hot, liquid rock from deep below the earth's surface rises towards the surface, cools, and solidifies, for instance, after a volcanic eruption. Sedimentary rocks form when small pieces of the earth that have been worn away by wind and water accumulate at the bottom of rivers,*

lakes, and oceans and are eventually compacted and consolidated into rock; they can also be formed when sea water evaporates and the dissolved minerals are deposited on the sea floor. Metamorphic rocks form when pre-existing rocks are changed by heat and pressure.)

- 3.4 describe the characteristics of the three classes of rocks (*e.g., Sedimentary rocks often have flat layers, are composed of pieces that are roughly the same size with pores between these pieces that are commonly filled with smaller grains, and sometimes contain fossils. Igneous rocks generally have no layers, have variable textures, and do not contain fossils. Metamorphic rocks may have alternating bands of light and dark minerals, or may be composed predominantly of only one mineral, such as marble or quartzite, and rarely contain fossils.*), and explain how their characteristics are related to their origin