

Appendices



APPENDIX A: GENERAL LEARNING OUTCOMES*

The purpose of Manitoba science curricula is to help students gain a measure of scientific literacy that will assist them in becoming informed, productive, and fulfilled members of society. As a result of their Early, Middle, and Senior Years science education Manitoba students will be able to:

Nature of Science and Technology

- A1. recognize both the power and limitations of science as a way of answering questions about the world and explaining natural phenomena
- A2. recognize that scientific knowledge is based on evidence, models, and explanations, and evolves as new evidence appears and new conceptualizations develop
- A3. distinguish critically between science and technology in terms of their respective contexts, goals, methods, products, and values
- A4. identify and appreciate contributions made by women and men from many societies and cultural backgrounds towards increasing our understanding of the world and in bringing about technological innovations
- A5. recognize that science and technology interact with and advance one another

Science, Technology, Society, and the Environment (STSE)

- B1. describe scientific and technological developments, past and present, and appreciate their impact on individuals, societies, and the environment, both locally and globally
- B2. recognize that scientific and technological endeavours have been and continue to be influenced by human needs and the societal context of the time
- B3. identify the factors that affect health and explain the relationships among personal habits, lifestyle choices, and human health, both individual and social
- B4. demonstrate a knowledge of, and personal consideration for, a range of possible science- and technology-related interests, hobbies, and careers
- B5. identify and demonstrate actions that promote a sustainable environment, society, and economy, both locally and globally

Scientific and Technological Skills and Attitudes

- C1. recognize safety symbols and practices related to scientific and technological activities and to their daily lives, and apply this knowledge in appropriate situations
- C2. demonstrate appropriate scientific inquiry skills when seeking answers to questions
- C3. demonstrate appropriate problem-solving skills while seeking solutions to technological challenges

*Source: The general learning outcomes are identified in Manitoba Education and Training. *Kindergarten to Grade 4 Science: Manitoba Curriculum Framework of Outcomes*. Renewing Education: New Directions series. Winnipeg, MB: Manitoba Education and Training, 1999.

- C4. demonstrate appropriate critical thinking and decision-making skills when choosing a course of action based on scientific and technological information
- C5. demonstrate curiosity, skepticism, creativity, open-mindedness, accuracy, precision, honesty, and persistence, and appreciate their importance as scientific and technological habits of mind
- C6. employ effective communication skills and utilize information technology to gather and share scientific and technological ideas and data
- C7. work cooperatively and value the ideas and contributions of others while carrying out scientific and technological activities
- C8. evaluate, from a scientific perspective, information and ideas encountered during investigations and in daily life

Essential Science Knowledge

- D1. understand essential life structures and processes pertaining to a wide variety of organisms, including humans
- D2. understand various biotic and abiotic components of ecosystems, as well as their interaction and interdependence within ecosystems and within the biosphere as a whole
- D3. understand the properties and structures of matter, as well as various common manifestations and applications of the actions and interactions of matter
- D4. understand how stability, motion, forces, and energy transfers and transformations play a role in a wide range of natural and constructed contexts
- D5. understand the composition of the Earth's atmosphere, hydrosphere, and lithosphere, as well as the processes involved within and among them
- D6. understand the composition of the universe, the interactions within it, and the impacts of humankind's continued attempts to understand and explore it

Unifying Concepts

- E1. describe and appreciate the similarity and diversity of forms, functions, and patterns within the natural and constructed world
- E2. describe and appreciate how the natural and constructed world is made up of systems and how interactions take place within and among these systems
- E3. recognize that characteristics of materials and systems can remain constant or change over time, and describe the conditions and processes involved
- E4. recognize that energy, whether transmitted or transformed, is the driving force of both movement and change, and is inherent within materials and in the interactions among them

APPENDIX B: KINDERGARTEN TO GRADE 4 AND SENIOR 1 CLUSTER TITLES

Manitoba’s *Science Frameworks (Kindergarten to Grade 4, Grades 5–8, Senior 1)* present specific learning outcomes (SLOs) that are arranged into groupings, referred to as clusters. The clusters are thematic and generally relate to the three science disciplines: life science, physical science, and Earth and space science.

The cluster titles for both Kindergarten to Grade 4 Science, and Senior 1 Science have been reproduced in the figure below.

Whereas the SLOs themselves are mandatory, the order in which they are addressed is not. Teachers are encouraged to plan their instruction based on student needs, individual contexts, learning resources, and other pertinent considerations.

Grades Clusters	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Senior 1
Cluster 0	Overall Skills and Attitudes (to be integrated into Clusters 1 to 4)					
Cluster 1	Trees	Characteristics and Needs of Living Things	Growth and Changes in Animals	Growth and Changes in Plants	Habitats and Communities	Reproduction
Cluster 2	Colours	The Senses	Properties of Solids, Liquids, and Gases	Materials and Structures	Light	Atoms and Elements
Cluster 3	Paper	Characteristics of Objects and Materials	Position and Motion	Forces that Attract or Repel	Sound	Nature of Electricity
Cluster 4		Daily and Seasonal Changes	Air and Water in the Environment	Soils in the Environment	Rocks, Minerals, and Erosion	Exploring the Universe

Notes

APPENDIX C: PETS IN THE CLASSROOM*

When we think of classroom pets, we often imagine small mammals such as gerbils, hamsters, or guinea pigs. While these are interesting creatures to observe, hamsters and gerbils are nocturnal animals and, as such, tend to be rather sleepy during the day. In fact, one group of Grade 1 students once questioned whether or not there was a real animal in the hamster cage. The children would occasionally annoy the hamster into activity, but for the most part, he remained an unseen fixture of the classroom.

Generally speaking, most animals in the classroom are best left as visitors, rather than residents. It is expected that students will have opportunities to observe living creatures, but this can be accomplished by having animals as special visitors for a period of time. Of course, teachers should outline strict guidelines for the safety of the animals, ensuring that they undergo as little stress as possible. Teachers must also be aware of allergies the students might have, especially to fur-bearing animals.

Teachers who are planning to maintain a “classroom pet” for any period of time need to recognize that all vertebrate animals have important dietary and housing concerns that require time, expertise, and care to address.

Birds, for the most part, do not make good classroom pets. Some, like the budgie or any member of the parrot family, can be carriers of parrot fever and should not be housed in a school or classroom. Other birds, such as finches, canaries, or pin quail, are sensitive to temperature changes and require large flight pens to move around comfortably.

Reptiles and amphibians require very specific environments and carefully designed diets. Being cold-blooded, these animals will endure a slow death of starvation if their dietary needs are not met. Turtles, of course, must be avoided in classrooms, due to concerns regarding salmonella. Amphibians, such as frogs, are sensitive to temperature and humidity changes and require large environments so that they have suitable ranges for movement.

Exotic pets of all types need not be resident in schools or classrooms. Large and small snakes, tropical birds, monkeys, and reptiles are interesting creatures for students to observe. However, with the availability of media today, there is no reason for these animals to be long-term “classroom pets.”

Wild animals may carry potentially dangerous pathogens, and must not be brought into classrooms unless under the care of a knowledgeable expert. Animals found by students and brought into school (such as raccoon babies, injured squirrels, small snakes, and other creatures) should be directed to a local humane shelter or wildlife rescue organization.

Small fish make good classroom pets. With proper housing, feeding schedules, and cleaning, an aquarium can house a collection of small fish, readily available from most pet stores. Teachers should avoid keeping fancy tropical fish in their classrooms. Fish can be sensitive to light and temperature changes — some schools turn down their heating over the weekends in wintertime, making heaters essential for aquaria. Feeding schedules must be maintained. While it may seem that classroom fish can make it through a holiday weekend without being fed such fasting periods put undue stress on the fish and make them far more susceptible to diseases.

*Source: Adapted from “Keeping Animals in the Classroom: A Guide.” Implementation Planning Workshop for *The Ontario Curriculum, Grades 1-8: Science and Technology*. © Queen’s Printer for Ontario, 1998. Adapted with permission.

Invertebrates can make good classroom pets. These pets are relatively easy to maintain. They require minimal amounts of space and small quantities of food. Of course, teachers have to be aware of their environmental and dietary needs.

The following guide provides some general classroom care information regarding the needs of a variety of living things. This guide should be used prior to having an animal in the classroom. It is, by no means, comprehensive, but rather gives teachers some information about the dietary and environmental needs of a number of animals they may wish to have as classroom visitors.

Organism	Housing	Temperature Range	Food	Causes of Failure	Remarks
Aquatic Snails	aquaria	24 °- 29 °C	lettuce	lack of food, drastic temperature changes	include in culture with guppies
Brine Shrimp	8 litre container or aquaria	21° - 27° C	diluted yeast solution	overfeeding, lack of oxygen, overcrowding	raise in a 3-5% solution of non-iodized salt
Chameleons-Anoles	large aquarium with screened lid	27° - 32° C	live crickets, occasional mealworm	overcrowding or lack of water/food	spray droplets or water on sides of container daily
Earthworms	organic soil in wooden or plastic box	13° - 18° C	mashed potatoes, lettuce, coffee grounds	too much heat, too much or not enough moisture, overcrowding	buss bedding works well in place of soil, keep covered
Guppies	aquaria, 8 litre container	24° - 29° C	prepared fish food, brine shrimp	excessive food	change water occasionally, include numerous aquatic plants
Mealworms	8 litre container or larger, plastic shoe box	16° - 27° C	bran, dog food, occasional apple or potato slice	mould growth from too much water	cover top of bran with cotton, sprinkle water on cotton
Newts	8 litre container, terrarium	17° - 28° C	live food, daphnia, brine shrimp or liver bits	lack of food, escape easily, no dry place	move liver when feeding (looks alive), provide dry resting place
Butterflies (painted lady)	large box with sides cut out; openings covered with screen	21° - 27° C	larvae-artificial media, adult -5% sugar water	humidity not correct	add containers of moist sand to adult container
Milkweed Bug	plastic shoe boxes or similar containers	10° - 35° C	milkweed seeds, shelled unsalted sunflower seeds	excessive mould on food, too much moisture	easily raised, good example of incomplete metamorphosis