



Let's Do Science

Grade One

Seasonal Changes



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Seasonal Changes Before You Begin

In this unit, students explore how weather-changes in the local environment affect their lives, and are guided to discover there are larger seasonal patterns of change that affect the life habits of many living things. Interactions among different parts of the environment and cyclical change are important science ideas introduced in this topic.

Students are given many opportunities to observe seasonal changes throughout the year. The changes they note in plants and animals will appeal to their natural curiosity.

Topic B: Seasonal Changes

(Suggested time: throughout the year during the various seasons)

Activities from the Seasonal Changes unit can be combined with activities from the Needs of Animals and Plants unit for a more comprehensive study of the adaptations of plants and animals to changes in the seasons. September and early October are ideal times to explore ways that animals, plants and people prepare for the cold winter and to record the shorter days, temperature decreases and increasing incidence of storms. (See *Innovations in Science, Level 1, Autumn Changes.*)

Establishing a Seasonal Changes centre in the classroom can help develop a cohesive, year-round theme. Provide posters, food, clothing, tools, sports equipment, seasonal pictures of animals and plants and other appropriate materials. *Innovations in Science, Level 1, A Tree for All Seasons* provides a number of year-round plant activities. In *Innovations in Science, Level 2, Whatever the Weather* there are winter poems and cold weather activities for students.

To prepare for this theme you will need to gather calendar patterns for the year, seasonal posters and student clipboards (made of cardboard and clothespins) for recording observations during outdoor activities. Find a nearby park with suitable trees for the year-long study. Request seasonal pictures from calendars and magazines in a letter to the parents. Field trips to a conservation area, zoo or farm should be booked well in advance.

Students should have a special Seasonal Changes science journal in which they can sketch, record observations and make graphs.

Background Information

Do you have a tendency to sleep in late in the morning during the dark, cold days of winter and jump out of bed so early during the summer months that you're left wondering what to do with all the time you have on your hands? Most people go through annual swings in their need for sleep—just one way our bodies long ago adapted to cope with seasonal changes in the environment. You can see the survival value in it. Until recently in the course of human existence, it was dangerous to be up before dawn in the cold of winter, stumbling around in the dark, needlessly using up precious reserves of food energy. Likewise, on fine summer mornings it was highly inadvisable to lay around sleeping once the sun came up and the predators came out.

Many species within the plant and animal kingdoms have developed physical adaptations and coping strategies to survive the changes in weather and hours of sunlight that accompany the change in season. (For a description of these changes and a full explanation of why we experience seasons, see the grade 6 unit Sky Science.) Following are a few of the most successful and widely used means of getting through the seasons.

Changing Form and Appearance

Many mammals that live in northern parts of the world and are active on a year-round basis—such as wolves, hares, coyotes and deer—have fur coats that become thicker in the winter and thinner in summer. Some species even grow different-colour coats of fur at different times of the year to provide *camouflage* so they match the changing landscape. The snowshoe hare, for example, has light brown or grayish outer hairs (“guard” hairs) from late spring through early fall that drop out and are replaced with white guard hairs during the winter; the snowshoe hare virtually disappears against the backdrop of snow.

Changing Location

Numerous and varied animals (caribou, whales, salmon, birds and monarch butterflies, to name a few) migrate annually to regions that offer more suitable living conditions (warmer temperatures, greater food supply). This can occur as a geographical displacement across a distance (e.g., monarch butterflies from Canada winter in Mexico) or as a vertical change in position (e.g., some species of fish inhabit the lower depths of a body of water during the winter and the upper layers during warmer seasons). Hormones secreted by the pituitary gland in the brain (which is clued in to the time of year via day length) bring on physiological changes in the fall, such as the build-up of fat deposits that prepare these animals for migration. In addition to physiological changes triggered by the dwindling hours of daylight, environmental pressures are factors in determining the exact timing of migration—especially a lack of readily accessible food. Flexibility in migration time is important because the point where lack of food becomes critical can occur at different times from year to year.

Changing Level of Activity

Some migrations span incredible distances. How do the animals manage to return to the same home base year after year? This is still somewhat of a mystery. Research has shown that navigating techniques vary from one type of animal to another. A large variety of animals possess a means of detecting the local alignment of the earth's magnetic field. This provides them with a sense of direction, regardless of time of day or weather conditions. It has also been demonstrated that some bird species that migrate by night use the stars as navigational aids. The recognition of landmarks, both large-scale and small-scale, also plays a role in their ability to return to the breeding ground where they were born.

Some animals deal with the stress of inhospitable weather by simply "sleeping" through it. *Hibernation* (from the latin for "winter") is a pronounced drop in body function levels (such as metabolic rate, respiration and heart rate), with body temperature dropping almost to the level of the surroundings; the animal is unresponsive to stimuli. Hibernating animals range from amphibians to bats, snakes and ground squirrels. Bears go into a deep sleep that only mimics true hibernation. They den up and sleep most of the winter, but their body temperature drops only a few degrees, and they show only a small drop in metabolic rate. For some species, the entire adult population (such as the snow mosquito of the Canadian Rockies) dies off every winter, leaving eggs for a new generation buried beneath the snow.

In Alberta we are familiar with hibernating animals. It's not as widely known that in hotter, drier parts of the world a similar type of annual dormancy occurs in the summer. *Aestivation* is a state of torpor that besets many desert species, allowing them to conserve water during the worst periods of drought.

Producing Young on a Seasonal Basis

Humans are one of the few species that have young at any time of the year. Most animals can procreate only at a time that ensures their offspring will not be born during the worst weather conditions of the year, thus standing a greater chance of survival. Hormones produced by the pituitary gland, taking cues from the seasonal length of daylight, trigger reproduction at the appropriate time.

Building Shelters

Ground burrows, middens and lodges are structures built by some small mammals to obtain protection from harsh seasonal weather and predators. Pocket gophers and water voles are two species, among many, that dig tunnel systems deep below the frost line, complete with storage rooms for winter food supplies. Red squirrels dig their burrows beneath extensive trash heaps they pile up called *middens*. In the fall, they add

stores of pine cones to the middens and access these as sources of food (pine seeds) over the winter. Likewise, during the fall, beavers cut and store saplings and branches in the bottom mud near the underwater outlets to their lodges (hollow stick-and-mud constructions built above water level), ensuring a winter-long supply of food below the iced-over surface of the pond. Muskrats also build lodges but, unlike the year-round lodges of beavers, these are temporary winter shelters built anew every fall and do not accommodate food supplies.

Plants also have ways of coping with winter. Deciduous trees and shrubs drop their leaves in fall to prevent the continued evaporation of water through leaf surfaces, a process that would dry out and kill the plant over winter as supplies of replenishing liquid water at root level freeze up. Other plants die off at the first hard frost but ensure propagation of their species by producing seeds, tubers, rhizomes and bulbs that survive underground or under a blanket of snow until the next growing season (see the grade 4 unit Plant Growth and Changes).

Humans have learned to use sheer intelligence to devise ways to cope with the consequences of seasonal climatic fluctuations. Not surprisingly, many of the solutions we have mimic the adaptations developed by other species. We don extra clothing in the winter and shed excess clothing in the summer. We build dwellings that protect us from the elements on a year-round basis. We even fly south on winter vacations—if our pocketbooks cooperate!

Elementary Science Program of Studies

General and Specific Learner Expectations

The following general and specific learner expectations have been taken directly from the 1996 Elementary Science Program of Studies. The specific learner expectations (SLEs) are referred to by number in the second column of the activities table.

General Learner Expectation

Students will be able to:

Describe seasonal changes, and interpret the effects of seasonal changes on living things.

Specific Learner Expectations

Students will be able to:

1. Describe the regular and predictable cycle of seasonal changes:
 - changes in sunlight
 - changes in weather
2. Identify and describe examples of plant and animal changes that occur on a seasonal basis:
 - changes in form and appearance
 - changes in location of living things
 - changes in activity; for example, students should recognize that many living things go into a dormant period during winter and survive under a blanket of snow as a seed or an egg
 - production of young on a seasonal basis
3. Identify human preparations for seasonal change and activities that are done on a seasonal basis.
4. Record observable seasonal changes over a period of time.

Cross-curricular Connections

This topic is related to the grade 1 unit Needs of Animals and Plants. To cover the Specific Learner Expectations, these two topics could be studied together.

Language Arts

- Writing pattern stories such as:
 - "I'll know it's spring when..."
 - "Early one spring morning, while on my way to school, I saw 1 _____, 2 _____, 3 _____ etc." or
 - "Early one winter morning, while on my way to school, I saw 1 _____, 2 _____, 3 _____"

Children's Alternative Frameworks

- General Outcome 3: Access information

Groups of students view paintings of seasonal scenes and make observations

- Write seasonal experience stories as a group or as individuals

Drama

- Dramatize animals or birds that live in a tree to show how the tree provides them with a home and food
- Dramatize farmers planting in spring, caring for crops in summer and harvesting in the fall
- Perform puppet plays about animals or people preparing for winter or people doing winter sports

Mathematics

- Graph weather changes
- Solve addition and subtraction problems using seasonal stories and seasonal shapes
- Collect data (e.g., *Explorations in Science, Level 1*, p. 22, 23)

Art

- Make paper, seasonal fruit and vegetable prints, seasonal mobiles and mural art illustrating seasonal stories
- Make paper pies and canned fruit and vegetables from construction paper
- Identify colours in nature using colour chips

Social Studies

- Have the class develop a questionnaire for the school caretaker to answer.
 - How do you prepare the school building and area in the fall?
 - How does your work change in the winter?
 - How does your work change in the spring?

Furuness and Cohen (1989) studied children's conceptions of the seasons using three different research techniques. Their findings, which are similar to those of Carter (1981) and Stepan and Kuehn (1985), summarized children's conceptions of the seasons as follows.

1. The world turns around, and we do not face the Sun in the wintertime.
2. The orbit of Earth brings it closer to the sun during the summer. Earth is farther away from the sun in the winter.

3. Because the Earth is tilted, the Sun hits more directly in the summer and makes the Earth warmer. The Earth actually leans over as it “tilts” toward the Sun during summer and “tilts” away from the Sun during the winter.
4. The Sun comes out more in the summer; the Sun gets hotter in the summer. There is a different Sun during the summer and winter, or the Sun is sometimes hot and sometimes cool.
5. The Sun does not shine during the winter.
6. In the winter, clouds make sleet and snow, and therefore we have winter.
7. The Earth and Sun can easily stop, start or change their direction of movement or orbit.
8. The weather (climate) on Earth becomes warmer as you move toward the equator. The seasons are less distinct as you move from the poles to the equator. The Sun is always “overhead” at the equator.

Activities

Classroom teachers have identified the following activities that address the Specific Learner Expectations (SLEs) in the Program of Studies. The list is not prescriptive and teachers may select activities that are most appropriate for their students.

Activities have been listed under two headings: Key Activities and Extension Activities. Key activities are supported by authorized resources and identify “powerful and practical” means for achieving learner expectations. Extension activities represent alternative ways of achieving or supporting learner expectations.

Key Activities

Key Activity	SLE	Print Resources	Essential Materials	Comments
Examining pictures and classifying in which season they were taken	1, 2, 3	<i>Explorations in Science, Level 1, Today's Forecast (Picture a Season), p. 16</i>	pictures from calendars, magazines, travel brochures (laminated if possible)	The students' reasons for classifying will give the teacher insight into children's prior ideas. The pictures can be used again for evaluation at the end of the study. Add photographs taken outside throughout the school year.
Observing, comparing and recording weather conditions to learn about daily and seasonal changes	1, 4	<i>Explorations in Science, Level 1, Today's Forecast (Weather Report), p. 10</i> <i>Explorations in Science, Level 1, Today's Forecast (Weather Watch), p. 11</i> <i>Explorations in Science, Level 1, Today's Forecast (Cloudy Days), p. 13</i> <i>Explorations in Science, Level 1, Today's Forecast (Walking in the Rain), p. 14</i>	chart paper, clipboard clipboard	This activity should be done on an ongoing basis so that seasonal comparisons can be made.
Going on seasonal study walks	2, 3	<i>Explorations in Science, Level 1, Today's Forecast (Season Walks), p. 15</i> <i>Knee High Nature: Fall. A Guide to Nature Activities and Fun (Hayley and Wishart) (Some Fall Walks), p. 13</i> <i>Knee High Nature: Winter. A Guide to Nature Activities and Fun (Hayley and Wishart) (Some Winter Walks), p. 12</i> <i>Innovations in Science, Level 1, Autumn Changes (Discovering Autumn), p. 5</i>	appropriate clothing for a seasonal walk, clipboard, chart paper, cardboard, clothespins, paper plates, mural paper, construction paper, pastels, crayons or paint, paper from a pattern book, pressed leaves, video recorder, tape recorder	Examples of themes for a seasonal walk include a leaf walk, a seed walk, a track walk, an animal friend walk and a colour walk. Video recorders and tape recorders can be taken on each walk to record the sights and sounds of each season. This activity could be adapted for each season.

Key Activity	SLE	Print Resources	Essential Materials	Comments
Observing birds during each season	2	<p><i>Explorations in Science, Level 1, Today's Forecast (Bird Watch)</i>, p. 19</p> <p><i>Knee High Nature: Winter. A Guide to Nature Activities and Fun</i> (Hayley and Wishart) (<i>Winter Birds</i>), p. 29</p> <p><i>Knee High Nature: Fall. A Guide to Nature Activities and Fun</i> (Hayley and Wishart) (<i>Fall Bird Migration</i>), p. 159</p>	collection of items to be made into bird feeders	Have the students bring materials from home.
Observing and exploring season changes in plants and animals	2	<p><i>Knee High Nature: Fall. A Guide to Nature Activities and Fun</i> (Hayley and Wishart) (<i>Squirrels, Chipmunks and Marmots</i>), p. 15</p> <p><i>Knee High Nature: Fall. A Guide to Nature Activities and Fun</i> (Hayley and Wishart) (<i>Trees, Shrubs, Nuts and Seeds</i>), p. 71</p> <p><i>Knee High Nature: Winter. A Guide to Nature Activities and Fun</i> (Hayley and Wishart) (<i>Here Comes Winter</i>), p. 13</p> <p><i>Knee High Nature: Winter. A Guide to Nature Activities and Fun</i> (Hayley and Wishart) (<i>Winter Birds</i>), p. 29</p> <p><i>Knee High Nature: Winter. A Guide to Nature Activities and Fun</i> (Hayley and Wishart) (<i>Mice, Voles and Rats</i>), p. 61</p> <p><i>Knee High Nature: Winter. A Guide to Nature Activities and Fun</i> (Hayley and Wishart) (<i>Hares and Rabbits</i>), p. 89</p> <p><i>Knee High Nature: Winter. A Guide to Nature Activities and Fun</i> (Hayley and Wishart) (<i>Deer Family and Friends</i>), p. 99</p>		

Key Activity	SLE	Print Resources	Essential Materials	Comments
Observing changes in trees during each season	1, 2, 4	<p><i>Explorations in Science, Level 1, Today's Forecast (Our Tree)</i>, p. 17</p> <p><i>Innovations in Science, Level 1, A Tree for All Seasons (Adopt a Tree)</i>, p. 5</p> <p><i>Innovations in Science, Level 1, A Tree for All Seasons (Winter Watch)</i>, p. 20</p> <p><i>Innovations in Science, Level 1, A Tree for All Seasons (Spring Has Sprung)</i>, p. 27</p>	<p>tree on or near school grounds, science journal, feely box, tree parts (cones, leaves, needles, bark, twigs), chart paper, coloured chalk or pens, crayons, coloured ribbons, camera, measuring tape, string, drawing paper</p> <p>chart paper, pieces of bark, crayons, art paper, cross-section of a tree trunk</p> <p>measuring tape, string, plastic sandwich bags, twist ties, long strips of paper divided into squares</p>	<p>Autumn activity: the “Adopt-a-Tree” activity can be done in September with a follow-up of the activity “Winter Watch” later in the season. Students can draw the tree in its changing environment in science journals, and write a story about the tree in language arts.</p> <p>Spring activity: Follow-up of the September “Adopt-a-Tree” activity</p>
Observing how weather affects people and animals	1, 2, 3, 4	<p><i>Explorations in Science, Level 1, Today's Forecast (Through the Window)</i>, p. 21</p> <p><i>Explorations in Science, Level 1, Today's Forecast (Feelings About Weather)</i>, p. 12</p> <p><i>Explorations in Science, Level 1, It's Raining, It's Shining (An Imaginary Trip)</i>, p. 23</p>	<p>art materials, line master 2</p> <p>as requested by the students</p>	<p>Can be done in groups. This type of activity could be done each season with a different focus (e.g., animals getting ready for winter, winter sports, spring plants, summer fun).</p>
Collecting and graphing information related to the seasons	3, 4	<p><i>Explorations in Science, Level 1, Today's Forecast (Seasonal Graphs)</i>, p. 22</p>	<p>index cards, drawing materials, large mural paper</p>	

Extension Activities

Extension Activity	SLE	Print Resources	Essential Materials	Comments
Exploring the relationship between the shape of the leaf and the way it falls from the tree	2	<i>Innovations in Science, Level 1, Autumn Changes (Spinning Leaves)</i> , p. 12	collection of leaves, lightweight paper, paper clips	Make a pattern for the spinning-leaf activity. The “arms” need to be higher than the centre point of the leaf. The lighter the paper, the better the leaf will spin. The children can dramatize the movements of falling leaves.
Predicting and examining the characteristics of pumpkins	2	<i>Innovations in Science, Level 1, Autumn Changes (Puzzling Pumpkins)</i> , p. 21	large towel, pumpkins of various shapes and sizes, balls of string, paper, magnifying glasses, bathroom scale, buckets, small plastic containers, tape measure	Buy pumpkins of various shapes and sizes or take students to a farm or market where they can pick their own. Extend this activity by having students predict the number of seeds in a pumpkin; record predictions.
Examining a number of leaves and identifying similarities and differences	4	<i>Innovations in Science, Level 1, Autumn Changes (Autumn Colours)</i> , p. 9	collection of leaves, paper, magnifying glasses, large paper circles, glue, crayons, clear contact paper	Collect a variety of leaves of different sizes, shapes, and colours. Encourage children to collect leaves after school.
Discussing perfect weather	1	<i>Explorations in Science, Level 1, Today’s Forecast (My Perfect Day)</i> , p. 26		
Preparing parties for each season	3	<i>Explorations in Science, Level 1, Today’s Forecast (Season Party)</i> , p. 24		
Investigating snow and ice	1	<i>Knee High Nature: Winter. A Guide to Nature Activities and Fun</i> (Haley and Wishart) (<i>Snow and Ice</i>), p. 55		

Assessment

For a broader discussion of science classroom assessment techniques see *Assessing Student Learning* in the introduction of this publication on p. 15. Good places to begin looking for the unit-related ideas are the *Explorations in Science* assessment handbooks, *Innovations in Science* teaching notes, Unit tests and Portfolio ideas, Alberta Education sample tests at www.education.gov.ab.ca and Alberta Assessment Consortium at www.aac.ab.ca

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