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ARTICLE

Biological Evolution in Canadian Science Curricula

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Context

The social controversy around biological evolution and creationism continues to persist throughout North America (Alters and Nelson 2002; Berkman and Plutzer 2011; Moore and Cotner 2009; Wiles and Alters 2011; Winslow and others 2011; Rissler and others 2014). This fierce debate has been quite visible in the United States, but seems to be relatively muted in Canada, which may lead many to believe that the dispute does not exist north of the border. While this issue has been researched and documented thoroughly in the US, relatively little is known about its dynamics in Canada, despite the powerful presence of such controversies there (Wiles and others 2005).

Public polls provide a glimpse of public perceptions of and opinions about biological evolution in North America. A 2012 Angus Reid poll showed striking differences between Canadians and Americans in response to evolution. While approximately 61% of Canadians thought that human beings evolved from less advanced life forms over millions of years, this view was shared by only 30% of their American neighbors. Similarly, 51% of American respondents believed that "God created human beings in their present form within the last 10 000 years," compared to only 22% of Canadians (Angus Reid 2012). Moreover, 16% of Canadians and 18% of Americans were "not sure" about the statements regarding the origin and evolution of human beings on Earth. This trend seems to have held stable over the last few years in Canada; in a poll conducted by the same organization in 2010, 61% of Canadians thought that human beings evolved from less advanced life forms and 24% shared the creationist belief about the creation of human beings in their present form within the last 10 000 years (Angus Reid 2010).

Regional breakdowns suggest interesting trends across various Canadian provinces. Respondents in Quebec (71%), British Columbia (62%), and Ontario (60%) are more likely to think human beings evolved than are Albertans (48%). Along the same lines, Quebecers are the least likely to believe in creationism (13%), while Albertans are the most likely (35%). Manitoba and Saskatchewan were in the middle, with 53% accepting human evolution and 24% believing in creationism (Angus Reid 2012). The gender breakdown in this poll reveals that more men (67%) accepted human evolution than did women (56%) (Angus Reid 2012).

While these data may suggest that public scientific literacy in Canada is more advanced than the US, 22% of Canadians still held creationist beliefs and 16% were not sure about evolution. Scholars argue that Canadians need to be aware that anti-evolution education efforts to promote rejection or avoidance of evolution in schools are a problem in their country as well (Barker 2004; Wiles 2006a).

A closer look at relevant Canadian literature suggests a creationist movement led by several local and international creationist/anti-evolution organizations. These groups are involved in a wide variety of community-based activities, such as supporting creation science museums, sponsoring anti-evolution/creationist fieldtrips to rebut modern geology, organizing anti-evolution family camps and conferences in communities, airing broadcasts on radio and television, and publishing printed materials that contradict the science of evolution. Describing the influence of these organizations on science education, Wiles notes that some creationists and their supporters often "put pressure on schools and teachers in Canada to teach creationist ideas" (2006a:135). Moreover, besides actively contesting evolution through media and on-line propaganda machines, many of these organizations engage in outreach activities in the form of presentations in schools and other community education forums. Indeed, there is a creationist museum in Alberta and a traveling museum set up by the Creation Truth Ministries (Wiles 2006a, 2006b). How these creationist activities are specifically shaping the attitudes of academic and broader publics in Canada is still uncharted territory, which needs to be investigated in future studies.

Museums are one of the best informal sources of knowledge about natural history and anthropology. Indeed, museums have always played a powerful role in shaping people's attitudes toward science (Asghar 2012). In this role, they can offer useful opportunities to foster scientific literacy about evolution and human evolution. The growing number of creationist museums in North America suggests that creationists seem to have recognized and tapped into the enormous potential of museums in creating lasting impressions on people and in particular affecting their attitudes toward evolution.

Bean (2011) conducted a comprehensive study of sixteen Canadian museums, investigating their exhibits in promoting public education about human evolution. Only two of these museums—the Manitoba Museum and the Redpath Museum at McGill University—then contained permanent exhibits on human evolution. Not surprisingly, a creationist museum (the Big Valley Creation Science Museum) housed an exhibit featuring a biblically based account of human creation that denied the evidence and decried the "fanciful drawings in textbooks" supporting evolution.

Bean found that university-affiliated museums in Canada were more likely than provincial- or national museums to feature human evolution. For example, the University of Alberta's Department of Anthropology had a permanent exhibit in a public hallway that addressed human evolution. The University of Winnipeg's Anthropology Department had three display cases in the hallway, and had previously housed student-mounted exhibits on human evolution); Simon Fraser University's Museum of Archaeology and Ethnology also previously had a temporary exhibit on human evolution; the director had applied for funding to develop a web version of the human evolution exhibit, but her application was denied (Bean 2011).

The reasons cited by most Canadian museums for not devoting any space to human evolution related exhibits included financial constraints, lack of specialist curators in this area, fear of possible controversy, lack of display resources and material, and the absence of human evolution from their mandate (Bean 2011:57).

According to prominent scientific and science education organizations in North America, evolution education occupies a central role in science education because of the fundamental role evolutionary theory plays in unifying biology into a coherent discipline. Thus, effective teaching of evolution is essential for students to understand and appreciate the explanatory and predictive power of this framework (Royal Society of Canada 1985; American Association for the Advancement of Science 1993; National Science Teachers Association 2003; InterAcademy Panel 2006; National Academy of Sciences 2008).

In particular, the Royal Society of Canada was signatory to the statement of the international Academies of Sciences (InterAcademy Panel 2006), which urges "decision makers, teachers, and parents to educate all children about the methods and discoveries of science and to foster an understanding of the science of nature" and emphasizes the importance of "evidence-based facts about the origins and evolution of the Earth and of life on this planet" (InterAcademy Panel, 2006:1). Moreover, the Academy of Science of the Royal Society of Canada "considers that 'scientific creationism' has nothing to do with science or the scientific method. Scientific creationism does not belong in any discussion of scientific principles or theories, and therefore should have no place in a science curriculum." It further adds, "The methodology and conclusions of scientists and 'scientific creationists' are therefore incompatible, and the term 'scientific creationism' is a contradiction in terms, since it has no basis in science" (Royal Society of Canada 1985).

Intense debates around the teaching of creationism and evolution feature prominently in the literature and mass media in the US. Studies on evolution education and the issues in implementing rigorous teaching of evolution in American schools and universities abound. However, it is hard to find any studies on issues concerning evolution understanding and instruction in Canadian schools. Wiles (2006a:135) points out that Canadians are generally not aware of the coverage of evolution in the science curriculum. Furthermore, they generally tend to think that Canada is somehow beyond this controversy and there are no issues regarding the teaching and acceptance of evolution in Canada. Nevertheless, the creationism/evolution issue has surfaced from time to time in the Canadian media as well.

Indeed, some debacles concerning the status and treatment of evolution in formal science curricula have been widely reported in the literature. An example is the presentation of pseudoscientific ideas in senior science classrooms by some creationists in Abbotsford, British Columbia, in the 1990s (Barker 2004). This case involved legal action by the British Columbia Civil Liberties Association, and the practice was eventually ended by the Minister of Education. Still, many teachers in British Columbia are sympathetic to creationism (Meijer 2005). In Prince Edward Island (PEI), the Home and Schools Federation—a parent advisory group—called for the PEI Education Department to devote equal time to evolution and creationism. At the same time, evolution was deemed as a controversial subject for science education curriculum by the Ministry of Education as "the government assured association president Georgina Allen that there is currently no teaching of evolution in any course in the PEI education system" (Heinrichs 2000). Prince Edward Island was not the only province that tended to neglect evolution, as the media also highlighted the "nearly extinct" status of evolution in the new science curriculum in Ontario around that time (Heinrichs 2000; Wiles 2006b).

Lerner (2000) conducted thorough assessments of K–12 science education standards in the US and illuminated chronic issues plaguing the teaching of evolution. Critically looking at the science standards from all the states, Lerner identified several problems concerning the treatment of evolution in various state standards. The evolution related content was sometimes described as "badly written," "error-filled," "timid," "hypocritical," or entirely absent from the science curriculum. According to Lerner's evaluation criteria, twenty states were given "sound" status and earned either an A or B grade. In these states, evolution was covered very well or well in their science standards. Lerner (2000) explained that some standards introduce at least some of the basic processes of biological evolution in early grades, building on them later in the secondary curriculum. Moreover, evolution was treated as the centerpiece of the life sciences and is treated in depth in grades 9–12, and in some cases earlier as well. Seven states were given a "passing" or C grade as their treatment of evolution seemed satisfactory "but not terribly good," while ten states received a D grade or were deemed "marginal" because these states cover evolution so "skimpily that the coverage is useless or nearly so." Moreover, human evolution is completely ignored in those standards (Lerner 2000:11).

Alarmingly, ten states "failed," receiving F grades. Lerner noted that some "avoid or carefully conceal the E-word, at least in the context of biology, and most employ the "misleading euphemism 'change over time.'" Kansas was given an "F minus"—"Not even failed" —due to the "extremity of its exclusion of evolution from statewide science standards" (Lerner 2000:16). Lerner views these deliberate efforts to avoid, deform, and neglect evolution—the central organizing principle of biological sciences—as an outcome of a long history of the battles that have been waged by the creationists in the US. In later studies of state science standards in which Lerner was involved, the results for evolution were broadly similar (Gross 2005; Lerner and others 2012).

Surprisingly, no comprehensive study has been carried out to examine the treatment of biological evolution in Canadian science curricula. Furthermore, some scholars report, based on anecdotal exchanges, that many teachers across various provinces in Canada "confess that evolution in never actually taught in their schools" (Wiles 2006b:39). This study looks at the coverage and treatment of biological evolution in K–12 science education frameworks from all the Canadian provinces and territories.

Methods

The policy and curriculum documents that were reviewed for this study included (a) the Common Framework of Science Learning Outcomes, K to 12 (Council of Ministers of Education, Canada 1997), (b) science education curriculum for grades 1–10 from all Canadian provinces and territories, and (c) learning outcomes for biology courses for grades 11–12 from all Canadian science education curricula (see the Appendix for a list of curriculum documents examined). Letters were sent out to all Canadian provinces and territories in 2011 requesting the most recent curriculum documents. Curricula were reviewed online, and links to all provincial and territorial documents can be found in the Appendix.

In the first phase of analysis, the Common Framework of Science Learning Outcomes in Canada was examined. The "Understanding Evolution" conceptual framework was employed as an analytical framework to identify the precursor or foundational evolutionary ideas in elementary grades as well as more specific concepts and mechanisms concerning evolution in middle and secondary grades in the Canadian Common Framework. This conceptual framework has been developed by leading evolutionary biologists and science education experts for K–16 levels, and includes the foundational as well as advanced concepts needed to develop a sophisticated understanding of evolutionary theory. The Understanding Evolution site is a collaborative project of the University of California Museum of Paleontology and the National Center for Science Education (http://evolution.berkeley.edu/evolibrary/teach/framework.php). This analytical tool was particularly useful in tracking the foundational evolutionary concepts in the earlier grades in the Canadian Common Framework.

To understand how evolution is covered in the Canadian Common Framework, we examined the learning outcomes related to evolutionary concepts. We focused on the concepts for grades K–10 to gain a sense of what all Canadian students are expected to learn, since science courses are compulsory up to grades 9 or 10. More precisely, we focused on the standards related to fossils and deep time, natural selection, and human evolution. The analysis of the Canadian Common Framework helped in developing a template with key evolutionary ideas, principles, and mechanisms included in the Common Framework. In the second phase, we used this template as an analytical tool to examine the provincial/territorial science and biology education benchmarks/curricula. The template was useful in identifying the similarities and differences between the Common Framework and individual curricula across all the provinces/territories.

A variety of standard qualitative content analysis methods were employed to carry out a detailed examination of the curriculum documents. For example, coding and categorizing techniques were employed to code the salient concepts concerning biological evolution in the curriculum documents (Bogdan and Biklen 1998; Maxwell 2005; Strauss and Corbin 1998). Coded items were sorted into themes, and matrices were created to display the themes emerging within and across the documents as explained in the findings section (Miles and Huberman 1994). Three researchers independently coded the individual curriculum benchmarks using the template based on the Canadian Common Framework. Codes and themes were compared by the research team and were subsequently revised and refined through critical discussions on interpretations of the curriculum content (Bergman 2010). Further, concept maps were created to conduct cross-case content analysis in order to detect patterns of similarities and differences between the Common Framework and individual curricula (Asghar and others 2011; Kim and Dionne 2014).

Findings and Discussion

History and Structure of the Canadian Common Framework

There are ten provinces and three territories in Canada, and each one, under the jurisdiction of the Department or Ministry of Education, is responsible for curriculum development within its respective region. Yukon has adopted British Columbia's curriculum, and Nunavut's curriculum has been adapted from those of several other provinces and territories, including the Northwest Territories, Alberta, Saskatchewan, and Manitoba. The Northwest Territories has its own curriculum for K–6, and borrows Alberta's for grades 7 onwards.

According to the Canadian Constitution Act of 1867, "In and for each Province the Legislature may exclusively make Laws in relation to Education" (Council of Ministers of Education, Canada, CMEC, 1997). While each region has the right to administer education, it was recognized that a certain level of collaboration between the provinces and territories would be of mutual benefit. In 1967, the Council of Ministers of Education, Canada (CMEC) was formed by the provincial and territorial ministers responsible for education. Through CMEC, the Ministries could consult and collaborate on educational initiatives and policies at all levels of education throughout the nation. In 1997, the Council developed its first joint project: "The Common Framework of Science Learning Outcomes K to 12" (the Common Framework). Its purpose was to set out "a vision and foundation statements for scientific literacy in Canada," outline "general and specific learning outcomes," and offer "illustrative examples for some of these outcomes" (CMEC 1997).

As education is within provincial jurisdiction in Canada and each province or territory is responsible for its own curriculum, the Common Framework is not a legal document that each province or territory must adhere to; rather, it serves as a guideline for curriculum development, with the aim of creating greater consistency among the science curricula of Canada's provinces and territories. The Common Framework includes vision and foundation statements for scientific literacy as well as general and specific learning outcomes for science and technology.

In order to understand how evolution is covered in the Common Framework, we examined the learning outcomes that could be related to evolution (see Tables 1 and 2). For grades 1–6, the Framework addresses concepts such as similarities and differences (variability) among living things, and how these characteristics help organisms thrive in different environments (adaptations). It also introduces classification systems for living things. In addition, students are expected to identify changes in animals over time (using fossils) and to describe rocks that contain records of the Earth's history. The Quebec curriculum is notable in that it lists "evolution of life forms" under Essential Knowledges for Living Things in Cycle 3 (Grade 6).

In grades 7–9, deep time is introduced, and students are expected to learn about the geologic time scale and major events in Earth's history, though there is no explicit list of such events. Students are also expected to learn the advantages and disadvantages of sexual and asexual reproduction, as well as factors that may lead to changes in a cell's genetic information. Theories about the origin and evolution of the universe are also included in the Framework in a general way, but specific theories, for example the Big Bang, are not mentioned explicitly.

In the Common Framework, the grade 10 learning outcomes for Life Sciences focus on the sustainability of ecosystems. It is only at the advanced high school level biology curricula—mostly offered in elective courses—that evolution is covered in detail. Biological evolution is covered in grade 11 or 12 (see Table 2), depending on the province or territory. Natural selection is explicitly mentioned in the Grades 11–12 Life Science Learning

Outcomes (Evolution, Change, and Diversity: The Common Framework of Science Learning Outcomes K to 12).

Table 1. *Common Framework Outcomes (Evolutionary Concepts Grades 1–10)*

Code	Grade	Evolutionary Concepts
100-4	1	Observe and identify similarities and differences in the needs of living things
100-8	1	Identify and describe common characteristics of humans and other animals, and identify variations that make each person and animal unique
100-29	3	Describe variations between plants growing in different locations
300-1	4	Compare the external features and behavioural patterns of animals that help them thrive in different kinds of places
300-2	4	Compare the structural features of plants that enable them to thrive in different kinds of places
300-7	4	Identify and describe rocks that contain records of Earth's history
300-15	6	Describe the role of a common classification system for living things
301-15	6	Compare the adaptations of closely related animals living in different parts of the world and discuss reasons for any differences
301-16	6	Identify changes in animals over time, using fossils
311-6	7	Develop a chronological model or time scale of major events in Earth's history. As students develop an understanding of the dynamics of geological systems and events, they are better able to explain and make connections between the theories of Earth science and their own experiences with local geology
305-3	9	Compare sexual and asexual reproduction in terms of their advantages and disadvantages
305-5	9	Discuss factors that may lead to changes in a cell's genetic information
312-3	9	Describe theories on the origin and evolution of the universe

Table 2. *Common Framework Outcomes (Evolutionary Concepts Grades 11–12)*

Code	Evolutionary Concepts
316-2	Evaluate current evidence that supports the theory of evolution and that feeds the debate on gradualism and punctuated equilibrium
316-3	Analyze evolutionary mechanisms such as natural selection, genetic variation, genetic drift, artificial selection, and biotechnology, and their effects on biodiversity and extinction
316-4	Outline evidence and arguments pertaining to the origin, development, and diversity of living organisms on Earth

Evolutionary Concepts in Canadian Science Education Curricula

The provincial curricula generally tend to include concepts that are outlined in the Common Framework, but there are important variations between the Framework and provincial/territorial curricula as well as across the individual curricula. Our analysis shows that most of the provinces cover basic evolutionary concepts in their required science curricula. As noted earlier, the main concepts related to evolution include fossils, the geological time scale, deep time, and natural selection. These concepts are generally taught in upper elementary and middle grades. Below we provide a comparative snapshot of the evolutionary concepts that are covered in grades K–10. We focused on K–10, since science courses at these levels are compulsory for all students. Specifically, we identified the following salient concepts for a deeper examination in our analysis: fossils, deep time, natural selection, and human evolution.

Fossils and Deep Time

Fossils are covered in a general way in grades 1–10 in all provinces/territories with the exception of Ontario, where they are not addressed in detail until grade 12; the Ontario curriculum mentions fossils in grade 4 but only in passing when describing rocks. In many curricula, fossils are taught in conjunction with deep time, but the term "deep time" is not explicitly used (see Table 3).

Specific learning outcomes related to fossils are generally included in the elementary and middle grades (4, 6, and 7) in most provinces/territories. Typical examples are:

- use the fossil record to understand geologic timescale
- describe and interpret evidence from the fossil record to understand ancient environments and the geological history of the earth
- learn about techniques used to discover, identify, and analyze fossils
- identify and describe rocks that contain records of the Earth's history
- identify changes in living organisms using fossils

Several provincial curricula address the magnitude of time involved in geological processes of the earth. Notably, ideas related to the nature of science are also discussed in conjunction with deep time in many provinces; in particular, emphasis is placed on the role of physical evidence in the development of accepted scientific models (see Table 3). In Alberta, British Columbia/Yukon, and Saskatchewan the goal of learning about the geological timescale is tied to developing an understanding of the appearance of and variations in life forms by interpreting the fossil evidence. While constructing the geological timeline and interpreting the fossil record, students are also expected to learn about the "role of accumulated evidence in developing accepted scientific ideas, theories, and explanations" (Alberta, grade 7).

In British Columbia/Yukon, deep time is also discussed in relation to fossils and the geological record in grade 7. For example, students should examine fossils and learn about "how fossils provide information about ancient environments." The concept of superposition is also included to teach students to make inferences about the time of events using the placement and position of an object. Furthermore, the appearance of life on earth and the age of "oldest mammals, birds, and dinosaurs" are also emphasized in seventh grade. In grade 10, students are expected to demonstrate knowledge of various types of biological and geological evidence that supports the plate tectonic theory, including fossil evidence. Further, some curricula also include examples of local fossil sites, such as the Burgess Shale in British Columbia.

Saskatchewan emphasizes examples of local land sites and fossils, along with application of knowledge in relation to the geological time scale. For example, students should learn about fossils and how the fossil record provides evidence of geological history as well as changes in species over long periods of time (grades 4 and 7). This knowledge should enable them to "predict the types of plant or animal fossils that would be found in Saskatchewan landforms in the past, present, and future" (grade 7). Similarly, in Northwest Territories and Manitoba students are expected to explain how fossils provide evidence of changes in animals over geological time; the emphasis again is on comparing similarities and differences between fossils and animals of the present (grade 6).

Interestingly, in the Northwest Territories and Saskatchewan some evolutionary concepts are introduced early on—in kindergarten—and are revisited in successive grades. For example, in the Northwest Territories, fossils are discussed in kindergarten in relation to the dinosaurs to which kindergartners receive ample exposure in cartoons, stories, and museums. Children are expected to learn that "fossils tell us about the characteristics of dinosaurs" and they are to "demonstrate an understanding that dinosaurs lived millions of years ago and are now extinct; and compare the characteristics of the modern day descendants of dinosaurs with the dinosaurs that lived over 65 million years ago." Similarly, in Saskatchewan fossils are used in primary grades to explain how fossils and the fossil record provide evidence of the Earth's history, including the formation of various landforms. Nova Scotia, too, emphasizes identifying rocks that contain records of Earth's history (grade 4) and looking at changes in animals over time (grade 6). Notably, students are expected to "model the work of scientists" while learning about rocks and fossils, and tracing changes in them over time.

Deep time is introduced in the middle school curriculum (grade 7) in New Brunswick, Prince Edward Island, and Newfoundland and Labrador. The focus is on developing students' understanding and appreciation of the "magnitude of time involved in most geological processes and events." Students should learn about geological and evolutionary history by developing a "chronological model or time scale of major events in Earth's history" using "fossils and periods of mountain building." In Newfoundland and Labrador's science curriculum, human existence is discussed in the context of geological time in a section containing teaching resources. In particular, teachers are advised to "continue to emphasize the magnitude of geological time and stress to students that human existence on Earth represents a very small proportion of that geological time." Furthermore, teachers are encouraged to present fossil evidence that supports biological evolution from the beginning of life in the Precambrian period to the present day. Interestingly, students are also encouraged to compare their own life time scale to the geological time scale. As noted in the curriculum, "Students can prepare and construct their own life time scale and compare it to a geological time scale" (grade 7). The science education curricula in British Columbia/Yukon, Prince Edward Island, Manitoba, Newfoundland and Labrador, and Saskatchewan note the similarities between existing and extinct animals. Several curricula also discuss the fossil record in relation to the geological time scale and the evolution of life, as detailed below in the discussion on deep time. Ontario does not cover deep time (including fossils as evidence for deep time) until Grade 12 (Recording Earth's Geological History, Earth and Space Science). In Quebec, the geological time scale and fossils are covered in the first year of Cycle 2 (Grade 9).

Table 3. *Coverage of Fossils and Deep Time in Canadian Compulsory Science Curricula (Grades 1–10)*

Province	Grade	Fossils and Deep Time
Alberta	7	Describe patterns in the appearance of different life forms, as indicated by the fossil record (e.g., construct and interpret a geological time scale; and describe, in general terms, the evidence that has led to its development). Identify uncertainties in interpreting individual items of fossil evidence, and explain the role of accumulated evidence in developing accepted scientific ideas, theories and explanations.
British Columbia/ Yukon	7	Fossils in sedimentary rocks allow us to interpret ancient environments. The geologic time scale is based on changes in life on Earth. Explain how the Earth's surface changes over time; Explain how scientists use the placement and position of an object to infer the time of events (e.g., superposition); Use the fossil examples to look at geologic time and the fossil record. Ask students: How long ago did life appear on Earth? What were the oldest life forms like? How old are the oldest mammals, birds, and dinosaurs?
	10	Demonstrate knowledge of evidence that supports plate tectonic theory; describe evidence for continental drift theory (e.g., fossil evidence, mountain belts, paleoglaciation)
Manitoba	6	Identify, based on evidence gathered by paleontologists, similarities and differences in animals living today and those that lived in the past. Examples: archaeopteryx and modern birds
New Brunswick & Prince Edward Island	7	Develop a chronological model or time scale of major events in Earth's history. Students should begin to appreciate the magnitude of time involved in most geological processes and events. Students can prepare and construct their own life time scale and compare it to a geological time scale. Students should come to realize that geological time has been subdivided into eras, periods, and further into epochs. Features that may be included in a geological time scale are such things as fossils and periods of mountain building.
Newfoundland and Labrador	7	Develop a chronological model or time scale of major events in Earth's history. Students should begin to appreciate the magnitude of time involved in most geological processes and events. Students can prepare and construct their own life time scale and compare it to a geological time scale. Students should come to realize that geological time has been subdivided into eras, periods, and further into epochs. Features that may be included in a geological time scale are such things as fossils and periods of mountain building Teachers should continue to emphasize the magnitude of geological time and stress to students that human existence on Earth represents a very small proportion of that geological time. Teachers could present material to enrich students' appreciation for geological time by showing how fossil evidence supports the evolution from the beginning of life in the Precambrian to present day.

Table 3. *Coverage of Fossils and Deep Time in Canadian Compulsory Science Curricula (Grades 1–10), continued*

Province	Grade	Fossils and Deep Time
Northwest Territories	K	Fossils tell us about the characteristics of dinosaurs; Demonstrate an understanding that dinosaurs lived millions of years ago and are now extinct; Compare the characteristics of the modern day descendants of dinosaurs with the dinosaurs that lived over 65 million years ago.
	6	Explain how fossils provide evidence of changes in animals over geological time; and Compare similarities and differences between fossils and animals of the present.
Nova Scotia	4	Identify and describe rocks that contain records of Earth's history
	6	Identify changes in animals over time and research and model the work of scientists
Quebec		Geological time scale Major stages in the history of life on Earth Extinctions Fossils Stratigraphic layers The geological time scale helps students understand the environmental conditions that existed during the major stages in the development of life on Earth. It begins with the creation of the Earth more than 4.55 billion years ago. After the formation of the Earth's crust and the oceans at the beginning of the Precambrian Era, the first forms of life (bacteria, prokaryotes) appear. Living organisms proliferated and diversified during the Paleozoic Era. This era is characterized by the massive extinction of almost all marine life forms and nearly 70 per cent of land species at the end of the Permian Period. The Mesozoic Era is associated with the reign of the large reptiles and dinosaurs. The Cenozoic Era (Tertiary and Quaternary periods) begins with the disappearance of the dinosaurs in another major extinction at the end of the Cretaceous Period. This era is associated with the diversification of mammals and the development of the primate and hominid lines. The Quaternary Period was the age of great glaciations and saw the disappearance of a number of mammal species, including the woolly mammoth. Modern man has been evolving for hundreds of thousands of years, but has been sedentary only for the past ten thousand years. Many traces of these changes are recorded in rock formations and on the ocean floor. Fossils provide traces of organisms that lived in the past. In a stratigraphic column, the older fossils are usually below the younger ones. Their arrangement helps us date the layers of the Earth.
Saskatchewan	4	Discuss how fossils and the fossil record provide evidence of the Earth's history, including the formation of various landforms; l) Predict the types of plant or animal fossils that would be found in Saskatchewan landforms in the past, present, and future.
	6	Explain how scientists use fossils and the fossil record as a source of information to identify changes or diversity in species over long periods of time.

Table 3. *Coverage of Fossils and Deep Time in Canadian Compulsory Science Curricula (Grades 1–10), continued*		
Province	**Grade**	**Fossils and Deep Time**
	7	Work cooperatively with group members to research catastrophic geological events and integrate individual findings into a chronological model or time scale of major events in Earth's geological history. Explain how geologists use the fossil record to provide evidence of geological history.

Natural selection

Natural selection is mostly addressed in middle or secondary grades. The role of evidence in supporting natural selection is emphasized in some curricula. Moreover, macroevolution as well as microevolution is indicated in a few curricula, as discussed below.

In Alberta's and the Northwest Territories' ninth grade science curriculum, natural selection is explicitly included, as students are expected to distinguish between natural and artificial selection with specific examples of adaptations in different animals. In British Columbia/Yukon, concepts involving natural selection appear in elementary grades and are revisited later in high school. In grade 6, students are expected to learn about specific adaptations of plants and animals; for example, mimicry or other behavior, and develop a "plausible explanation of how particular adaptations help life forms interact in their environments." In grade 10, they learn about natural selection and the "various ways in which natural populations are altered or kept in equilibrium" (see Table 4).

In New Brunswick, Newfoundland and Labrador, and Prince Edward Island, the concept of natural selection is introduced in grade 6. Students are to "identify the theory of natural selection" and learn about the "gradual accumulation of evidence" used in its development. Students are also exposed to the process of theory construction in science and the role of evidence in building a scientific theory. In Prince Edward Island, students are also encouraged to explore evidence supporting natural selection by looking at bacterial resistance to antibiotics. Further, in Newfoundland and Labrador and Prince Edward Island, the work of scientists and the role of technology in gathering evidence to support theories, such as fossil evidence to support evolutionary theory, are highlighted in the standards. For example, students should learn about "paleontologists as people who study fossils, and [are to] describe examples of improvements in some of their techniques and tools that have resulted in a better understanding of fossil discoveries." In Saskatchewan, while the concept of adaptations is emphasized in grade 6, the term *natural selection* is not mentioned explicitly. For example, the focus is on examination of "structures and behaviours" that help different species to "adapt to their environments in the long term."

Strikingly, the Newfoundland and Labrador secondary science biology curriculum (BIO3201) points to the controversies that surround the theory of evolution in the section on suggested learning and teaching strategies related to the historical perspectives on evolutionary change. In particular, teachers are expected to be "aware that many topics in biology, (and in medical research), especially evolution, may be appraised along the lines of personal value judgments, ethical assessments and religious beliefs" (DEN&L 2004:118). Further, various strategies are suggested to teach different theories about evolution so that the "student can intellectually question each and make educated decisions about what s/he believes." As stated in the curriculum guide, "Students should be aware that the topic of evolution is based on many different theories. Like all theories, there is no evidence that completely eliminates doubt" (DEN&L 2004:118). At the same time, while pointing out that "many of the topics relating to Earth origins, life origins, evolution, etc., may be addressed from various points of view," it is added that the "suggested intent" of this biology course is to "outline the topics from the scientific process approach" (DEN&L 2004:118). It further goes on to suggest that teachers could include different beliefs about the beginning of life including "intelligent design." As explained:

> Teaching evolution to students is a very controversial exercise. By including "Intelligent Design" as a theory for the origin of life, teachers can show students that there are many different beliefs about the beginning of life on Earth. This may help students who, because of religious beliefs, do not believe in the scientific view of evolution. It can be emphasized that the purpose of learning about all views is so that the student can intellectually question each and make educated decisions about what s/he believes. (DEN&L 2004:130)

Moreover, in Newfoundland and Labrador's grade 9 science curriculum, teachers are advised to be "respectful of [students'] religious-based beliefs but limit discussion to the science-based theories as outlined in the textbook" (DEN&L 2011:44). This shows that the Canadian public education context is different from the US education, where there are legal strictures against including "intelligent design" or any other religious ideas about evolution in science classrooms in public schools (for example, *Kitzmiller v Dover Area School District* in 2005).

The elementary science curriculum in Ontario (grade 6) emphasizes the importance of "biodiversity within species" in terms of maintaining their "resilience because of genetic differences," although the term natural selection is not explicitly mentioned. Additionally, bacterial resistance to antibiotics is included so that students learn how "resistant individuals have survived and reproduced." In Quebec, however, there is an explicit inclusion of evolution and natural selection in grades 7 and 8 in terms of understanding the changes in "certain characteristics of living things" and appearance of "new species." Students should learn that new species appeared over time through a process of evolution and natural selection. The mechanism of natural selection is also explained in terms of variation within a given species improving its ability to adapt to the environment and the genetic transmission of favorable characteristics to succeeding generations. However, in Manitoba, Northwest Territories, and Nova Scotia, natural selection or other evolutionary mechanisms are not explicitly addressed in elementary or middle science courses. Nevertheless, in Manitoba, evolutionary processes are treated in depth in upper secondary courses (grades 11 and 12).

TABLE 4. *Coverage of Natural Selection in Canadian Compulsory Science Curricula (Grades 1–10)*		
Province	**Grade**	**Natural Selection**
Alberta and Northwest Territories	9	Distinguish between, and identify examples of, natural and artificial selection (e.g., evolution of beak shapes in birds, development of high milk production in dairy cows).
British Columbia and Yukon	6	Analyse how different organisms adapt to their environments. Identify two or more specific adaptations of various life forms (e.g., colouration or other physical characteristics, mimicry or other behaviour and suggest a plausible explanation of how particular adaptations help life forms interact in their environments.
	10	Explain various ways in which natural populations are altered or kept in equilibrium; natural selection
New Brunswick	6	Identify the theory of natural selection as one that has been developed based on the gradual accumulation of evidence
Newfoundland and Labrador	6	Identify the theory of natural selection as one that has developed based on the gradual accumulation of evidence; identify paleontologists as people who study fossils, and describe examples of improvements to some of their techniques and tools that have resulted in a better understanding of fossil discoveries
Ontario	6	Describe ways in which biodiversity within species is important for maintaining the resilience of those species (e.g., because of genetic differences, not all squirrels are affected equally by infectious diseases such as mange; some species of bacteria have become resistant to antibiotics because resistant individuals have survived and reproduced)
Prince Edward Island	6	Identify the theory of natural selection as one that has developed based on the gradual accumulation of evidence. Students should explore evidence of natural selection from studies of bacterial strains that are resistant to antibiotics; identify paleontologists as people who study fossils, and describe examples of improvements to some of their techniques and tools that have resulted in a better understanding of fossil discoveries.
Quebec	7,8	Over time and through a process of evolution and natural selection, certain characteristics of living things have changed, and new species have appeared. When variations within a given species improve its ability to adapt, these characteristics are favoured and genetically transmitted to succeeding generations
Saskatchewan	6	Examine and describe structures and behaviours that help species of living organisms adapt to their environments in the long term.

Human evolution

Human evolution is not mentioned in the Common Framework, and is not addressed in the majority of provinces and territories. Three provinces (Manitoba, Quebec, and Saskatchewan) mention human evolution in their curricula. Manitoba's curriculum requires students to "investigate an evolutionary trend in a group of organisms," and lists hominid evolution as one possible example.

Quebec includes the "development of primate and hominid lines" in its Secondary Cycle 2 curriculum (grades 10 and 11). Further, evolution of "modern man" is also addressed in these grades: "Modern man has been evolving for hundreds of thousands of years, but has been sedentary only for the past ten thousand years." Saskatchewan's curriculum states students should "consider the speciation and development of humans" (see Table 5).

In the Newfoundland and Labrador Biology 3201 curriculum, one of the suggested assessment strategies (DEN&L 2004:129) is for students to "conduct research into the debate on the extinction of the *Homo neanderthalis* [*sic*]. They should evaluate the two main competing theories: extinction due to competition with *Homo sapiens* or extinction due to interbreeding with *Homo sapiens*." While this is not part of the curriculum, but rather an optional learning activity, it is one of the few examples where human evolution is explicitly mentioned.

Table 5. *Coverage of Human Evolution in Canadian Compulsory Science Curricula (Grades 1–10)*

Province	Grades	Human Evolution
Manitoba	11–12	Investigate an evolutionary trend in a group of organisms. Examples: hominid evolution, vascularization in plants, animal adaptations for life on land …
Quebec	10–11	This era [Cenozoic] is associated with the diversification of mammals and the development of the primate and hominid lines. The Quaternary Period was the age of great glaciations and saw the disappearance of a number of mammal species, including the woolly mammoth. Modern man has been evolving for hundreds of thousands of years, but has been sedentary only for the past ten thousand years.
Saskatchewan	11–12	Consider the speciation and development of humans.

Summary and Conclusions

What are the evolutionary literacy benchmarks for Canadian students? This analysis, in particular, centered on scientific/evolution literacy standards for *all* Canadian students. Our analysis illustrates that the Common Framework contains precursor and foundational evolutionary concepts in primary and secondary science courses (K–12). For example, these concepts include:

- learning about common as well as unique characteristics of humans and other animals;
- comparing structural features of animals and plants that help them flourish in different environments, as well as behavioral patterns of animals that help them thrive in different kinds of places;
- comparing the adaptations of closely related animals living in different parts of the world and discussing reasons for any differences;
- identifying rocks that contain records of Earth's history;
- using fossils to identify changes in animals over time; developing a chronological model or time scale of major events in Earth's history factors that may lead to changes in a cell's genetic information; and
- describing theories on the origin and evolution of the universe.

Nearly all provinces and territories address basic evolutionary concepts in their required science curriculum in accordance with the Common Framework standards. In addition, a number of provincial curricula address some of the basic concepts and processes of biological evolution in elementary and middle grades and build on them in secondary life science courses. Among them are Quebec, Newfoundland and Labrador, New Brunswick, Prince Edward Island, Alberta, British Columbia/Yukon, Manitoba, and Saskatchewan. More precisely, most provinces address specific evolutionary concepts and mechanisms, such as deep time, geological timescale, fossil evidence for evolution, adaptations, and natural selection, in required elementary and secondary science courses. However, some discuss adaptations of organisms without mentioning any evolutionary mechanisms. Some provinces, including Quebec, Manitoba, Saskatchewan, and Newfoundland and Labrador, also treat human evolution explicitly.

Importantly, concepts relating to the nature of science are also discussed in several curricula along with deep time, geological timescale, and natural selection, in order to encourage students to model the work of scientists, and to emphasize the significance of evidence in constructing scientific knowledge. Several provinces, such as Alberta, British Columbia/Yukon, Quebec, New Brunswick, Newfoundland and Labrador, Prince Edward Island, Manitoba, Nova Scotia, Northwest Territories, and Saskatchewan, underscore in elementary and middle grades the significance of making the process of scientific inquiry visible to the students in order to develop their understanding of the role of evidence in constructing scientific explanations and theories. For example, students are expected to learn about collecting fossil evidence and interpreting it to support evolution. The science curricula in Saskatchewan and British Columbia/Yukon highlight the geological history of local sites, and they use examples of fossils to engage students in learning about the evolution of local species and landforms.

Ontario's required science curriculum addresses the precursor evolutionary concepts that are outlined in the Common Framework. Other related evolutionary processes, such as biodiversity and its role in maintaining the resilience of species, are included in the upper elementary science curriculum. However, biological evolution is addressed in depth only in grades 11 and 12 biology courses in Ontario. Similarly, Nova Scotia and Northwest Territories also address the concepts of geological timescale and deep time in elementary and middle science curricula, but evolutionary mechanisms are not included at these levels. As noted earlier, the curriculum in Nunavut is adopted from other jurisdictions including Northwest Territories, Alberta, Saskatchewan, and Manitoba. Researchers can explore more specific details regarding the evolutionary standards in Nunavut in particular in future studies.

Although an in-depth analysis of all the historical sciences that are addressed in required and optional Canadian science courses was outside the scope of this study, it is worthwhile to mention the curricula that address models and processes concerning the evolution of the universe. For example, in New Brunswick, Newfoundland and Labrador, Saskatchewan, and Ontario, the scientific theories and models of the evolution of the universe and the evidence supporting those theories are included in the science curriculum for grade 9.

This study can only illuminate the treatment of evolutionary concepts and processes in Canadian science *curricula*. What is actually taught about evolution in science classes is not known, and this raises a number of questions that need to be investigated in future studies. For example, how do teachers approach evolution in required general science and more specialized biology courses? How do teachers address opposition to evolution? How do school administrators perceive the treatment and teaching of evolution? What are students' views about learning evolution? This study attempts to provide a context for asking these and other questions about the enactment of evolutionary standards in actual Canadian classrooms.

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[DEN&L] Department of Education, Newfoundland and Labrador. 2004. Specific Curriculum Outcomes. In: *Biology 3201 Curriculum Guide*. p 24–132. Government of Newfoundland and Labrador; [accessed 2015 Aug 18]. http://www.ed.gov.nl.ca/edu/k12/curriculum/guides/science/bio3201/outcomes.pdf.

[DEN&L] Department of Education, Newfoundland and Labrador. 2011. Unit 1: Space. In: *Grade 9 Science Curriculum Guide (Interim Edition)*. p 19–52. Government of Newfoundland and Labrador; [accessed 2015 Aug 18]. http://www.ed.gov.nl.ca/edu/k12/curriculum/guides/science/grade9/unit_1_grd_9_science.pdf.

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Heinrichs K. 2000 Nov 14. Evolution disappearing from Canadian schools. *ChristianWeek*; [accessed 2015 Aug 18]. http://www.christianweek.org/evolution-disappearing-from-canadian-schools/.

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Rissler LJ, Duncan SI, Caruso NM. 2014. The relative importance of religion and education on university students' views of evolution in the Deep South and state science standards across the United States. *Evolution: Education and Outreach;* [accessed 2015 Aug 18]; 7(24). http://www.evolution-outreach.com/content/7/1/24

Meijer T. 2005. Evolution & education. *Humanist in Canada* 38(3):6–7.

Todd D. 2009 Feb 17. Canadian schools get low grade on teaching evolution. *The Vancouver Sun*; [accessed 2015 Aug 18]. http://blogs.vancouversun.com/2009/02/17/canadian-schools-get-low-grade-on-teaching-evolution/.

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Wiles JR. 2006a. A threat to geoscience education: Creationist anti-evolution activity in Canada. *Geoscience Canada* 33(3):135–140.

Wiles JR. 2006b. Evolution in schools: Where's Canada? *Education Canada* 46(4):37–41.

Wiles J, Asghar A., Alters B. 2005. Evolution Education Research Centre (EERC). *Humanist in Canada* 154:10–13.

Wiles JR. 2011. Challenges to teaching evolution: What's ahead? *Futures* 43(8):787–796.

Winslow M, Staver J, Scharman L. 2011. Evolution and personal religious belief: Christian university biology-related majors' search for reconciliation. *Journal of Research in Science Teaching* 48(9):1026–1049.

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Appendix: Curriculum Documents Examined

Alberta

Elementary Science (1996): https://education.alberta.ca/media/654825/elemsci.pdf
Note: The following documents had minor revisions in 2014, and a summary of these revisions can be found here: http://www.education.alberta.ca/media/8150767/science_pos_updates.pdf
Science 7–8–9: http://education.alberta.ca/media/654829/sci7to9.pdf
Science 10: http://education.alberta.ca/media/654833/science10.pdf
Science 14–24: http://education.alberta.ca/media/586516/sc1424.pdf
Science 20–30: http://education.alberta.ca/media/654837/sci2030_07.pdf
Biology 20–30: http://education.alberta.ca/media/654841/bio203007.pdf

British Columbia

Science K–7 (2005): http://www.bced.gov.bc.ca/irp/pdfs/sciences/2005scik7.pdf
Science 8 (2006): http://www.bced.gov.bc.ca/irp/pdfs/sciences/2006sci_8.pdf
Science 9 (2006): http://www.bced.gov.bc.ca/irp/pdfs/sciences/2006sci_9.pdf
Science 10 (2008): http://www.bced.gov.bc.ca/irp/pdfs/sciences/2008sci_10.pdf
Biology 11 and 12 (2006): http://www.bced.gov.bc.ca/irp/pdfs/sciences/2006biology1112.pdf
Earth Science 11 and Geology 12 (2006):
    http://www.bced.gov.bc.ca/irp/pdfs/sciences/2006earthsci11geology12.pdf

Manitoba

Kindergarten to Grade 4 (1999):
    http://www.edu.gov.mb.ca/k12/cur/science/outcomes/k-4/index.html
Grade 5–8 (2000): http://www.edu.gov.mb.ca/k12/cur/science/outcomes/5-8/index.html
Grade 9 (2000): http://www.edu.gov.mb.ca/k12/cur/science/outcomes/s1/index.html
Grade 10 (2001): http://www.edu.gov.mb.ca/k12/cur/science/outcomes/s2/index.html
Grade 11 Biology (2010): http://www.edu.gov.mb.ca/k12/cur/science/found/gr11_bio/index.html

New Brunswick

Grade 3 (2002): http://www.gnb.ca/0000/publications/curric/science-grade3.pdf
Grade 4 (2002): http://www.gnb.ca/0000/publications/curric/grade4science.pdf
Grade 5 (2002): http://www.gnb.ca/0000/publications/curric/grade5science.pdf
Grade 6 (2002): http://www.gnb.ca/0000/publications/curric/grade6science.pdf
Grade 7 (2002): http://www.gnb.ca/0000/publications/curric/grade7science.pdf
Grade 8 (2002): http://www.gnb.ca/0000/publications/curric/grade8science.pdf
Grade 9 (2002): http://www.gnb.ca/0000/publications/curric/grade9science.pdf
Grade 10 (2002): http://www.gnb.ca/0000/publications/curric/grade10science.pdf
Biology 112/111 (2008): http://www.gnb.ca/0000/publications/curric/Biology112-111.pdf
Biology 122/121 (2008): http://www.gnb.ca/0000/publications/curric/Biology122-121.pdf

Newfoundland and Labrador

Kindergarten (2010):
    http://www.ed.gov.nl.ca/edu/k12/curriculum/guides/science/kinder/3.Outcomes_p19-58.pdf
Grade 1: http://www.ed.gov.nl.ca/edu/k12/curriculum/guides/science/primary/gr1outcomes.pdf
Grade 2: http://www.ed.gov.nl.ca/edu/k12/curriculum/guides/science/primary/gr2outcomes.pdf
Grade 3: http://www.ed.gov.nl.ca/edu/k12/curriculum/guides/science/primary/gr3outcomes.pdf
Grade 4 (2002): http://www.ed.gov.nl.ca/edu/k12/curriculum/guides/science/elementary/gr4.pdf
Grade 5 (2002): http://www.ed.gov.nl.ca/edu/k12/curriculum/guides/science/elementary/gr5.pdf
Grade 6 (2002): http://www.ed.gov.nl.ca/edu/k12/curriculum/guides/science/elementary/gr6.pdf
Grade 7 (2013):
    http://www.ed.gov.nl.ca/edu/k12/curriculum/guides/science/grade7/Science_Grade7_%20CurriculumGuide_webversion2013.pdf

Grade 8 (interim):
http://www.ed.gov.nl.ca/edu/k12/curriculum/guides/science/grade8/Contents_Grd_8_science.pdf
Grade 9 (interim):
http://www.ed.gov.nl.ca/edu/k12/curriculum/guides/science/grade9/unit_4_grd_9_science.pdf
Biology 2201 (2002):
http://www.ed.gov.nl.ca/edu/k12/curriculum/guides/science/bio2201/Biology%202201%20Cover.PDF
Biology 3201 (2004):
http://www.ed.gov.nl.ca/edu/k12/curriculum/guides/science/bio3201/bio3201cover.pdf

Northwest Territories
K–6 (2004):
http://www.ece.gov.nt.ca/files/Early-Childhood/K-6%20Science%20%26%20Technology%20CurriculumFINAL%20.pdf
For grades 7–12 please see Alberta curriculum documents.

Nova Scotia
Grade 1 (2005): http://www.ednet.ns.ca/files/curriculum/science_1_sec-web.pdf
Grade 2 (2005): http://www.ednet.ns.ca/files/curriculum/science2.pdf
Grade 3 (2005): http://www.ednet.ns.ca/files/curriculum/science3_web_2007.pdf
Grade 4 (2006): http://www.ednet.ns.ca/files/curriculum/Science4_web.pdf
Grade 5 (2008): http://www.ednet.ns.ca/files/curriculum/Science5_web_secured.pdf
Grade 6 (2008): http://www.ednet.ns.ca/files/curriculum/Science6_Web.pdf
Grade 10 (2012): http://www.ednet.ns.ca/files/curriculum/Science10-2012.pdf
Biology 11 (2000): http://www.ednet.ns.ca/files/curriculum/biology11.pdf

Nunavut
For grades K–6, please see Northwest Territories curriculum document.
For grades 7–12, please see Alberta curriculum documents.

Ontario
Grades 1–8 (2007): http://www.edu.gov.on.ca/eng/curriculum/elementary/scientec18currb.pdf
Grades 9 and 10 (2008): http://www.edu.gov.on.ca/eng/curriculum/secondary/science910_2008.pdf
Grades 11 and 12 (2008):
http://www.edu.gov.on.ca/eng/curriculum/secondary/2009science11_12.pdf

Prince Edward Island
Kindergarten (2008): http://www.gov.pe.ca/photos/original/k_doc.pdf
Grade 1: http://www.gov.pe.ca/photos/original/ed_gr1_sci.pdf
Grade 2: http://www.gov.pe.ca/photos/original/ed_gr2_sci.pdf
Grade 3: http://www.gov.pe.ca/photos/original/ed_gr3_sci.pdf
Grade 4: http://www.gov.pe.ca/photos/original/ed_gr4_sci.pdf
Grade 5: http://www.gov.pe.ca/photos/original/ed_gr5_sci.pdf
Grade 6: http://www.gov.pe.ca/photos/original/educ_6ScienceCu.pdf
Grade 7: http://www.gov.pe.ca/photos/original/ed_gr7_sciguide.pdf
Grade 8: http://www.gov.pe.ca/photos/original/ed_gr8_sciguide.pdf
Grade 9: http://www.gov.pe.ca/photos/original/ed_gr9_sciguide.pdf
Grade 10: http://www.gov.pe.ca/photos/original/ed_sci421Aguide.pdf
Biology 521 A (Grade 11): http://www.gov.pe.ca/photos/original/edu_bio521A2010.pdf
Biology 621 A (Grade 12): http://www.gov.pe.ca/photos/original/eecd_bio621A.pdf

Quebec

Elementary Cycles 1–3:
http://www1.mels.gouv.qc.ca/sections/programmeFormation/primaire/pdf/educprg2001bw/educprg2001bw-062.pdf

Secondary Cycle 1:
http://www1.mels.gouv.qc.ca/sections/programmeFormation/secondaire1/pdf/qepsecfirstcycle.pdf

Secondary Cycle 2:
http://www1.mels.gouv.qc.ca/sections/programmeFormation/secondaire2/medias/en/6c_QEP_ScienceTechno.pdf

Saskatchewan

Kindergarten (2010):
http://www.progetudes.gov.sk.ca/index.jsp?kindergarten=true&view=indicators&lang=en&subj=science&level=k

Grade 1 (2011):
https://www.edonline.sk.ca/bbcswebdav/library/curricula/English/Science/Science_1_2011.pdf

Grade 2 (2011):
https://www.edonline.sk.ca/bbcswebdav/library/curricula/English/Science/Science_2_2011.pdf

Grade 3 (2011):
https://www.edonline.sk.ca/bbcswebdav/library/curricula/English/Science/Science_3_2011.pdf

Grade 4 (2011)
https://www.edonline.sk.ca/bbcswebdav/library/curricula/English/Science/Science_4_2011.pdf

Grade 5 (2011)
https://www.edonline.sk.ca/bbcswebdav/library/curricula/English/Science/Science_5_2011.pdf

Grade 6 (2009)
https://www.edonline.sk.ca/bbcswebdav/library/curricula/English/Science/science_6_2009.pdf

Grade 7 (2009)
https://www.edonline.sk.ca/bbcswebdav/library/curricula/English/Science/science_7_2009.pdf

Grade 8 (2009)
https://www.edonline.sk.ca/bbcswebdav/library/curricula/English/Science/science_8_2009.pdf

Grade 9 (2005)
https://www.edonline.sk.ca/bbcswebdav/library/curricula/English/Science/science_9_2009.pdf

Grade 10 (2005)
https://www.edonline.sk.ca/bbcswebdav/library/curricula/English/Science/Science_10_2005.pdf

Biology 20/30 (1992)
https://www.edonline.sk.ca/bbcswebdav/library/curricula/English/Science/Biology_20_30_1992.pdf

Yukon

Please see British Columbia curriculum documents