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Saskatchewan Curriculum

Science

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Introduction

Science is a Required Area of Study in Saskatchewan's Core Curriculum. The provincial requirement for science is 150 minutes of instruction per week at this grade level (*Core Curriculum: Principles, Time Allocations, and Credit Policy*).

The purpose of this curriculum is to outline the provincial requirements for science at this grade level, including the intended learning outcomes that students are expected to achieve by the end of the year. Indicators are included to provide the breadth and depth of what students should know and be able to do to achieve the learning outcomes.

This renewed curriculum reflects current science education research, updated technology, and recently developed resources, and is responsive to changing demographics within the province. This curriculum is based on the *Pan-Canadian Protocol for Collaboration on School Curriculum Common Framework of Science Learning Outcomes K to 12* (Council of Ministers of Education, Canada [CMEC], 1997).

Inquiry into authentic student questions generated from student experiences is the central strategy for teaching science.

(National Research Council [NRC], 1996, p. 31)

The philosophy and spirit of science education in Saskatchewan is reflected in this curriculum, in the resources developed to support the new curriculum, and in materials designed and utilized to support curriculum implementation. In addition, the philosophy for science education builds on and supports the concept of Core Curriculum in Saskatchewan.

This curriculum includes the following information to support science instruction in Saskatchewan schools:

- connections to Core Curriculum, including the Broad Areas of Learning and Cross-curricular Competencies
- the K-12 aim and goals for science education
- characteristics of an effective science program
- outcomes and indicators for this grade level
- assessment and evaluation
- connections with other areas of study
- a glossary.

Using this Curriculum

Outcomes describe the knowledge, skills, and understandings that students are expected to attain by the end of a particular grade.

Outcomes are statements of what students are expected to know and be able to do by the end of a grade in a particular area of study. The outcomes provide direction for assessment and evaluation, and for program, unit, and lesson planning.

Critical characteristics of an outcome:

- focus on what students will learn rather than what teachers will teach
- specify the skills and abilities, understandings and knowledge, and/or attitudes students are expected to demonstrate
- are observable, assessable, and attainable
- are written using action-based verbs and clear professional language (educational and subject-related)
- are developed to be achieved in context so that learning is purposeful and interconnected
- are grade and subject specific
- are supported by indicators which provide the breadth and depth of expectations
- have a developmental flow and connection to other grades where applicable.

Indicators are a representative list of the types of things a student should know or be able to do if they have attained the outcome.

Indicators are representative of what students need to know and/or be able to do to achieve an outcome. Indicators represent the breadth and depth of learning related to a particular outcome. The list of indicators provided in the curriculum is not an exhaustive list. Teachers may develop additional and/or alternative indicators, reflective of and consistent with the breadth and depth defined by the given indicators.

Within the outcomes and indicators in this curriculum, the terms "including", "such as", and "e.g.," commonly occur. Each term serves a specific purpose.

- The term "including" prescribes content, contexts, or strategies that students must experience in their learning, without excluding other possibilities. For example, an indicator might state that students are to evaluate methods used to investigate the effects of contact and non-contact forces on the movement of objects, including identifying and suggesting explanations for discrepancies in the collected data. This means that, although other methods of investigation can be evaluated, identifying and suggesting explanations for discrepancies in the collected data are mandatory.

- The term "such as" provides examples of possible broad categories of content, contexts, or strategies that teachers or students may choose, without excluding other possibilities. For example, an indicator might include the phrase "such as pyramids, Stonehenge, Easter Island moai, tipis, inukshuks, and totem poles" as examples of different types of structures that were constructed using inclined planes and other simple machines. This statement provides teachers and students with possible examples of structures to consider, while not excluding other examples.
- The term "e.g.," offers specific examples of what concepts, contexts, or strategies might look like. For example, an indicator might include the phrase "e.g., wind vane, rain gauge, thermometer, barometer, and anemometer" to refer to examples of simple weather instruments that students may design and construct.

Although the outcomes and indicators in the science curriculum are organized by units, teachers may organize their instruction using disciplinary or interdisciplinary themes. Teachers are not required to structure instruction into four distinct science units.

Core Curriculum

Core Curriculum is intended to provide all Saskatchewan students with an education that will serve them well, regardless of their choices after leaving school. Through its components and initiatives, Core Curriculum supports the achievement of the Goals of Education for Saskatchewan. For current information regarding Core Curriculum, please refer to *Core Curriculum: Principles, Time Allocations, and Credit Policy* on the Saskatchewan Ministry of Education website. For additional information related to the various components and initiatives of Core Curriculum, please refer to the Ministry website at *www.education.gov.sk.ca/policy* for policy and foundation documents.

Broad Areas of Learning

Three Broad Areas of Learning reflect Saskatchewan's Goals of Education. Science education contributes to student achievement of the Goals of Education through helping students achieve knowledge, skills, and attitudes related to these Broad Areas of Learning.

Lifelong Learners

Related to the following Goals of Education:

- *Basic Skills*
- *Lifelong Learning*
- *Positive Lifestyle*

Students who are engaged in constructing and applying science knowledge naturally build a positive disposition towards learning. Throughout their study of science, students bring their curiosity about the natural and constructed world, which provides the motivation to discover and explore their personal interests more deeply. By sharing their learning experiences with others, in a variety of contexts, students develop skills that support them as lifelong learners.

Sense of Self, Community, and Place

Related to the following Goals of Education:

- *Understanding and Relating to Others*
- *Self-Concept Development*
- *Spiritual Development*

Students develop and strengthen their personal identity as they explore connections between their own understanding of the natural and constructed world and the perspectives of others, including scientific and Indigenous perspectives. Students develop and strengthen their understanding of community as they explore ways in which science can inform individual and community decision making on issues related to the natural and constructed world. Students interact experientially with place-based local knowledge to deepen their connection to and relationship with nature.

Engaged Citizens

Related to the following Goals of Education:

- *Career and Consumer Decisions*
- *Membership in Society*
- *Growing with Change*

As students explore connections between science, technology, society, and the environment, they experience opportunities to contribute positively to the environmental, economic, and social sustainability of local and global communities. Students reflect and act on their personal responsibility to understand and respect their place in the natural and constructed world, and make personal decisions that contribute to living in harmony with others and the natural world.

Cross-curricular Competencies

The Cross-curricular Competencies are four interrelated areas containing understandings, values, skills, and processes which are considered important for learning in all areas of study. These competencies reflect the Common Essential Learnings and are intended to be addressed in each area of study at each grade level.

Developing Thinking

Learners construct knowledge to make sense of the world around them. In science, students develop understanding by building and reflecting on their observations and what already is known by themselves and others. By thinking contextually, creatively, and critically, students deepen their understanding of phenomena in the natural and constructed world.

K-12 Goals for Developing Thinking:

- *thinking and learning contextually*
- *thinking and learning creatively*
- *thinking and learning critically.*

Developing Identity and Interdependence

This competency addresses the ability to act autonomously in an interdependent world. It requires the learner to be aware of the natural environment, social and cultural expectations, and the possibilities for individual and group accomplishments. Interdependence assumes the possession of a positive self-concept and the ability to live in harmony with others and with the natural and constructed world. In science, students examine the interdependence among living things within local, national, and global environments, and consider the impact of individual decisions on those environments.

K-12 Goals for Developing Identity and Interdependence:

- *understanding, valuing, and caring for oneself*
- *understanding, valuing, and caring for others*
- *understanding and valuing social, economic, and environmental interdependence and sustainability.*

Developing Literacies

Literacies are multi-faceted and provide a variety of ways, including the use of various language systems and media, to interpret the world and express understanding of it. Literacies involve the evolution of interrelated knowledge, skills, and strategies that facilitate an individual's ability to participate fully and equitably in a variety of roles and contexts – school, home, and local and global communities. In science, students collect, analyze, and represent ideas and understanding of the natural and constructed world in multiple forms.

K-12 Goals for Developing Literacies:

- *developing knowledge related to various literacies*
- *exploring and interpreting the world through various literacies*
- *expressing understanding and communicating meaning using various literacies.*

K-12 Goals for Developing Social Responsibility:

- *using moral reasoning*
- *engaging in communitarian thinking and dialogue*
- *taking social action.*

Developing Social Responsibility

Social responsibility is how people positively contribute to their physical, social, cultural, and educational environments. It requires the ability to participate with others in accomplishing shared or common goals. This competency is achieved by using moral reasoning processes, engaging in communitarian thinking and dialogue, and taking social action. Students in science examine the impact of scientific understanding and technological innovations on society.

Aim and Goals

The aim of K-12 science education is to enable all Saskatchewan students to develop scientific literacy. Scientific literacy today embraces Euro-Canadian and Indigenous heritages, both of which have developed an empirical and rational knowledge of nature. A Euro-Canadian way of knowing about the natural and constructed world is called science, while First Nations and Métis ways of knowing nature are found within the broader category of Indigenous knowledge.

Diverse learning experiences based on the outcomes in this curriculum provide students with many opportunities to explore, analyze, evaluate, synthesize, appreciate, and understand the interrelationships among science, technology, society, and the environment (STSE) that will affect their personal lives, careers, and future.

Goals are broad statements identifying what students are expected to know and be able to do upon completion of the learning in a particular area of study by the end of Grade 12. The four goals of K-12 science education are to:

- **Understand the Nature of Science and STSE Interrelationships:** Students will develop an understanding of the nature of science and technology, their interrelationships, and their social and environmental contexts, including interrelationships between the natural and constructed world.
- **Construct Scientific Knowledge:** Students will construct an understanding of concepts, principles, laws, and theories in life science, physical science, earth and space science, and Indigenous knowledge of nature, then apply these understandings to interpret, integrate, and extend their knowledge.
- **Develop Scientific and Technological Skills:** Students will develop the skills required for scientific and technological inquiry, problem solving, and communicating; for working collaboratively; and for making informed decisions.

- **Develop Attitudes that Support Scientific Habits of Mind:** Students will develop attitudes that support the responsible acquisition and application of scientific, technological, and Indigenous knowledge to the mutual benefit of self, society, and the environment.

Inquiry

Inquiry learning provides students with opportunities to build knowledge, abilities, and inquiring habits of mind that lead to deeper understanding of their world and human experience. Inquiry is more than a simple instructional method. It is a philosophical approach to teaching and learning, grounded in constructivist research and methods, which engages students in investigations that lead to disciplinary and interdisciplinary understanding.

Inquiry builds on students' inherent sense of curiosity and wonder, drawing on their diverse backgrounds, interests, and experiences. The process provides opportunities for students to become active participants in a collaborative search for meaning and understanding.

Elementary students who are engaged in inquiry in science should be able to:

- ask questions about objects, organisms, and events in the environment
- plan and conduct a simple investigation
- employ simple equipment and tools to gather data and extend the senses
- use data to construct a reasonable explanation
- communicate investigations and explanations.

(NRC, 1996, p. 122-123)

Inquiry is intimately connected to scientific questions – students must inquire using what they already know and the inquiry process must add to their knowledge.

(NRC, 2000, p. 13)

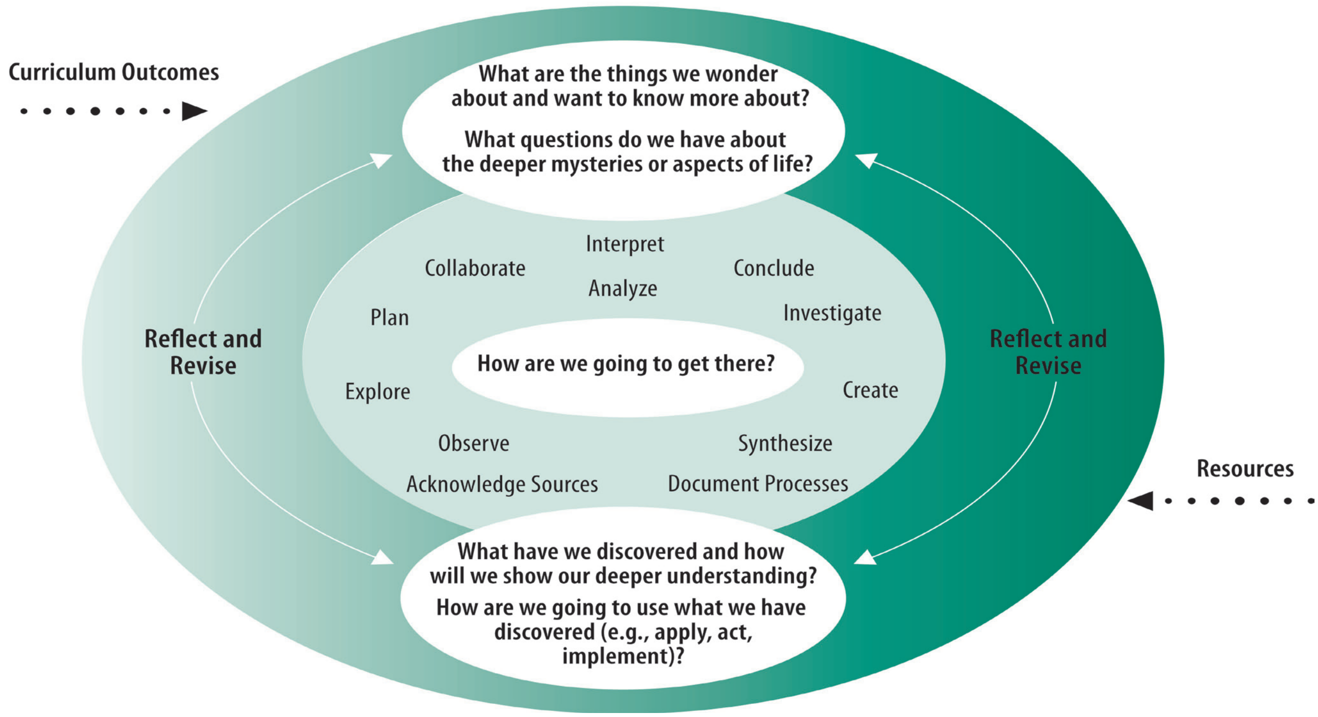
An important part of any inquiry process is student reflection on their learning and the documentation needed to assess learning and make it visible. Student documentation of their inquiries in science may take the form of works-in-progress, reflective writing, journals, reports, notes, models, arts expressions, photographs, video footage, or action plans.

Students do not come to understand inquiry simply by learning words such as "hypothesis" and "inference" or by memorizing procedures such as "the steps of the scientific method".

(NRC, 2000, p. 14)

Inquiry learning is not a step-by-step process, but rather a cyclical process with various phases of the process being revisited and rethought as a result of students' discoveries, insights, and construction of new knowledge. Experienced inquirers will move back and forth among various phases as new questions arise and as students become more comfortable with the process. The following graphic shows various phases of the cyclical inquiry process.

Constructing Understanding Through Inquiry



Good science inquiry provides many entry points – ways in which students can approach a new topic – and a wide variety of activities during student work.

(Kluger-Bell, 2000, p. 48)

Creating Questions for Inquiry in Science

Inquiry focuses on the development of driving questions to initiate and guide the learning process. Students and/or teachers formulate questions to motivate inquiries into topics, problems, and issues related to curriculum content and outcomes.

Well-formulated inquiry questions are broad in scope and rich in possibilities. Such questions encourage students to explore, observe, gather information, plan, analyze, interpret, synthesize, problem solve, take risks, create, conclude, document, reflect on learning, and develop new questions for further inquiry.

In science, teachers and students can use the four learning contexts of Scientific Inquiry, Technological Problem Solving, STSE Decision Making, and Cultural Perspectives (see Learning Contexts on p.17 for further information) as curriculum entry points to begin their inquiry. The process may evolve into interdisciplinary learning opportunities reflective of the holistic nature of our lives and interdependent global environment.

Developing questions evoked by student interests have the potential for rich and deep learning. These questions are used to initiate and guide the inquiry and give students direction for investigating topics, problems, ideas, challenges, or issues under study.

The process of constructing questions for deep understanding can help students grasp the important disciplinary or interdisciplinary ideas that are situated at the core of a particular curricular focus or context. These broad questions lead to more specific questions that can provide a framework, purpose, and direction for the learning activities in a lesson or series of lessons.

Questions give students initial direction for uncovering the understandings associated with a unit of study. Questions can help students grasp the big disciplinary ideas surrounding a focus or context and related themes or topics. They provide a framework, purpose, and direction for the learning activities in each unit and help students connect what they are learning to their experiences and life beyond the classroom. Questions also invite and encourage students to pose their own questions for deeper understanding.

Students should recognize science is generally unable to answer "why" questions; in these instances, scientists rephrase their inquiries into "how" questions.

Essential questions that lead to deeper understanding in science should:

- *center on objects, organisms, and events in the natural world*
- *connect to science concepts outlined in the curricular outcomes*
- *lend themselves to empirical investigation*
- *lead to gathering and using data to develop explanations for natural phenomena.*

(NRC, 2000, p. 24)

An Effective Science Education Program

An effective science education program supports student achievement of learning outcomes through:

- incorporating all foundations of scientific literacy
- using the learning contexts as entry points into student inquiry
- understanding and effectively using the language of science
- engaging in laboratory and field work
- practising safety
- choosing and using technology in science appropriately.

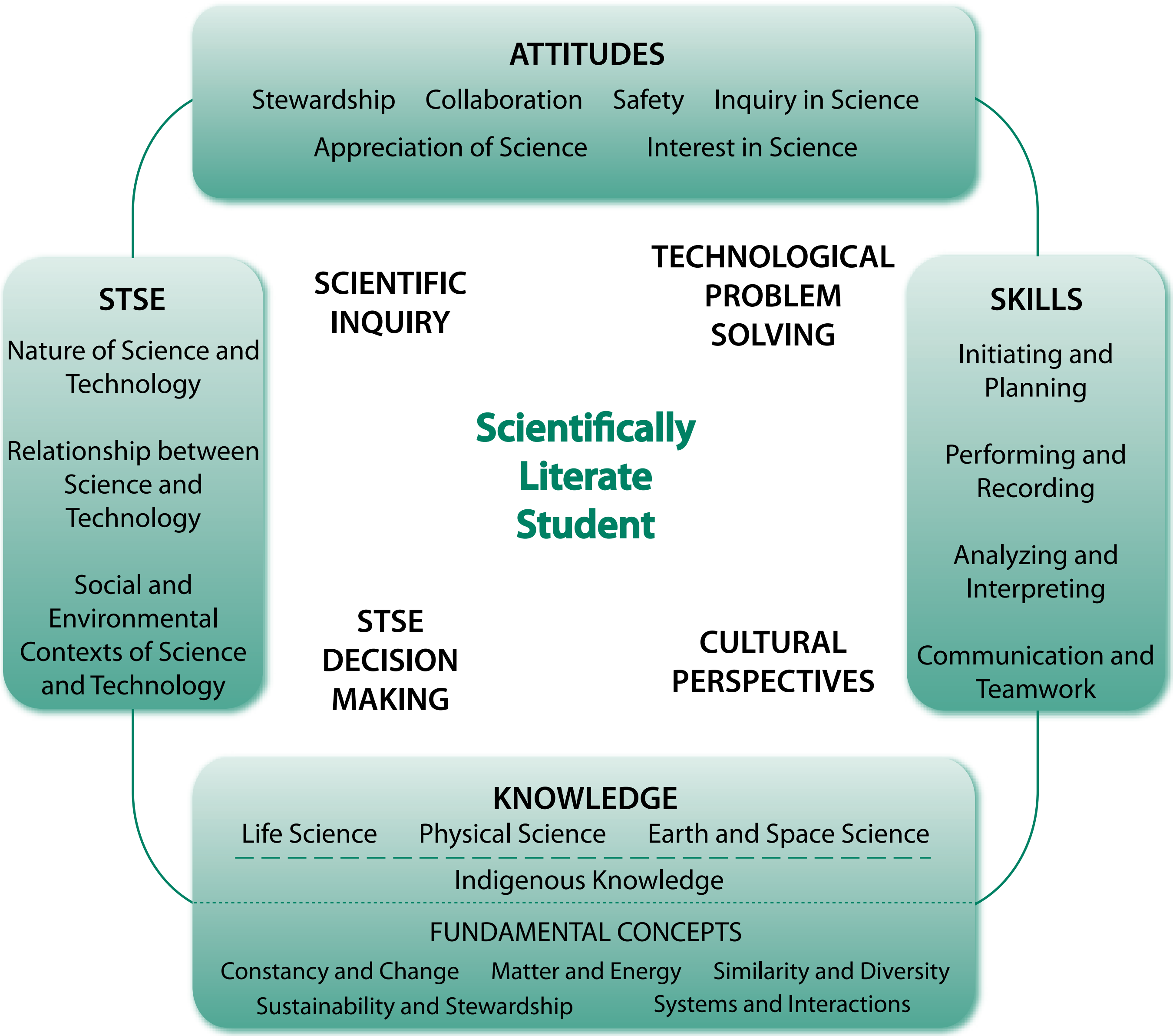
All science outcomes and indicators incorporate one or more foundations of scientific literacy; these are the "what" of the curriculum. The learning contexts represent different processes for engaging students in achieving curricular outcomes; they are the "how" of the curriculum. The four units of study at each grade are an organizing structure for the curriculum.

Scientists construct models to support their explanations based on empirical evidence. Students need to engage in similar processes through authentic investigations. During the investigations, students must follow safe practices.

Technology serves to extend our powers of observation and support the sharing of information. Students should use a variety of technology tools for data collection and analysis, visualization and imaging, and communication and collaboration throughout the science curriculum.

To achieve the vision of scientific literacy outlined in this curriculum, students increasingly must become engaged in the planning, development, and evaluation of their own learning activities. In the process, students should have the opportunity to work collaboratively with others, initiate investigations, communicate findings, and complete projects that demonstrate learning.

Scientific Literacy Framework



Foundations of Scientific Literacy

The K-12 goals of science education parallel the foundation statements for scientific literacy described in the *Common Framework of Science Learning Outcomes K to 12* (CMEC, 1997, p. 6-18). These four foundation statements delineate the critical aspects of students' scientific literacy. They reflect the wholeness and interconnectedness of learning and should be considered interrelated and mutually supportive.

Foundation 1: Science, Technology, Society, and the Environment (STSE) Interrelationships

This foundation is concerned with understanding the scope and character of science, its connections to technology, and the social and environmental contexts in which it is developed. This foundation is the driving force of scientific literacy. Three major dimensions address this foundation.

Nature of Science and Technology

Science is a social and cultural activity anchored in a particular intellectual tradition. It is one way of knowing nature, based on curiosity, imagination, intuition, exploration, observation, replication, interpretation of evidence, and consensus-making over this evidence and its interpretation. More than most other ways of knowing nature, science excels at predicting what will happen next, based on its descriptions and explanations of natural and technological phenomena.

Science-based ideas continually are being tested, modified, and improved as new ideas supersede existing ideas. Technology, like science, is a creative human activity concerned with solving practical problems that arise from human and social needs, particularly the need to adapt to the environment and fuel a nation's economy. Research and development leads to new products and processes through the processes of inquiry and design.

Relationships between Science and Technology

Historically, the development of technology has been strongly linked to advances in science, with each making contributions to the other. Where the focus of science is on the development and verification of knowledge, in technology, the focus is on the development of solutions, involving devices and systems that meet a given need within the constraints of the problem. The test of science knowledge is that it helps explain, interpret, and predict; the test of technology is that it works, enabling us to achieve a given purpose.

Social and Environmental Contexts of Science and Technology

The history of science shows that scientific development takes place within a social context that includes economic, political, social, and cultural forces, along with personal biases and the need for peer acceptance and recognition. Many examples demonstrate how cultural and intellectual traditions have influenced the focus and methodologies of science, and how science, in turn, has influenced the wider world of ideas. Today, societal and environmental needs and issues often drive research agendas. As technological solutions emerge from previous research, many new technologies give rise to complex social and environmental issues which increasingly are becoming part of the political agenda. The potential of science, technology, and indigenous knowledge to inform and empower decision-making by individuals, communities, and society is central to scientific literacy in a democratic society.

Foundation 2: Scientific Knowledge

This foundation focuses on the subject matter of science including the theories, models, concepts, and principles that are essential to an understanding of the natural and constructed world. For organizational purposes, this foundation is framed using widely accepted science disciplines.

Life Science

Life science deals with the growth and interactions of life forms within their environments in ways that reflect the uniqueness, diversity, genetic continuity, and changing nature of these life forms. Life science includes the study of topics such as ecosystems, biological diversity, organisms, cell biology, biochemistry, diseases, genetic engineering, and biotechnology.

Physical Science

Physical science, which encompasses chemistry and physics, deals with matter, energy, and forces. Matter has structure, and its components interact. Energy links matter to gravitational, electromagnetic, and nuclear forces in the universe. Physical science also addresses the conservation laws of mass and energy, momentum, and charge.

Earth and Space Science

Earth and space science brings local, global, and universal perspectives to student knowledge. Earth, our home planet, exhibits form, structure, and patterns of change, as do our surrounding solar system and the physical universe beyond. Earth and space science includes geology, hydrology, meteorology, and astronomy.

Traditional and Local Knowledge

A strong science program recognizes that modern science is not the only form of empirical knowledge about nature and aims to broaden student understanding of traditional and local knowledge systems. The dialogue between scientists and traditional knowledge holders has an extensive history and continues to grow as researchers and practitioners seek to understand our complex world. The terms "traditional knowledge", "indigenous knowledge", and "traditional ecological knowledge" are used by practitioners worldwide when referencing local knowledge systems which are embedded within particular worldviews. This curriculum uses the term "indigenous knowledge" and provides the following definitions to show parallels and distinctions between indigenous knowledge and scientific knowledge.

Indigenous Knowledge

"Traditional [Indigenous] knowledge is a cumulative body of knowledge, know-how, practices, and representations maintained and developed by peoples with extended histories of interaction with the natural environment. These sophisticated sets of understandings, interpretations and meanings are part and parcel of a cultural complex that encompasses language, naming and classification systems, resource use practices, ritual, spirituality and worldview" (International Council for Science, 2002, p. 3).

Scientific Knowledge

Similar to Indigenous knowledge, scientific knowledge is a cumulative body of knowledge, know-how, practices, and representations maintained and developed by people (scientists) with extended histories of interaction with the natural environment. These sophisticated sets of understandings, interpretations, and meanings are part and parcel of cultural complexes that encompass language, naming and classification systems, resource use practices, ritual, and worldview.

Fundamental Ideas – Linking Scientific Disciplines

A useful way to create linkages among science disciplines is through fundamental ideas that underlie and integrate different scientific disciplines. Fundamental ideas provide a context for explaining, organizing, and connecting knowledge. Students deepen their understanding of these fundamental ideas and apply their understanding with increasing sophistication as they progress through the curriculum from Kindergarten to Grade 12. These fundamental ideas are identified in the following chart.

Constancy and Change	The ideas of constancy and change underlie understanding of the natural and constructed world. Through observations, students learn that some characteristics of materials and systems remain constant over time whereas other characteristics change. These changes vary in rate, scale, and pattern, including trends and cycles, and may be quantified using mathematics, particularly measurement.
Matter and Energy	Objects in the physical world are comprised of matter. Students examine materials to understand their properties and structures. The idea of energy provides a conceptual tool that brings together many understandings about natural phenomena, materials, and the process of change. Energy, whether transmitted or transformed, is the driving force of both movement and change.
Similarity and Diversity	The ideas of similarity and diversity provide tools for organizing our experiences with the natural and constructed world. Beginning with informal experiences, students learn to recognize attributes of materials that help to make useful distinctions between one type of material and another, and between one event and another. Over time, students adopt accepted procedures and protocols for describing and classifying objects encountered, thus enabling students to share ideas with others and to reflect on their own experiences.
Systems and Interactions	An important way to understand and interpret the world is to think about the whole in terms of its parts and, alternately, about its parts in terms of how they relate to one another and to the whole. A system is an organized group of related objects or components that interact with one another so that the overall effect is much greater than that of the individual parts, even when these are considered together.
Sustainability and Stewardship	Sustainability refers to the ability to meet our present needs without compromising the ability of future generations to meet their needs. Stewardship refers to the personal responsibility to take action to participate in the responsible management of natural resources. By developing their understanding of ideas related to sustainability, students are able to take increasing responsibility for making choices that reflect those ideas.

Foundation 3: Scientific and Technological Skills and Processes

This foundation identifies the skills and processes students develop in answering questions, solving problems, and making decisions. While these skills and processes are not unique to science, they play an important role in the development of scientific and technological understanding and in the application of acquired knowledge to new situations. Four broad skill areas are outlined in this foundation. Each area is developed further at each grade level with increasing scope and complexity of application.

Initiating and Planning

These are the processes of questioning, identifying problems, and developing preliminary ideas and plans.

Performing and Recording

These are the skills and processes of carrying out a plan of action, which involves gathering evidence by observation and, in most cases, manipulating materials and equipment. Gathered evidence can be documented and recorded in a variety of formats.

Analyzing and Interpreting

These are the skills and processes of examining information and evidence, organizing and presenting data so that they can be interpreted, interpreting those data, evaluating the evidence, and applying the results of that evaluation.

Communication and Teamwork

In science and technology, as in other areas, communication skills are essential whenever ideas are being developed, tested, interpreted, debated, and accepted or rejected. Teamwork skills also are important because the development and application of ideas rely on collaborative processes both in science-related occupations and in learning.

Foundation 4: Attitudes

Both scientific and Indigenous knowledge systems place value on attitudes, values, and ethics. These are more likely to be presented in a holistic manner in Indigenous knowledge systems.

This foundation focuses on encouraging students to develop attitudes, values, and ethics that inform a responsible use of science and technology for the mutual benefit of self, society, and the environment. This foundation identifies six categories in which science education contributes to the development of scientific literacy.

Appreciation of Science

Students will be encouraged to critically and contextually appreciate the role and contributions of science and technology in their lives and to their community's culture, and be aware of the limits of science and technology and their impact on economic, political, environmental, cultural, and ethical events.

Interest in Science

Students will be encouraged to develop curiosity and continuing interest in the study of science at home, in school, and in the community.

Inquiry in Science

Students will be encouraged to develop critical beliefs concerning the need for evidence and reasoned argument in the development of scientific knowledge.

Collaboration

Students will be encouraged to nurture competence in collaborative activity with classmates and others, inside and outside of the school.

Stewardship

Students will be encouraged to develop responsibility in the application of science and technology in relation to society and the natural environment.

Safety

Students engaged in science and technology activities will be expected to demonstrate a concern for safety and doing no harm to themselves or others, including plants and animals.

Learning Contexts

Learning contexts provide entry points into the curriculum that engage students in inquiry-based learning to achieve scientific literacy. Each learning context reflects a different, but overlapping, philosophical rationale for including science as a Required Area of Study:

- The **scientific inquiry** learning context reflects an emphasis on understanding the natural and constructed world using systematic empirical processes that lead to the formation of theories that explain observed events and facilitate prediction.
- The **technological problem-solving** learning context reflects an emphasis on designing, constructing, testing, and refining prototypes to solve practical human problems using an engineering approach.
- The **STSE decision-making** learning context reflects the need to engage citizens in thinking about human and world issues through a scientific lens to inform and empower decision making by individuals, communities, and society.
- The **cultural perspectives** learning context reflects a humanistic perspective on examining and understanding the knowledge systems that other cultures use, and have used, to describe and explain the natural world.

These learning contexts are not mutually exclusive; thus, well-designed instruction may incorporate more than one learning context. Students need to experience learning through each learning context at each grade; it is not necessary, nor advisable, for each student to attempt to engage in learning through each learning context in each unit. Learning within a classroom may be structured to enable individuals or groups of students to achieve the same curricular outcomes through different learning contexts.

Each learning context is identified with a two-or three-letter code. One or more of these codes are listed under each outcome as a suggestion regarding which learning context(s) most strongly support the intent of the outcome.

A choice of learning approaches also can be informed by recent well-established ideas on how and why students learn:

- Learning occurs when students are treated as a community of practitioners of scientific literacy.
- Learning is both a social and an individual event for constructing and refining ideas and competences.

- Learning involves the development of new self-identities for many students.
- Learning is inhibited when students feel a culture clash between their home culture and the culture of school science.

Scientific inquiry refers to the diverse ways in which scientists study the natural world and propose explanations based on the evidence derived from their work.

(NRC, 1996, p. 23)

Scientific Inquiry [SI]

Inquiry is a defining feature of the scientific way of knowing nature. Inquiry requires identification of assumptions, use of critical and logical thinking, and consideration of alternative explanations. Inquiry is a multi-faceted activity that involves:

- making observations, including watching or listening to knowledgeable sources
- posing questions or becoming curious about the questions of others
- examining books and other sources of information to see what is already known
- reviewing what is already known in light of experimental evidence and rational arguments
- planning investigations, including field studies and experiments
- acquiring the resources (financial or material) to carry out investigations
- using tools to gather, analyze, and interpret data
- proposing critical answers, explanations, and predictions
- communicating the results to various audiences.

By participating in a variety of inquiry experiences that vary in the amount of student self-direction, students develop competencies necessary to conduct inquiries of their own – a key element to scientific literacy.

Technological design is a distinctive process with a number of defined characteristics; it is purposeful; it is based on certain requirements; it is systematic; it is iterative; it is creative; and there are many possible solutions.

(International Technology Education Association, 2000, p. 91)

Technological Problem Solving [TPS]

The essence of the technological problem-solving learning context is that students seek answers to practical problems. This process is based on addressing human and social needs, and typically is addressed through an iterative design-action process that involves steps such as:

- identifying a problem
- identifying constraints and sources of support
- identifying alternative possible solutions and selecting one on which to work
- planning and building a prototype or a plan of action to resolve the problem

- testing and evaluating the prototype or plan.

By participating in a variety of technological and environmental problem-solving activities, students develop capacities to analyze and resolve authentic problems in the natural and constructed world.

STSE Decision Making [DM]

Scientific knowledge can be related to understanding interrelationships among science, technology, society, and the environment. Students also must consider values or ethics when addressing a question or issue. STSE decision making involves steps such as:

- clarifying an issue
- evaluating available research and different viewpoints on the issue
- generating possible courses of action or solutions
- evaluating the pros and cons for each action or solution
- identifying a fundamental value associated with each action or solution
- making a thoughtful decision
- examining the impact of the decision
- reflecting back on the process of decision making.

Students may engage with STSE issues through research projects, student-designed laboratory investigations, case studies, role playing, debates, deliberative dialogues, and action projects.

To engage with science and technology toward practical ends, people must be able to critically assess the information they come across and critically evaluate the trustworthiness of the information source.

(Aikenhead, 2006, p. 2)

Cultural Perspectives [CP]

Students should recognize and respect that all cultures develop knowledge systems to describe and explain nature. Two knowledge systems emphasized in this curriculum are First Nations and Métis cultures (Indigenous knowledge) and Euro-Canadian cultures (science). In their own way, both of these knowledge systems convey an understanding of the natural and constructed worlds, and they create or borrow from other cultures' technologies to resolve practical problems. Both knowledge systems are systematic, rational, empirical, dynamically changeable, and culturally specific.

Cultural features of science, in part, are conveyed through the other three learning contexts, and when addressing the nature of science. Cultural perspectives on science also can be taught in activities that explicitly explore Indigenous knowledge or knowledge from other cultures.

Addressing cultural perspectives in science involves:

- recognizing and respecting knowledge systems that various

For First Nations people, the purpose of learning is to develop the skills, knowledge, values and wisdom needed to honour and protect the natural world and ensure the long-term sustainability of life.

(Canadian Council on Learning, 2007, p. 18)

For the Métis people, learning is understood as a process of discovering the skills, knowledge and wisdom needed to live in harmony with the Creator and creation, a way of being that is expressed as the 'Sacred Act of Living a Good Life'.

(Canadian Council on Learning, 2007, p. 22)

cultures have developed to understand the natural world and the technologies they have created to solve human problems

- recognizing science, as one of those knowledge systems, evolved within Euro-Canadian cultures
- valuing place-based knowledge to solve practical problems
- honouring protocols for obtaining knowledge from a knowledge keeper and taking responsibility for knowing it.

By engaging in explorations of cultural perspectives, scientifically literate students begin to appreciate the worldviews and belief systems fundamental to science and Indigenous knowledge.

The Language of Science

Science is a way of understanding the natural world using internally consistent methods and principles that are well-described and understood by the scientific community. The principles and theories of science have been established through repeated experimentation and observation and have been refereed through peer review before general acceptance by the scientific community. Acceptance of a theory does not imply unchanging belief in a theory or denote dogma. Instead, as new data become available, previous scientific explanations are revised and improved or rejected and replaced. There is a progression from a hypothesis to a theory using testable, scientific laws. Many hypotheses are tested to generate a theory. Only a few scientific facts are considered natural laws (e.g., the Law of Conservation of Mass).

Scientists use the terms "law", "theory", and "hypothesis" to describe various types of scientific explanations about phenomena in the natural and constructed world. These meanings differ from common usage of the same terms.

The terms "law", "theory", and "hypothesis" have special meaning in science.

- Law – A law is a generalized description, usually expressed in mathematical terms, that describes some aspect of the natural world under certain conditions.
- Theory – A theory is an explanation for a set of related observations or events that may consist of statements, equations, models, or a combination of these. Theories also predict the results of future observations. A theory becomes a theory once the explanation is verified multiple times by different groups of researchers. The procedures and processes for testing a theory are well-defined within each scientific discipline, but they vary between disciplines. No amount of evidence proves that a theory is correct. Rather, scientists accept theories until the emergence of new evidence that the theory is unable to explain adequately. At

this point, the theory is discarded or modified to explain the new evidence. Note that theories never become laws; theories explain laws.

- Hypothesis – A hypothesis is a tentative, testable generalization that may be used to explain a relatively large number of events in the natural world. It is subject to immediate or eventual testing by experiments. Hypotheses must be worded in such a way that they can be falsified. Hypotheses are never proven correct, but are supported by empirical evidence.

Scientific models are constructed to represent and explain certain aspects of physical phenomenon. Models are never exact replicas of real phenomena; rather, models are simplified versions of reality, generally constructed to facilitate study of complex systems such as the atom, climate change, and biogeochemical cycles. Models may be physical, mental, or mathematical, or contain a combination of these elements. Models are complex constructions that consist of conceptual objects and processes in which the objects participate or interact. Scientists spend considerable time and effort building and testing models to further understanding of the natural world.

When engaging in the processes of science, students constantly are building and testing their own models of understanding the natural world. Students may need help in learning how to identify and articulate their own models of natural phenomena. Activities that involve reflection and metacognition are particularly useful in this regard. Students should be able to identify the features of the physical phenomena their models represent or explain. Just as importantly, students should identify which features are not represented or explained by their models. Students should determine the usefulness of their model by judging whether the model helps in understanding the underlying concepts or processes. Ultimately, students realize that different models of the same phenomena may be needed to investigate or understand different aspects of the phenomena.

Laboratory and Field Work

Laboratory work often is at the centre of scientific research; as such, it also should be an integral component of school science. The National Research Council (2006, p. 3) defines a school laboratory investigation as an experience in the laboratory, classroom, or field that provides students with opportunities to interact directly with natural phenomena or with data collected by others, using tools, materials, data collection techniques, and models. Laboratory experiences should be designed so that all students – including students with academic and physical challenges – are able to participate authentically in and benefit from those experiences.

Laboratory activities help students develop scientific and technological skills and processes including:

- initiating and planning
- performing and recording
- analyzing and interpreting
- communication and teamwork.

Ideally, laboratory work should help students to understand the relationship between evidence and theory, develop critical thinking and problem-solving skills, as well as develop acceptable scientific attitudes.

(Di Giuseppe, 2007, p. 54)

Laboratory investigations also help students understand the nature of science, specifically that explanations and predictions must be consistent with observations. Similarly, student-centered laboratory investigations help to emphasize the need for curiosity and inquisitiveness as part of the scientific endeavour. The National Science Teachers Association [NSTA] position statement, *The Integral Role of Laboratory Investigations in Science Instruction* (2007), provides further information about laboratory investigations.

A strong science program includes a variety of individual, small, and large group laboratory and field experiences for students. Most importantly, these experiences need to go beyond conducting confirmatory "cook-book" experiments. Similarly, computer simulations and teacher demonstrations can support, but should not replace, hands-on student activities.

Assessment and evaluation of student performance must reflect the nature of the laboratory experience by addressing scientific and technological skills. Students should document their observations and processes using science journals and narrative lab reports. The narrative lab report enables students to tell the story of their process and findings by addressing four questions:

- What was I looking for?
- How did I look for it?
- What did I find?
- What do these findings mean?

Student responses may be written in point form or essay format. For some investigations, teachers may decide that writing a paragraph describing the significance of their findings is sufficient.

Safety

Safety in the classroom is of paramount importance. Other components of education (resources, teaching strategies, facilities) attain their maximum utility only in a safe classroom. Creating a safe classroom requires that a teacher be informed, aware, and proactive, and that the students listen, think, and respond appropriately.

Safe practice in or out of the classroom is the joint responsibility of the teacher and students. The teacher's responsibility is to provide a safe environment and ensure that students are aware of safe practice. The students' responsibility is to act intelligently based on the advice which is given and which is available in various resources.

Kwan and Texley (2003) suggest that teachers, as professionals, consider the four Ps of safety: prepare, plan, prevent, and protect. The following points are adapted from those guidelines and provide a starting point for thinking about safety in the science classroom:

Prepare

- Keep up-to-date with personal safety knowledge and certifications.
- Be aware of national, provincial, division, and school level safety policies and guidelines.
- Create a safety contract with students.

Plan

- Develop learning plans that ensure all students learn effectively and safely.
- Choose activities that are best suited to the learning styles, maturity, and behaviour of all students, and that include all students.
- Create safety checklists for in-class activities and field studies.

Prevent

- Assess and mitigate hazards.
- Review procedures for accident prevention with students.
- Teach and review safety procedures with students, including the need for appropriate clothing.
- Do not use defective or unsafe equipment or procedures.
- Do not allow students to eat or drink in science areas.

Protect

- Ensure students have sufficient protective devices such as safety glasses.
- Demonstrate and instruct students on the proper use of safety equipment and protective gear.
- Model safe practice by insisting that all students and visitors use appropriate protective devices.

The definition of safety includes consideration of the well-being of all components of the biosphere, such as plants, animals, earth, air, and water. From knowing what wild flowers can be picked to considering

Safety cannot be mandated soley by rule of law, teacher command, or school regulation. Safety and safe practice are an attitude.

the disposal of toxic wastes from chemistry laboratories, the safety of our world and our future depends on our actions and teaching in science classes. Students also must practise ethical, responsible behaviours when caring for and experimenting with live animals. For further information, refer to the NSTA position statement, *Responsible Use of Live Animals and Dissection in the Science Classroom* (2008).

WHMIS regulations govern storage and handling practices of chemicals in schools.

Safety in the science classroom includes the storage, use, and disposal of chemicals. The Workplace Hazardous Materials Information System (WHMIS) regulations under the Hazardous Products Act govern storage and handling practices of chemicals in schools. All school divisions must comply with the provisions of the act. Chemicals should be stored in a safe location according to chemical class, not just alphabetically. Appropriate cautionary labels must be placed on all chemical containers, and all school division employees using hazardous substances should have access to appropriate Materials Safety Data Sheets (MSDS). Under provincial WHMIS regulations, all employees involved in handling hazardous substances must receive training by their employer. Teachers who have not been informed about or trained in this program should contact their Director of Education. Further information related to WHMIS is available through Health Canada and Saskatchewan Labour Relations and Workplace Safety.

The Chemical Hazard Information Table in Safety in the Science Classroom (Alberta Education, 2005) provides detailed information including appropriateness for school use, hazard ratings, WHMIS class, storage class, and disposal methods for hundreds of chemicals.

Technology in Science

Technology should be used to support learning in science when:

- *it is pedagogically appropriate*
- *it makes scientific views more accessible*
- *it helps students to engage in learning that otherwise would not be possible.*

(Flick & Bell, 2000)

Technology-based resources are essential for instruction in the science classroom. Technology is intended to extend our capabilities and, therefore, is one part of the teaching toolkit. Individual, small group, or class reflection and discussions are required to connect the work with technology to the conceptual development, understandings, and activities of the students. Choices to use technology, and choices of which technologies to use, should be based on sound pedagogical practices, especially those that support student inquiry. These technologies include computer technologies, as described below, and non-computer based technologies.

Some recommended examples of using computer technologies to support teaching and learning in science include:

Data Collection and Analysis

- Data loggers, such as temperature probes, permit students to collect and analyze data, often in real-time, and to collect observations over very short or long periods of time, enabling investigations that otherwise would be impractical.
- Graphing software can facilitate the analysis and display of student-collected data or data obtained from other sources.

Visualization and Imaging

- Students may collect their own digital images and video recordings as part of their data collection and analysis, or they may access digital images and video online to help enhance understanding of scientific concepts.
- Simulation and modeling software provide opportunities to explore concepts and models which are not readily accessible in the classroom, such as those that require expensive or unavailable materials or equipment, hazardous materials or procedures, levels of skills not yet achieved by the students, or more time than is possible or appropriate in a classroom.

Communication and Collaboration

- Students can use word-processing and presentation tools to share the results of their investigations with others.
- The Internet can be a means of networking with scientists, teachers, and other students by gathering information and data, posting data and findings, and comparing results with students in different locations.
- Students can participate in authentic science projects by contributing local data to large-scale web-based science inquiry projects such as Journey North (www.learner.org/north) or GLOBE (www.globe.gov).

Outcomes and Indicators

Life Science – Human Body Systems (HB)
HB5.1 Analyze personal and societal requirements for, and the impact of, maintaining a healthy human body.
HB5.2 Investigate the structure, function, and major organs of one or more human body systems such as the digestive, excretory, respiratory, circulatory, nervous, muscular, and skeletal systems.
HB5.3 Assess how multiple human body systems function together to enable people to move, grow, and react to stimuli.

Physical Science – Properties and Changes of Materials (MC)
MC5.1 Investigate the characteristics and physical properties of materials in solid, liquid, and gaseous states of matter.
MC5.2 Investigate how reversible and non-reversible changes, including changes of state, alter materials.
MC5.3 Assess how the production, use, and disposal of raw materials and manufactured products affects self, society, and the environment.

Physical Science – Forces and Simple Machines (FM)
FM5.1 Analyze the effects of gravitational, magnetic, and mechanical forces, including friction, on the movement of objects.
FM5.2 Investigate characteristics of simple machines, including levers, wheels and axles, pulleys, inclined planes, screws, and wedges, for moving and lifting loads.
FM5.3 Assess how natural and man-made forces and simple machines affect individuals, society, and the environment.

Earth and Space Science – Weather (WE)
WE5.1 Measure and represent local weather, including temperature, wind speed and direction, amount of sunlight, precipitation, relative humidity, and cloud cover.
WE5.2 Investigate local, national, and global weather conditions, including the role of air movement and solar energy transfer.
WE5.3 Analyze the impact of weather on society and the environment, including technologies that help humans address weather conditions.

Life Science: Human Body Systems (HB)
All outcomes in this unit contribute to the development of all K-12 science goals.

Outcomes	Indicators
HB5.1 Analyze personal and societal requirements for, and the impact of, maintaining a healthy human body. ***[CP, DM]***	a. Examine methods and perspectives of various cultures, including First Nations and Métis, which have contributed to knowledge about maintaining a healthy body (e.g., balance inherent in the Medicine Wheel). b. Identify local knowledge, including the effects of traditional lifestyles, that contributes to human understanding of maintaining a healthy body. c. Analyze the role of the skin (e.g., protection, heat regulation, absorption, and evaporation) in maintaining a healthy body. d. Research how the body's defences, such as tears, saliva, skin, certain blood cells, and stomach secretions, work to fight against infections. e. Describe the function of technologies (e.g., defibrillator, soap, exercise equipment, and safety equipment) that have been developed to support personal health. f. Relate the effects of common diseases to the organs or body systems they affect or are related to (e.g., heart attacks affect the circulatory system, epilepsy affects the nervous system, hepatitis affects the liver, gallstones affect the gall bladder, and asthma affects the respiratory system). g. Predict how the failure or removal of a specific organ in the human body system would affect an individual's health. h. Compare personal diets and those of people who live in different communities and countries worldwide to *Canada's Food Guide* and *Canada's Food Guide – First Nations, Métis, and Inuit*. i. Assess the benefits of lifestyle choices (e.g., daily physical activity, proper nutrition, adequate sleep, appropriate hygiene practices, regular medical check-ups, and using safety equipment) that contribute to maintaining a healthy body. j. Propose actions that individuals can take to minimize the harmful effects and maximize the beneficial effects of natural- and human-caused environmental factors (e.g., West Nile Virus, mosquitoes, pesticides, air quality, noise pollution, food safety, and water and wastewater treatment) on human health.

Outcomes	Indicators
HB5.1 continued	k. Research the roles of different individuals and organizations within their communities that help support personal and community health.
HB5.2 Investigate the structure, function, and major organs of one or more human body systems such as the digestive, excretory, respiratory, circulatory, nervous, muscular, and skeletal systems. ***[SI, TPS]***	a. Explain at least two functions of the human digestive, excretory, respiratory, circulatory, nervous, muscular, or skeletal systems. b. Create a written and/or visual representation of the location of the major organs of at least two human body systems within the entire body. c. Model the structure and/or function of one or more organs from the human digestive, excretory, respiratory, circulatory, nervous, muscular, or skeletal system. d. Assess, in collaboration with other students, a model of an organ from a human body system to refine the model. e. Critique models in science, such as models of human organs, as representations of natural phenomena, objects, and/or physical processes. f. Suggest the processes that scientists might follow to investigate questions related to the structure and/or function of human body systems (e.g., Which factors affect breathing and heartbeat rate? How does the digestion process work? How much air do lungs hold? Why is blood red? Where does my food go?). g. Rephrase, into a testable form, questions about the structure and/or function of one or more body systems. h. Design and carry out procedures, including identifying and controlling variables, to investigate the structure and/or function of one or more body systems (e.g., the influence of exercise on heart rate, the role of simulated saliva in starting the digestion process, and factors that influence a person's response time). i. Compile and display data from investigations related to the structure and/or function of human body systems using appropriate formats such as frequency tallies, tables, and bar graphs. j. Suggest explanations for patterns and discrepancies in data collected during investigations related to the structure and/or function of human body systems. k. Imagine how a human body might function or look if it did not have one or more of the major body systems.

Outcomes	Indicators
HB5.3 Assess how multiple human body systems function together to enable people to move, grow, and react to stimuli. ***[SI]***	a. Pose questions to investigate or suggest practical problems to solve in relation to human body systems (e.g., How are the various systems connected to each other? Could one system live without the other systems? If not, why not? Why do we need to eat? Could we breathe without a diaphragm? Which organs work hard during exercise? Why do people sometimes become paralyzed due to an injury?). b. Relate body changes, such as acne on the skin and growth of body hair, to human growth and development from birth to puberty. c. Represent, physically, dramatically, or visually, the interactions among the skeletal, muscular, and nervous systems that produce movement of the body or parts of the body. d. Research how the respiratory, digestive, and circulatory systems work together to move oxygen and nutrients throughout the human body. e. Investigate the interdependence between the nervous system and other body systems for reacting to stimuli and controlling body functions. f. Explain how the digestive and excretory systems work together to ensure that the body makes use of food that is eaten and disposes of waste. g. Propose alterations to the human body that might enable humans to function more effectively to accomplish one or more typical daily tasks.

Physical Science: Properties and Changes of Materials (MC)

All outcomes in this unit contribute to the development of all K-12 science goals.

Outcomes	Indicators
MC5.1 Investigate the characteristics and physical properties of materials in solid, liquid, and gaseous states of matter. ***[CP, SI]***	a. Recognize that matter is anything that has mass and takes up space. b. Classify materials in their environment as solids, liquids, or gases based on personal observation. c. Discuss the importance of water, in all states of matter, as a sacred substance within First Nations and Métis cultures. d. Carry out a procedure to compare the mass of an object with the mass of its components. e. Pose questions related to the characteristics and physical properties of matter that are suitable for investigating using processes of science. f. Observe and record characteristics and physical properties (e.g., colour, texture, mass, volume, hardness, flexibility, absorbency, strength, buoyancy, melting point, malleability, magnetism, and solubility) of different solids, liquids, and gases in their environment. g. Determine the distinguishing characteristics which enable scientists to differentiate between solids, liquids, and gases. h. Measure the temperature, volume, and mass of materials using appropriate instruments (e.g., digital thermometer, ruler, tape measure, graduated cylinder, measuring cup, single-pan balance, and electronic scale) and standard units (e.g., ^{0}C, cm^3, ml, and kg). i. Explain how some characteristics and physical properties, such as melting point, boiling point, buoyancy, and solubility, help to distinguish materials from one another. j. Critique personal and scientific classification systems of matter by identifying substances that are not easily classified as solids, liquids, or gases (e.g., butter, fat scraped off hides, fog, Jell-O, and wax).

Outcomes	Indicators
MC5.2 Investigate how reversible and non-reversible changes, including changes of state, alter materials. ***[SI]***	a. Pose and refine questions for investigation related to changes in materials. b. Demonstrate changes (e.g., cutting aluminium foil, forming clay, breaking wood, and crumpling paper) that can be made to an object without changing the properties of the material making up the object. c. Explore how characteristics and physical properties of materials may change when they interact with one another. d. Predict whether changes to a material will be reversible or non-reversible. e. Observe and classify changes to materials as reversible (e.g., melting ice cube, dissolving salt in water, blowing up a balloon, and folding paper) and non-reversible (e.g., paper burning, egg cooking, bicycle rusting, balloon popping, and apple turning brown). f. Differentiate between changes to materials that occur rapidly (e.g., wood burning, explosives detonating, balloon popping, and glass breaking) and those that occur over extended periods (e.g., bicycle rusting, paint fading, and newspaper yellowing). g. Provide evidence of the six changes of state (i.e., evaporation, condensation, freezing, melting, sublimation, and deposition) of matter in the environment (e.g., water evaporating from wet clothes, steam condensing on the wall of a shower, lake freezing, butter melting, ice cube sublimating in the freezer, and frost forming on a car window). h. Demonstrate that changes of state of matter are reversible when heat is applied or removed. i. Compare the characteristics and physical properties of a material in its solid and liquid states (e.g., compare the mass of ice cubes with the mass of liquid that results when they melt). j. Design and carry out a procedure to determine whether the mass of materials changes during reversible and non-reversible changes. k. Follow established safety procedures for working with heating appliances and hot materials (e.g., switch hot plates off immediately after use, use tongs and insulated mitts for carrying hot materials and for tending a fire). l. Discuss the characteristics of fair tests and why scientists value the importance of conducting fair tests for gaining knowledge about the physical properties of materials.

Outcomes	Indicators
MC5.2 continued	m. Investigate methods, such as firing clay and forming alloys (e.g., brass, bronze, white gold, and sterling silver) that artists use to change materials based on their understanding of the properties of materials. n. Develop conclusions about the effects of reversible and non-reversible changes on the characteristics and physical properties of materials.
MC5.3 Assess how the production, use, and disposal of raw materials and manufactured products affects self, society, and the environment. ***[DM, SI]***	a. Differentiate between raw materials and manufactured products. b. Assess the benefits and drawbacks of manufactured materials (e.g., plastic, steel, aluminium, glass, nylon, and other fabric) that have been developed to improve human living conditions. c. Research a product to determine the raw materials from which it is made and the process required to turn the raw materials into a manufactured product. d. Conduct a fair test to determine the effectiveness of different types or brands of a material (e.g., glue, coffee mug, paper towel, battery, bubble gum, paper, soap, and balloon). e. Develop and apply criteria (e.g., function, cost, reliability, and aesthetics) for evaluating the effectiveness of a consumer product. f. Identify locations in their communities and in Saskatchewan where agricultural and industrial manufacturing occurs, what products are created and tested, which raw materials are used, and how by-products and waste are disposed. g. Assess the societal and environmental impacts of industrial and agricultural processes that change raw materials into manufactured products, taking into account different perspectives such as consumer, manufacturer, salesperson, and community leader. h. Identify potentially harmful products used at home, school, and in communities, including interpreting consumer chemical hazard symbols, and describe practices that individuals can follow to ensure personal and community safety. i. Research cultural values related to the consumption of products, such as using all parts of an animal. j. Investigate how natural and manufactured products (e.g., tires, computers, trees, garbage, paper, scrap metal, house construction materials, food, clothing, oil, and automobiles) are disposed of personally, in their communities, and in Saskatchewan.

Outcomes	Indicators
MC5.3 continued	k. Recognize the need for developing a sense of responsibility towards other people, other living things, and the environment when choosing how to use and dispose of manufactured products.

Physical Science: Forces and Simple Machines (FM)

All outcomes in this unit contribute to the development of all K-12 science goals.

Outcomes	Indicators
FM5.1 Analyze the effects of gravitational, magnetic, and mechanical forces, including friction, on the movement of objects. ***[CP, SI]***	a. Differentiate between examples of contact (e.g., wind, push, and pull) and non-contact (e.g., magnetic and gravitational) forces in their daily lives. b. Describe how forces can act directly or from a distance to cause objects to start to move, speed up, slow down, change direction, or stop moving. c. Explain and diagram, using force arrows to represent the relative strength and direction of a force, how contact and non-contact forces affect the movement of objects. d. Collaboratively design and carry out an experiment to determine the effects of changing the amount of force applied to an object on the movement of the object. e. Measure, using non-standard units (e.g., number of elastic bands, and the length that an elastic band stretches), the force required to cause an object to move a specified distance, and estimate the force required to move a different object the same distance or the same object a different distance. f. Record qualitative observations and quantitative measurements about the effects of non-contact (i.e., gravitational and magnetic) forces which act from a distance to cause objects to move, change direction, or stay in place. g. Differentiate between the effects of balanced and unbalanced forces (e.g., gravitational, magnetic, and mechanical) on the movement of objects. h. Pose questions to investigate the effects of friction on stationary and moving objects, and identify variables (e.g., surface material, texture, mass, angle of ramp, and orientation of object) that may be relevant to the investigation.

Outcomes	Indicators
FM5.1 continued	i. Conduct a fair test to compare the effects of friction on the movement of objects over a variety of surfaces (e.g., wood, cloth, floor tile, carpet, tabletop, sidewalk, and grass). j. Collect and display quantitative data related to forces and motion using tables, charts, diagrams, and line graphs. k. Measure forces in standard units (e.g., Newton) using a spring scale or a force sensor. l. Collect and graph quantitative data to compare the mass and gravitational force acting on various objects. m. Evaluate methods used to investigate the effects of contact and non-contact forces on the movement of objects, including identifying and suggesting explanations for discrepancies in collected data. n. Draw conclusions about the relationship between contact and non-contact forces on the movement of objects.
FM5.2 Investigate characteristics of simple machines, including levers, wheels and axles, pulleys, inclined planes, screws, and wedges, for moving and lifting loads. ***[SI, TPS]***	a. Pose and refine testable questions about the operation of simple machines. b. Demonstrate how simple machines (e.g., hammer, screwdriver, pliers, bottle opener, ramp, splitting wedges, and scissors) act to reduce effort, increase the distance a load moves, and/or change the direction of an applied force. c. Select and safely use tools and materials in a manner that ensures personal safety and the safety of others when investigating the characteristics of simple machines. d. Design and carry out an experiment to compare the force needed to lift a load manually with that required to lift it using various simple machines. e. Demonstrate how the position of the fulcrum, the load, and the applied force differs for each of the three classes of levers. f. Determine the relationship between the applied force and the distance the load is moved for each class of lever. g. Compare the operation of wheel and axle mechanisms (e.g., Ferris wheel, bicycle wheel, rolling pin, in-line skate, windmill, and door knob) with the operation of levers. h. Determine the effectiveness of wheel and axle mechanisms (e.g., screwdrivers, wheels, doorknobs, and gear systems) of various diameters, rotational speeds, and rotational directions for accomplishing specific tasks.

Outcomes	Indicators
FM5.2 continued	i. Investigate the relationship between the amount of applied force and the distance that the load is moved in single and multiple pulley systems, including determining the mechanical advantage of the system. j. Explain the operating principles of an inclined plane, such as a ramp or ladder, with reference to the applied load and the distance that the load is moved. k. Design and construct a prototype of a simple machine which is meant to accomplish a student-identified task. l. Evaluate the efficiency and effectiveness of a prototype of a simple machine using student-identified criteria, and refine the prototype based on data. m. Create a representation of the characteristics and operating principles of each type of simple machine. n. Recognize that scientific processes and ideas help explain how and why simple machines operate. o. Pose new questions to investigate about the characteristics of simple machines.
FM5.3 Assess how natural and man-made forces and simple machines affect individuals, society, and the environment. ***[CP, DM, SI]***	a. Provide examples of simple and complex machines used at home, in school, and throughout their community. b. Compare technologies developed and/or used by various cultures, past and present, which represent applications of simple machines. c. Analyze the effects of forces from natural phenomena (e.g., earthquake, tornado, hurricane, and tsunami) on the natural and constructed environment. d. Assess, using student-identified criteria, the function and effectiveness of products designed to enhance or reduce friction (e.g., grease, oil, ski wax, skate blade, fishing lure, canoe paddle, Velcro, and winter tires) between two surfaces. e. Suggest how the function of common simple mechanisms, such as a crowbar, wheelbarrow, elbow joint, fork, rake, baseball bat, can opener, stapler, or scissors, might be different had they been based on a different class of lever. f. Identify the benefits and disadvantages of practical examples of levers (e.g., pliers, teeter-totter, bottle opener, wheelbarrow, and fishing rod) on their lives and in their community. g. Assess the impacts of machines, such as carts, boats, airplanes, logging equipment, and tractors, on traditional lifestyles.

Outcomes	Indicators
FM5.3 continued	h. Examine how agricultural, industrial, automotive, marine, and household applications of pulleys (e.g., combine, swather, crane, fan belt, block and tackle, clothesline, and flagpole) have changed the lives of individuals and affected society and the environment. i. Research the use of inclined planes and other simple machines used to construct structures such as pyramids, Stonehenge, Easter Island moai, tipis, inukshuks, and totem poles. j. Examine the types of tasks in the community that have been and are being currently accomplished using wedges (e.g., shim, splitting maul, knife, axe, and chisel). k. Analyze technologies that are based on principles of simple machines in sports and recreation (e.g., teeter-totter, water slide, gymnastics wedge, balance board, and roller coaster). l. Analyze the ways in which various combinations of simple machines can be combined to create complex machines. m. Imagine machines that could be developed to simplify tasks within their lives, including fanciful devices such as Rube Goldberg machines.

Earth and Space Science: Weather (WE)

All outcomes in this unit contribute to the development of all K-12 science goals.

Outcomes	Indicators
WE5.1 Measure and represent local weather, including temperature, wind speed and direction, amount of sunlight, precipitation, relative humidity, and cloud cover. ***[CP, SI, TPS]***	a. Pose questions about local weather conditions and methods of collecting weather data. b. Compare strengths and limitations of methods and technologies used historically and currently by different people around the world to obtain information about the weather. c. Classify clouds as stratus, cumulus, cirrus, or "other", compare results with others, and analyze why results may vary. d. Use a technological problem-solving process to design and construct simple weather instruments (e.g., wind vane, rain gauge, thermometer, barometer, and anemometer). e. Explain the function and purpose of simple weather instruments.

Outcomes	Indicators
WE5.1 continued	f. Compile and display local weather data (e.g., temperature, wind speed and direction, amount of sunlight, precipitation, relative humidity, and cloud cover) for a given time interval (e.g., hourly throughout the day, daily for one week, and weekly for one month) using a weather journal, tables, charts, diagrams, and graphs. g. Construct a wind rose to determine the predominant wind direction in a region over a given time period. h. Evaluate, using student-developed criteria, the effectiveness of a personally-constructed weather instrument. i. Construct a sample weather map for their region, indicating the temperature, wind speed and direction, precipitation, and cloud cover at a given time. j. Analyze patterns and discrepancies in weather data for a given location over a specified time interval. k. Generate simple conclusions about the prevailing local weather conditions. l. Pose new questions about local weather conditions based on what was learned.
WE5.2 Investigate local, national, and global weather conditions, including the role of air movement and solar energy transfer. ***[SI]***	a. Pose questions about the characteristics of local, national, and global weather conditions. b. Demonstrate properties of air, in that air takes up space, has weight, expands and rises when heated, exerts pressure, and moves from areas of high pressure to areas of low pressure. c. Measure, describe, and represent patterns in indoor and local outdoor air movement. d. Design and safely carry out an experiment to determine the effects of solar energy on different surfaces (e.g., water, soil, sand, asphalt, concrete, grass, and wood). e. Record and share, using tables, charts, diagrams, and graphs, the results of experimentation into the effects of solar energy on different surfaces. f. Develop simple conclusions about the relationship between the amount of energy absorbed by a material and the nature of the material. g. Relate the transfer of energy from the sun to the heating of Earth's surface by providing examples of surfaces that heat at different rates and locations (e.g., desert, forest, island, and summerfallow field) that have different temperatures.

Outcomes	Indicators
WE5.2 continued	h. Describe the characteristics of severe weather events, such as hurricanes, tornadoes, blizzards, hailstorms, droughts, and tropical cyclones, including the role of air movement and solar energy transfer in those events. i. Relate weather extremes (e.g., hottest air temperature, lowest air temperature, greatest rainfall, highest wind speed, and heaviest hailstone) to specific locations in Canada and on Earth. j. Compare weather conditions locally, regionally, and across Canada at various times throughout the year. k. Examine weather lore and animal behaviours in traditional and contemporary cultures as tools to predict weather conditions. l. Predict patterns in local, regional, and global weather over a given time frame (e.g., a day, a week, a month, and a year). m. Suggest explanations for patterns or discrepancies between predictions of weather patterns and actual data for a given location during a given time interval. n. Identify examples of local, national, and global weather phenomena that Canadian scientists are currently studying (e.g., UV protection, wind chill, ozone layer, seasonal snow cover, and temperature trends).
WE5.3 Analyze the impact of weather on society and the environment, including technologies that help humans adddress weather conditions. ***[DM]***	a. Explain the purpose of different types of information (e.g., satellite and radar maps, weather watches and warnings, summary statistics, travel advisories, and air quality reports) that weather forecasters provide. b. Research how and why people in their communities use short- and long-term weather forecasts in their daily lives. c. Analyze the impact of weather conditions for a particular region on the lives and livelihoods of people in that region, including choices of food, shelter, clothing, transportation, and employment. d. Research effects of short- and long-term changes in weather on the lives and livelihoods of people locally, nationally, and globally. e. Relate weather conditions, and changing weather conditions, to the activities and behaviours of animals. f. Explain the effects of different types of severe weather on people, communities, and the environment, including personal safety preparations for various severe weather events.

Outcomes	Indicators
WE5.3 continued	g. Examine how scientists and traditional knowledge keepers can collaborate to provide a more comprehensive understanding of the effects of weather on people and the environment. h. Research traditional and contemporary technological innovations and products related to clothing, shelter, agriculture, and transportation that various cultures have developed to address various types of weather conditions. i. Explain why forecasting, measuring, and understanding weather is important for humans. j. Propose ideas for new products that would help humans address various types of weather conditions.

Assessment and Evaluation of Student Learning

Assessment and evaluation require thoughtful planning and implementation to support the learning process and inform teaching. All assessment and evaluation of student achievement must be based on the outcomes in the provincial curriculum.

Assessment involves the systematic collection of information about student learning with respect to:

- achievement of provincial curriculum outcomes
- effectiveness of teaching strategies employed
- student self-reflection on learning.

Evaluation compares assessment information against criteria based on curriculum outcomes for the purpose of communicating to students, teachers, parents/caregivers, and others about student progress, and making informed decisions about the teaching and learning process.

Reporting of student achievement must be in relation to curriculum outcomes. Assessment information unrelated to outcomes (e.g., attendance, behaviour, general attitude, completion of homework, and effort) can be gathered and reported to complement the reported achievement related to curricular outcomes.

We assess students for three interrelated purposes. Each type of assessment, systematically implemented, contributes to an overall picture of an individual student's achievement.

Assessment for learning involves the use of information about student progress to support and improve student learning, inform instructional practices, and:

- is teacher-driven for student, teacher, and parent use
- occurs throughout the teaching and learning process using a variety of tools
- engages teachers in providing differentiated instruction, feedback to students to enhance learning, and information to parents in support of learning.

Assessment as learning actively involves student reflection on learning, monitoring her/his own progress, and:

- engages students in critically analyzing learning related to curricular outcomes (metacognition)
- is student-driven with teacher guidance for personal use
- occurs throughout the learning process.

Assessment of learning involves teachers' use of evidence of student learning to make judgements about student achievement and:

- provides the opportunity to report evidence of achievement related to curricular outcomes
- occurs at the end of a learning cycle using a variety of tools
- provides the foundation for discussions on placement or promotion.

Connections with Other Areas of Study

Although some learning outcomes or subject-area knowledge may be better achieved through discipline-specific instruction, deeper understanding may be attained through the integration of the disciplines. Some outcomes for each area of study complement each other and offer opportunities for subject-area integration. Integrating science with another area of study can help students develop in a holistic manner by addressing physical, emotional, mental, and spiritual dimensions.

By identifying a particular context to use as an organizer, the outcomes from more than one subject area can be achieved, and students can make connections across areas of study. Integrated, interdisciplinary instruction, however, must be more than just a series of activities. An integrated approach must facilitate students' learning of the related disciplines and understanding of the conceptual connections. The learning situations must achieve each subject area's outcomes ensure that in-depth learning occurs. If deep understanding is to occur, the experiences cannot be based on superficial or arbitrarily connected activities (Brophy & Alleman, 1991, p. 66). The outcomes and activities of one area of study must not be obscured by the outcomes or activities of another area of study (Education Review Office, 1996, p. 13).

Many possibilities for the integration of science and other subject areas exist. In doing this integration, however, teachers must be cautious not to lose the integrity of any of the subjects. Integration gives students experience with transfer of knowledge and provides rich contexts in which the students are able to make sense of their learning. A few of the ways in which science can be integrated into other subject areas (and other subject areas into science) at grade five follow.

Arts Education

The conceptual focus for Grade 5 Arts Education is "Pop Culture". This focus includes investigations of how works of art are part of, or influenced by, mainstream pop culture. Connections between arts education and science may include:

- Representing their understanding of the actions of simple and complex machines using models, interpretive dance, or dramatic representations.
- Examining how artists represent their understanding of issues related to healthy and unhealthy actions, behaviours, and consequences through dance, drama, music, and the visual arts.
- Creating a visual representation of one or more human body systems in a manner that reflects pop art.

English Language Arts (ELA)

As students gather and evaluate information, construct and refine knowledge, and share what they know with a variety of audiences, they use and develop their language skills. The environment/technology context in English language arts can provide students with an opportunity to learn and apply science knowledge. Some specific examples of connections between ELA and science at grade five include:

- Throughout the science curriculum, students should view, listen to, read, comprehend, and respond to a variety of texts, including fiction, non-fiction, videos, websites, and summarize the main ideas and supporting details of those texts.
- Students should understand that the structure of science textbooks differs from the structure of other types of texts. By gaining an understanding of that structure, students will be able to read those texts efficiently and effectively for a variety of purposes, including gathering information, following directions, understanding information, and enjoyment.
- Students should present the results of their science inquiries using a variety of text forms, including expository, informational, and procedural texts (e.g., document the development of a prototype of a simple machine), descriptive texts (e.g., write a journal of weather data over a given time period), and persuasive texts (e.g., propose actions that individuals can take to minimize the effects of environmental factors on human health).
- Students should reflect on and critique their choices of grade-appropriate strategies for communicating their science learning.

Health Education

Connections often can be found between the topics in health education and science, even though students may conduct their inquiries into these topics from different disciplinary "worlds". Specific examples of the connection between these areas of study at grade five include:

- Analyzing how personal eating practices influence human health.
- Examining how specific illnesses and diseases impact individual body systems and holistic well-being.

Mathematics

A key connection between mathematics and science is the search for patterns and relationships in the natural and constructed world. Inquiries in science require students to collect, analyze, and display data, which require the application of a variety of mathematical skills and processes, including measuring, counting, and data analysis skills.

When students construct mathematical and physical models in science to represent and explain natural phenomena, they apply mathematical skills related to number. Some specific examples of these connections in grade five include:

- Identifying and interpreting patterns and discrepancies in local weather data.
- Classifying data related to weather conditions as first-hand and second-hand.
- Investigating the volume and/or capacity of various human organs.
- Differentiating between edges and faces of 3-D objects when studying simple and complex machines.

Physical Education

Both science and physical education involve an understanding of the human body, albeit within different disciplinary "worlds". Understanding scientific principles related to movement can serve to enhance skillful movement of the human body; in contrast, the analysis of human movement can contribute to a deeper understanding of the underlying scientific principles. Two specific examples of connections between these areas of study at grade five include:

- Examining how muscular fitness and cardiovascular endurance contribute to a healthy human body.
- Designing and carrying out a process to investigate the function of the muscular and/or cardiovascular systems.

Social Studies

The content of social studies and science often can be used to connect the two areas of study, particularly with respect to connections between the environment and all living things, including humans. This connection is emphasized through the STSE (Science-Technology-Society-Environment) foundation of scientific literacy and the STSE Decision Making learning context. Some specific examples of these connections in grade five include:

- Comparing traditional and contemporary ways of life with respect to understanding what is required to maintain a healthy human body.
- Examining the consequences of human choices regarding the production, use, and disposal of raw materials and manufactured products for society and the environment.

Glossary

Acne is a common human skin disease, characterized by pimples and possibly scarring, that occurs most commonly during adolescence.

An **anemometer** is an instrument used to measure wind speed, usually in km/h or knots.

Balanced forces are equal in strength and opposite in direction and thus do not cause changes in an object's motion.

A **barometer** is an instrument used to measure atmospheric pressure, usually in mb, mmHg, or kPa.

Changes of state (e.g., condensation, deposition, evaporation, freezing, melting, and sublimation) are changes in matter from one form to another that occurs when heat is added or removed.

The **circulatory system** is the organ system that pumps blood to and from the heart, lungs, and body to pass nutrients to and from cells in the body and to help fight disease and stabilize body temperature and pH.

Clouds are collections of small water or ice particles occurring about Earth's surface, classified according to their height of occurrence and shape.

A **complex machine** is a combination of two or more simple machines.

Condensation is the change of state of a substance from a gas to a liquid.

A **contact force**, such as a physical push or pull or friction, is a force between two objects or an object and a surface that are in contact with each other.

A **controlled variable**, or control, is a variable or factor that is not changed throughout an experiment.

Cultural perspectives is the learning context that reflects a humanistic perspective which views teaching and learning as cultural transmission and acquisition.

A **dependent variable** is something that can be measured, and its value may change as a result of an experiment.

Deposition is the change of state of a substance from a gas to a solid without forming a liquid.

A **diet** is what a person usually eats and drinks.

The **digestive system** is the organ system that supports digestion and the processing of food into smaller components that are more easily absorbed into the bloodstream.

A **disease** is an abnormal condition affecting the body of an organism.

Evaporation is the change of state of a substance from a liquid to a gas.

The **excretory system** is the organ system that removes excess water and waste from the body.

A **fair test** is an experiment that has been planned and controlled so that only one variable is changed at a time.

A **force**, usually measured in Newtons (N), is a push or pull that causes an object to move, change direction, change speed, or change shape.

Freezing is the change of state of a substance from a liquid to a solid.

Friction is the force resisting movement of surfaces between each other.

A **gas** is the state of matter that expands to fill and take the shape of a container.

The **Gravitational force** is the force of attraction between Earth and objects near or on Earth's surface.

An **inclined plane** is a simple machine that consists of a flat surface whose ends are of different heights.

An **independent variable** is something that can be changed by an experimenter to cause an effect.

Interdependence means mutually and physically reliant on others.

A **lever** is a simple machine that consists of a rigid object that pivots about a fulcrum.

Lifestyle is a term that describes the way that a person lives.

A **liquid** is the state of matter that is characterized by a specific volume but flows to take the shape of the container.

Local knowledge refers to long-standing traditions and practices of certain communities and often is associated with traditional indigenous knowledge.

A **magnetic force** is the force of attraction or repulsion between two magnetically charged objects.

Mass, usually measured in kilograms (kg), is the amount of matter in an object.

Matter is anything that has mass and occupies space.

Mechanical advantage is a measurement of the factor by which a simple machine multiplies the force applied to it.

Melting is the change of state of a substance from a solid to a liquid.

A **model** is an abstract, physical, and/or mathematical simplified representation of physical phenomena, objects, and/or processes.

The **muscular system** is the organ system that provides support to the body and enables it to move.

The **nervous system** is the organ system that coordinates the actions of the body.

A **non-contact force**, such as a gravitational force or magnetic force, is a force between two objects that are not in contact with each other.

Nutrients are substances taken in from an organism's environment which enable it to live and grow.

An **organ** is a group of different types of tissues that work together to perform a function.

An **organ system** is comprised of a group of related organs that perform specific functions.

Physical properties are aspects of a material that can be measured or observed without changing the identity of the material (e.g., smell, colour, texture, hardness, lustre, flexibility, buoyancy, solubility, and melting point).

Precipitation refers to water vapour that falls under the force of gravity as rain, snow, sleet, and hail.

Puberty is the process of physical change in which a child's body becomes an adult body capable of reproduction.

A **pulley** is a simple machine that consists of a rope, cable, belt, or chain run over a groove or sprocket in a wheel.

Qualitative observations of physical phenomena, such as colour, texture, and smell, cannot be readily measured and assigned a magnitude.

Quantitative measurements are observations of physical phenomena, such as mass, volume, and melting point, that have a specific unit and magnitude.

A **rain gauge** is an instrument used to measure the amount of rainfall, usually in millimetres (mm).

Relative humidity is a measure of the amount of water vapour in a sample of air compared to the amount of water vapour that same sample of air could hold if it were saturated.

The **respiratory system** is the organ system that provides oxygen to blood cells and removes carbon dioxide from blood cells.

Saliva is a watery and frothy substance produced in the mouths of humans and most animals to aid the initial process of food digestion.

Scientific inquiry is the learning context that reflects an emphasis on understanding the natural and constructed world using systematic empirical processes that lead to the formation of theories that explain observed events and facilitate prediction.

Scientific literacy is an evolving combination of the knowledge of nature, skills, processes, and attitudes that students need to develop inquiry, problem solving, and decision making abilities to become lifelong learners and maintain a sense of wonder about and responsibility towards the natural and constructed world.

A **screw** is a simple machine that consists of a cylindrical shaft with helical groove or ridges around the outside.

A **simple machine** is a mechanical device that changes the direction and/or magnitude of an applied force.

The **skeletal system** is the organ system that supports the body, gives it shape, and protects the internal organs.

Skin, the soft outer covering of an animal, provides protection and covering to the other organs, helps to regulate body temperature, and keeps water from getting in and fluids from getting out of the body.

A **solid** is the state of matter that is characterized by a stable specific shape and definite volume.

Stimuli are changes in an environment that are detectable by an organism in that environment.

STSE, or Science-Technology-Society-Environment, is the foundation of scientific literacy that is concerned with understanding the scope and character of science, its connections to technology, and the social and environmental context in which it is developed.

STSE decision making is the learning context that reflects the need to engage citizens in thinking about human and world issues through a scientific lens to inform and empower decision making by individuals, communities, and society.

Tears are the liquid product that results during tearing of the eyes which cleans and lubricates them.

Technological problem solving is the learning context that reflects an emphasis on designing and building to solve practical human problems.

A **thermometer** is an instrument used to measure temperature, usually in degrees Celcius (^{o}C).

Variables are the factors that are being changed or held constant during an experiment.

Volume is a measure of how much space an object occupies and typically is measured in cubic centimeters (cm^3) for solids and millilitres (ml) for liquids.

Weather is the day-to-day environmental conditions in a location.

A **wedge** is a simple machine that is a thin, triangular-shaped tool.

The **wheel and axle** is a simple machine that consists of a wheel that is attached to a rod.

WHMIS is the Workplace Hazardous Materials Information System, which provides standardized information about hazardous materials.

A **wind vane** is an instrument used to indicate the direction from which the wind is blowing (e., a North wind comes from the North).

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Suggested Reading

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Feedback Form

The Ministry of Education welcomes your response to this curriculum and invites you to complete and return this feedback form.

Grade 5 Science Curriculum:

1. Please indicate your role in the learning community:

☐ parent ☐ teacher ☐ resource teacher

☐ guidance counsellor ☐ school administrator ☐ school board trustee

☐ teacher librarian ☐ school community council member

☐ other ____

What was your purpose for looking at or using this curriculum?

2. a) Please indicate which format(s) of the curriculum you used:

☐ print

☐ online

b) Please indicate which format(s) of the curriculum you prefer:

☐ print

☐ online

3. Please respond to each of the following statements by circling the applicable number.

The curriculum content is:	Strongly Agree	Agree	Disagree	Strongly Disagree
appropriate for its intended purpose	1	2	3	4
suitable for your use	1	2	3	4
clear and well organized	1	2	3	4
visually appealing	1	2	3	4
informative	1	2	3	4

4. Explain which aspects you found to be:

Most useful:

Least useful:

5. Additional comments:

6. Optional:

    Name: ____

    School: ____

    Phone: _____________________ Fax: _____________________

Thank you for taking the time to provide this valuable feedback.

Please return the completed feedback form to:

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