Prince Edward Island
Science Curriculum

Prince
Edward
Island
CANADA

Education and Early
Childhood Development
English Curriculum

Science

Grade 1

CURRICULUM

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Introduction

Foreword

The pan-Canadian *Common Framework of Science Learning Outcomes K to 12* (1997) will assist in standardizing science education across the country. The Prince Edward Island Department of Education and Early Childhood Development commits to align, where possible and appropriate, the scope and sequence of science education in Prince Edward Island with the scope and sequence outlined in the *Common Framework of Science Learning Outcomes K to 12.* New provincial science curriculum is also supported by the *Foundation for the Atlantic Canada Science Curriculum* (1998).

Purpose

The purpose of this curriculum is to outline the provincial requirements for Grade 1 Science. This guide provides the specific curriculum outcomes that Grade 1 students are expected to achieve in science by the end of the year. Achievement indicators and elaborations are included to provide the breadth and depth of what students should know and be able to do in order to achieve the outcomes. This renewed curriculum reflects current science education research, updated technology, and recently developed resources, and is responsive to changing demographics within the province.

Focus and Context

The focus of Grade 1 Science is to introduce students to a balance of life science, physical science, and Earth and space science. The concepts and terminology associated with Grade 1 Science will be delivered through the contexts of Needs and Characteristics of Living Things, Exploring Objects and Materials with Our Senses and Daily and Seasonal Changes. Inquiry investigations and problem-solving situations create powerful learning opportunities for students. They increase students' understanding of scientific and technological concepts and help students connect ideas about their world. The Grade 1 Science program supports an interactive learning environment that encourages students to make sense of experiences through a combination of "hands-on" and "minds-on" activities.

Aim

The aim of science education in the Prince Edward Island is to develop scientific literacy. Scientific literacy is an evolving combination of the science-related attitudes, skills, and knowledge students need to develop inquiry, problem solving, and decision-making abilities; to become lifelong learners; and to maintain a sense of wonder about the world around them. To develop scientific literacy, students require diverse learning experiences that provide opportunities to explore, analyse, evaluate, synthesize, appreciate, and understand the interrelationships among science, technology, society, and the environment.

Scientific Literacy

Vision
The Prince Edward Island science curriculum is guided by the vision that all students, regardless of gender or cultural background, will have an opportunity to develop scientific literacy. Scientific literacy is an evolving combination of the science-related attitudes, skills, and knowledge that students need to develop inquiry, problem-solving, and decision-making abilities, to become lifelong learners, and to maintain a sense of wonder about the world around them.

Goals
Consistent with views expressed in a variety of national and international science education documents, the following goals for Canadian science education have been established:

- encourage students at all grade levels to develop a critical sense of wonder and curiosity about scientific and technological endeavours
- enable students to use science and technology to acquire new knowledge and solve problems, so that they may improve the quality of their own lives and the lives of others
- prepare students to address critically science-related societal, economic, ethical, and environmental issues
- provide students with a foundation in science that creates opportunities for them to pursue progressively higher levels of study, prepares them for science-related occupations, and engages them in science-related hobbies appropriate to their interests and abilities
- develop in students, of varying aptitudes and interests, a knowledge of the wide variety of careers related to science and technology

While teachers play the most significant role in helping students achieve scientific literacy, they need support from the rest of the educational system if the challenge is to be met. Science must be an important component of the curriculum at all grade levels and must be explored in an enjoyable environment that students find interesting and intrinsically rewarding. The designation of science into various categories should be discouraged at the primary and elementary levels. At the high school level students will be introduced to the traditional sciences. These divisions are arbitrary and do not reflect current scientific practice. At all stages of science education the connections within and across the sciences, as well as the connections of science to technology, society and the environment should be stressed.

To achieve scientific literacy for all students (K–12), the science curriculum is expected to:

• address the three basic scientific fields of study—life, physical, and Earth and space science. From K–10, students will be exposed to all fields. At the high school level students may opt to take specific sciences. However, in all cases attempts should be made to develop the connections among the basic sciences

• demonstrate that science is open to inquiry and controversy; promote student understanding of how we came to know what we know and how we test and revise our thinking

• utilize a wide variety of print and non-print resources developed in an interesting and interactive style.

• involve instructional strategies and materials which allow all learners to experience both challenge and success

• incorporate assessment approaches that are aligned and correlated with the instructional program

• engage students in inquiry, problem solving, and decision making situations and contexts that give meaning and relevance to the science curriculum. These include the processes of science such as predicting and formulating hypotheses, higher level skills such as critical thinking and evaluating, and manipulative skills such as the use of laboratory equipment

• give students the opportunities to construct important ideas of science, which are then developed in depth, through inquiry and investigation

• be presented in connection with students' own experiences and interests by frequently using hands-on experiences that are integral to the instructional sequence

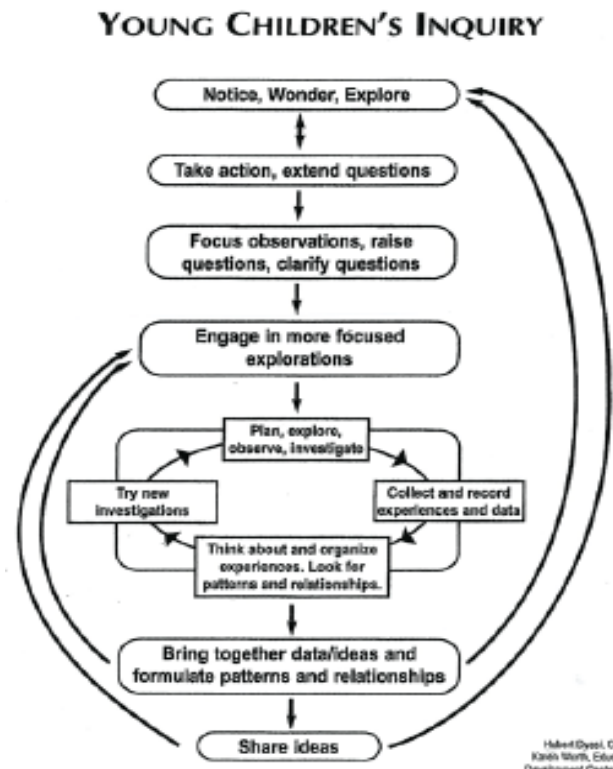• demonstrate connections across the curriculum

Student achievement in science and in other school subjects such as social studies, English language arts, technology, etc. is enhanced by coordination between and among the science program and other programs. Furthermore, such coordination can maximize use of time in a crowded school schedule.

The Three Processes of Scientific Literacy

A science education which strives for scientific literacy must engage students in asking and answering meaningful questions. Some of these questions will be posed by the teacher, while others will be generated by the students. These questions are of three basic types: "Why…?" "How…?" and "Should…?". There are three processes used to answer these questions. Scientific inquiry addresses "why" questions. "How" questions are answered by engaging in the problem solving process, and "should" questions are answered by engaging in decision making.

Scientific Inquiry

The first of the three processes, scientific inquiry, is a way of learning about the universe. It involves the posing of questions and the search for explanations of phenomena. Although there is no such thing as a "scientific method," students require certain skills to participate in the activity of science. There is general agreement that skills such as questioning, observing, inferring, predicting, measuring, hypothesising, classifying, designing experiments, collecting data, analysing data, and interpreting data are fundamental to engaging in science. These skills are often represented as a cycle which involves the posing of questions, the generation of possible explanations, and the collection of evidence to determine which of these explanations is most useful in accounting for the phenomena under investigation. Teachers should engage students in scientific inquiry activities to develop these skills.

YOUNG CHILDREN'S INQUIRY

Notice, Wonder, Explore

Take action, extend questions

Focus observations, raise questions, clarify questions

Engage in more focused explorations

Plan, explore, observe, investigate

Try new investigations

Collect and record experiences and data

Think about and organize experiences. Look for patterns and relationships.

Bring together data/ideas and formulate patterns and relationships

Share ideas

Hubert Dyasi, CCNY; Karen Worth, Education Development Center, Inc.

Problem Solving

The second process, problem solving, seeks solutions to human problems. It is also often represented as a cycle. In this case the cycle represents the proposing, creating, and testing of prototypes, products, and techniques in an attempt to reach an optimum solution to a given problem. The skills involved in this cycle facilitate a process which has different aims and different procedures from the inquiry process. Students should be given ample opportunity in the curriculum to propose, perform, and evaluate solutions to problem solving or technological tasks or questions.

Problem Solving Process

Evaluate | Investigate | Create | Design | Plan

Decision Making

The third process is decision making. It is the determination of what we, as global citizens, should do in a particular context or in response to a given situation. Increasingly, the types of problems that we deal with, both individually and collectively, require an understanding of the processes and products of science and technology. The actual process of decision making involves the identification of the problem or situation, generation of possible solutions or courses of action, evaluation of the alternatives, and a thoughtful decision based on the information available. Students should be actively involved in decision making situations as they progress through the science curriculum. Decision making situations not only are important in their own right, they also oft en provide a relevant context for engaging in scientific inquiry and/or problem solving.

Process Involved in Answering the Question:	Scientific inquiry	Technological problem solving	Decision making
Question:	Why does my coffee cool so quickly? (Science question)	How can I make a container to keep my coffee hot? (Technology question)	Should we use styrofoam cups or ceramic mugs for our meeting? (STSE question)
Response:	Heat energy is transferred by conduction, convection, and radiation.	A styrofoam cup will keep liquids warm for a long time.	Personal health, the environment, cost, and availability must be considered along with science and technology information
Problems Arise from:	Curiosity about events and phenomena in the natural world	Coping with everyday life, practices, and human needs	Different views or perspectives based on different or the same information
Types of Questions:	What do we know? How do we know?	How can we do it? Will it work?	What alternatives or consequences are there? Which choice is best at this time?
Solutions Result in:	Knowledge about the events and phenomena in the natural world	An effective and efficient way to accomplish a task	A defensible decision in the particular circumstances

Curriculum Outcomes Framework

Conceptual Map

The conceptual map below provides the blueprint of the Prince Edward Island science outcomes framework and is the basis from which general and key-stage outcomes have been developed. At all times when making use of this framework, educators must keep in mind that the outcomes are intended to develop scientific literacy in students. The outcomes in the following section are taken from the Pan-Canadian framework document Common Framework of Science Learning Outcomes K–12.
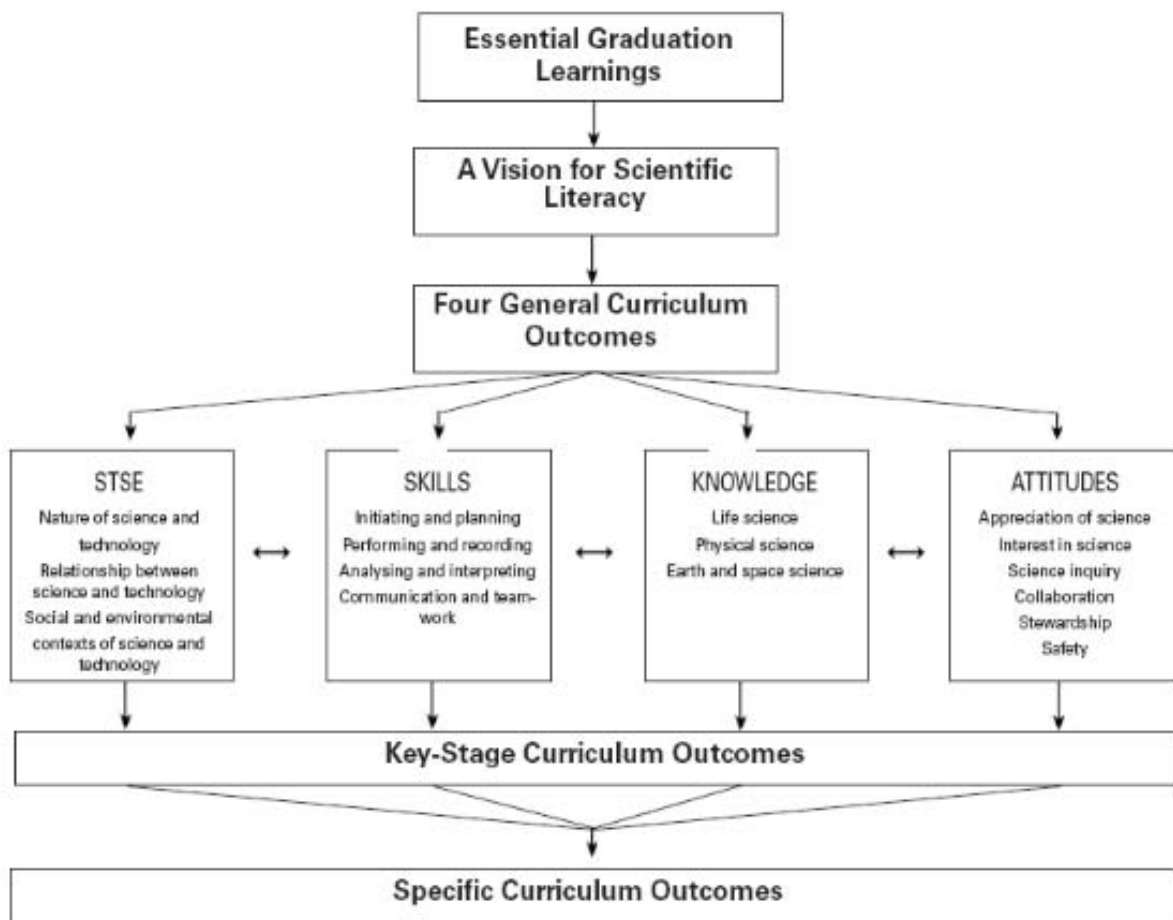
General Curriculum Outcomes

The general curriculum outcomes (GCO) form the basis of the outcomes framework. They constitute a starting point for the development of all subsequent work. They also identify the key components of scientific literacy. Four general curriculum outcomes have been identified to delineate the four critical aspects of students' scientific literacy. They reflect the wholeness and interconnectedness of learning and should be considered as interrelated and mutually supportive.

General Curriculum Outcome 1: Science, technology, society, and the environment (STSE)—Students will develop an understanding of the nature of science and technology, of the relationships between science and technology, and of the social and environmental contexts of science and technology.

General Curriculum Outcome 2: Skills and processes—Students will develop the skills required for scientific and technological inquiry, for solving problems, for communicating scientific ideas and results, for working collaboratively, and for making informed decisions.

General Curriculum Outcome 3: Knowledge—Students will construct knowledge and understandings of concepts in life science, physical science, and Earth and space science, and apply these understandings to interpret, integrate, and extend their knowledge.

General Curriculum Outcome 4: Attitudes—Students will be encouraged to develop attitudes that support the responsible acquisition and application of scientific and technological knowledge to the mutual benefit of self, society, and the environment.

Description of the General Curriculum Outcomes

GCO 1: Science, technology, society, and the environment (STSE)

This general curriculum outcome is the driving force of the curriculum outcomes framework. Many key stage curriculum outcomes presented in this document flow directly or indirectly from the STSE domain. The outcome statement focuses on three major dimensions:
• the nature of science and technology
• the relationships between science and technology
• the social and environmental contexts of science and technology

Nature of science and technology

Science provides a base used for predicting, interpreting, and explaining natural and technological phenomena. It is one way of knowing nature, based on curiosity, imagination, intuition, exploration, observation, replication, interpretation of evidence, and consensus making over this evidence. Science-based ideas are continually being tested, modified, and improved as new ideas supersede existing ideas. There is no set procedure for conducting a scientific investigation. Rather, science is driven by a combination of theories, knowledge, experimentation, and processes anchored in the physical world.

Technology, like science, is a creative human activity, but is concerned with solving practical problems that arise from human/social needs, particularly the need to adapt to the environment and to fuel a nation's economy. New products and processes are produced by research and development through the processes of inquiry and design.

Relationships between science and technology

While there are important relationships between science and technology, there are also important differences. Science and technology differ in purpose and in process. Where the focus of science is on the development and verification of knowledge; in technology, the focus is on the development of solutions. The test of science knowledge is that it helps us explain, interpret, and predict; the test of technology is that it works – it enables us to achieve a given purpose. By understanding the relationships between science and technology, students learn to appreciate how science and technology interact, how they develop in a social context, how they are used to improve people's lives, and how they have implications for the students themselves, for others, for the economy, and for the environment.

Social and environmental contexts of science and technology

The history of science highlights the ways in which culture has influenced the questions of science, and how science in turn has influenced culture. Growth in STSE understandings may involve the following elements:
• increasing complexity of scientific understanding - from simple to abstract ideas
• applications in local and global contexts
• consideration of variables and perspectives - from simple to complex
• critical judgement - from simple right and wrong assessments to complex evaluations
• decision making - from guided decisions based on limited knowledge, to independent decisions based on extensive research and personal judgement.

GCO 2: Skills and processes

This GCO 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 GCO. The listing of these skills is not intended to imply a linear sequence or to identify a single set of skills required in each science investigation. Every investigation and application of science has unique features that determine the particular mix and sequence of skills involved. As students advance from grade to grade, the skills they have developed are applied in increasingly demanding contexts. Growth in skills may involve each of the following skill elements:
• range of application—from a limited range to a broad range of applications
• complexity of application—from simple, direct applications to applications that involve abstract ideas and complex interpretations and judgements
• precision of measures and manipulations—from coarse measures and manipulations to those that are precise
• use of current and appropriate technologies and tools—from working with a few simple tools to working with a broad array of specialized and precise tools
• degree of independence and structure—from working under teacher guidance or in a structured situation to working independently and without guidance
• awareness and control—from following a predetermined plan to an approach involving awareness, understanding, and control, such as selecting skills and strategies that are most appropriate to the task at hand and making use of metacognition and strategic thinking
• ability to work collaboratively— from working as an individual to working as part of a team

Initiating and planning
These are the skills of questioning, identifying problems, and developing preliminary ideas and plans.

Analysing and interpreting
These are the skills of examining information and evidence, of processing and presenting data so that it can be interpreted, and of interpreting, evaluating, and applying the results.

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.

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 are also important because the development and application of ideas rely on collaborative processes both in society and in learning.

GCO 3: Knowledge

This general curriculum outcome 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 GCO is framed using the widely accepted science disciplines - life science, physical science, Earth and space science.

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, biodiversity, 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. The conservation laws of mass and energy, momentum, and charge are addressed in physical science.

Earth and space science

Earth and space science brings global and universal perspectives to students' knowledge. Earth, our home planet, exhibits form, structure, and patterns of change, as does our surrounding solar system and the physical universe beyond. Earth and space science includes fields of study such as geology, meteorology, and astronomy.

GCO 4: Attitudes

This general curriculum outcome 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. Attitudes are not acquired in the same way as skills and knowledge. They cannot be observed at any particular moment, but are evidenced by regular, unpromoted displays over time. Attitude development is a lifelong process that involves the home, the school, the community, and society at large. This GCO identifies six categories in which science education can contribute 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 to be aware of the limits of science and technology as well as their impact on economic, political, environmental, cultural, and ethical events.

Scientific inquiry
Students will be encouraged to develop critical beliefs concerning the need for
• open-mindedness and flexibility,
• critical-mindedness and respect for evidence,
• initiative and perseverance,
• creativity and inventiveness in the development of scientific knowledge.

Collaboration
Students will be encouraged to develop attitudes that support collaborative activity. This will develop their sense of interpersonal responsibilities, an openness to diversity, respect for multiple perspectives, and an appreciation of the efforts and contributions of others.

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.

Safety
Students engaged in science and technology activities will be expected to demonstrate a positive attitude toward safety and doing no harm to themselves or others.

Stewardship
Students will be encouraged to develop responsibility in the application of science and technology in relation to society and the natural environment. They should be involved in activities that encourage responsible action toward living things and the environment, and to consider issues related to sustainability from a variety of perspectives.

Science K-10: At a Glance

The following chart outlines the K-10 science topics organized by processes and skills, life science, physical science, and Earth and space science. Note that these four organizers are for the purposes of identifying prescribed learning outcomes; they are not intended to suggest a linear delivery of course material.

	Processes and Skills of Science	Life Science	Physical Science	Earth and Space Science
Kindergarten	•Observing • Communicating (Sharing)	• Exploring the World Using our Senses		
Grade 1	• Communicating (Recording) • Classifying	• Needs and Characteristics of Living Things	• Exploring Objects and Materials With Our Senses	• Daily and Seasonal Changes
Grade 2	• Interpreting Observations • Making Inferences	• Animal Growth and Changes	• Properties of Liquids and Solids • Relative Position and Motion	• Air and Water in the Environment
Grade 3	• Questioning • Measuring and Reporting	• Plant Growth and Changes	• Invisible Forces • Materials and Structures	• Exploring Soils
Grade 4	• Interpreting Data • Predicting	• Habitats and Communities	• Sound • Light	• Rocks, Minerals and Erosion
Grade 5	• Designing Experiments • Fair Testing	• Meeting Basic Needs and Maintaining a Healthy Body	• Properties and Changes of Materials • Forces and Simple Machines	• Weather
Grade 6	• Controlling Variables • Scientific Problem Solving	• Diversity of Life	• Electricity	• Space • Flight

	Processes and Skills of Science	Life Science	Physical Science	Earth and Space Science
Grade 7	• Hypothesizing • Developing Models	• Interactions within Ecosystems	• Mixtures and Solutions • Heat	• Earth's Crust
Grade 8	• Safety • Scientific method • Representing and interpreting scientific information • Scientific literacy	• Cells, Tissues, Organs and Systems	• Optics • Fluids	• Water Systems on Earth
Grade 9		• Reproduction	• Atoms and Elements • Electricity	• Space Exploration
Grade 10	• Ethical behaviour and cooperative skills • Application of scientific principles • Science-related technology	• Sustainability of Ecosystems	• Chemical Reactions • Motion	• Weather

Key-Stage Curriculum Outcomes

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

Students will develop an understanding of the nature of science and technology, of the relationships between science and technology, and of the social and environmental contexts of science and technology.

By the end of grade 3 (STSE/knowledge), students will be expected to
• investigate objects and events in their immediate environment, and use appropriate language to develop understanding and to communicate results
• demonstrate and describe ways of using materials and tools to help answer science questions and to solve practical problems
• describe how science and technology affect their lives and those of people and other living things in their community
• undertake personal actions to care for the immediate environment and contribute to responsible group decisions

By the end of grade 6, students will have achieved the outcomes for entry–grade 3 and will also be expected to
• demonstrate that science and technology use specific processes to investigate the natural and constructed world or to seek solutions to practical problems
• demonstrate that science and technology develop over time
• describe ways that science and technology work together in investigating questions and problems and in meeting specific needs
• describe applications of science and technology that have developed in response to human and environmental needs
• describe positive and negative effects that result from applications of science and technology in their own lives, the lives of others, and the environment

By the end of grade 9, students will have achieved the outcomes for entry–grade 6 and will also be expected to
• describe various processes used in science and technology that enable people to understand natural phenomena and develop technological solutions
• describe the development of science and technology over time
• explain how science and technology interact with and advance one another
• illustrate how the needs of individuals, society, and the environment influence and are influenced by scientific and technological endeavours
• analyse social issues related to the applications and limitations of science and technology, and explain decisions in terms of advantages and disadvantages for sustainability, considering a few perspectives

By the end of grade 12, students will have achieved the outcomes for entry–grade 9 and will also be expected to
- describe and explain disciplinary and interdisciplinary processes used to enable us to understand natural phenomena and develop technological solutions
- distinguish between science and technology in terms of their respective goals, products, and values and describe the development of scientific theories and technologies over time
- analyse and explain how science and technology interact with and advance one another
- analyse how individuals, society, and the environment are interdependent with scientific and technological endeavours
- evaluate social issues related to the applications and limitations of science and technology, and explain decisions in terms of advantages and disadvantages for sustainability, considering a variety of perspectives

Skills

Students will develop the skills required for scientific and technological inquiry, for solving problems, for communicating scientific ideas and results, for working collaboratively, and for making informed decisions.

By the end of grade 3 (STSE/knowledge), students will be expected to
- ask questions about objects and events in the immediate environment and develop ideas about how those questions might be answered
- observe and explore materials and events in the immediate environment and record the results
- identify patterns and order in objects and events studied
- work with others and share and communicate ideas about their explorations

By the end of grade 6, students will have achieved the outcomes for entry–grade 3 and will also be expected to
- ask questions about objects and events in the local environment and develop plans to investigate those questions
- observe and investigate their local environment and record the results
- interpret findings from investigations using appropriate methods
- work collaboratively to carry out science-related activities and communicate ideas, procedures, and results

By the end of grade 9, students will have achieved the outcomes for entry–grade 6 and will also be expected to
- ask questions about relationships between and among observable variables and plan investigations to address those questions
- conduct investigations into relationships between and among observations, and gather and record qualitative and quantitative data
- analyse qualitative and quantitative data and develop and assess possible explanations
- work collaboratively on problems and use appropriate language and formats to communicate ideas, procedures, and results

By the end of grade 12, students will have achieved the outcomes for entry–grade 9 and will also be expected to
• ask questions about observed relationships and plan investigations of questions, ideas, problems, and issues
• conduct investigations into relationships between and among observable variables, and use a broad range of tools and techniques to gather and record data and information
• analyse data and apply mathematical and conceptual models to develop and assess possible explanations
• work as a member of a team in addressing problems, and apply the skills and conventions of science in communicating information and ideas and in assessing results

Knowledge

Students will construct knowledge and understandings of concepts in life science, physical science, and Earth and space science, and apply these understandings to interpret, integrate, and extend their knowledge.

By the end of grade 3 (STSE/knowledge), students will be expected to
• For grade 3, STSE and knowledge outcomes are combined in the STSE section.

By the end of grade 6, students will have achieved the outcomes for entry–grade 3 and will also be expected to
• describe and compare characteristics and properties of living things, objects, and materials
• describe and predict causes, effects, and patterns related to change in living and non-living things
• describe interactions within natural systems and the elements required to maintain these systems
• describe forces, motion, and energy and relate them to phenomena in their observable environment

By the end of grade 9, students will have achieved the outcomes for entry–grade 6 and will also be expected to

Life Science
• explain and compare processes that are responsible for the maintenance of an organism's life
• explain processes responsible for the continuity and diversity of life
• describe interactions and explain dynamic equilibrium within ecological systems Physical Science
• describe the properties and components of matter and explain interactions between those components
• describe sources and properties of energy, and explain energy transfers and transformations
• recognize that many phenomena are caused by forces and explore various situations involving forces

Earth and Space Science
• explain how Earth provides both a habitat for life and resource for society
• explain patterns of change and their eff ects on Earth
• describe the nature and components of the solar system

By the end of grade 12, students will have achieved the outcomes for entry–grade 9 and will also be expected to

Life Science
• compare and contrast the reproduction and development of representative organisms
• determine how cells use matter and energy to maintain organization necessary for life
• demonstrate an understanding of the structure and function of genetic material
• analyse the patterns and products of evolution
• compare and contrast mechanisms used by organisms to maintain homeostasis
• evaluate relationships that affect the biodiversity and sustainability of life within the biosphere

Chemistry
• identify and explain the diversity of organic compounds and their implications in the environment
• demonstrate an understanding of the characteristics and interactions of acids and bases
• illustrate and explain the various forces that hold structures together at the molecular level, and relate the properties of matter to its structure
• use the redox theory in a variety of contexts related to electrochemistry
• demonstrate an understanding of solutions and stoichiometry in a variety of contexts
• predict and explain energy transfers in chemical reactions

Physics
• analyse and describe relationships between force and motion
• analyse interactions within systems, using the laws of conservation of energy and momentum
• predict and explain interactions between waves and with matter, using the characteristics of waves
• explain the fundamental forces of nature, using the characteristics of gravitational, electric, and magnetic fields
• analyse and describe different means of energy transmission and transformation

Earth and Space Science
• demonstrate an understanding of the nature and diversity of energy sources and matter in the universe
• describe and predict the nature and effects of changes to terrestrial systems
• demonstrate an understanding of the relationships among systems responsible for changes to the Earth's surface
• describe the nature of space and its components and the history of the observation of space

Attitudes

Students will be encouraged to develop attitudes that support the responsible acquisition and application of scientific and technological knowledge
to the mutual benefit of self, society, and the environment.

By the end of grade 3 (STSE/knowledge), students will be expected to
• recognise the role and contribution of science in their understanding of the world
• show interest in and curiosity about objects and events within the immediate environment
• willingly observe, question, and explore
• consider their observations and their own ideas when drawing a conclusion
• appreciate the importance of accuracy
• be open-minded in their explorations
• work with others in exploring and investigating
• be sensitive to the needs of other people, other living things, and the local environment
• show concern for their own safety and that of others in carrying out activities and using
  materials

By the end of grade 6, students will have achieved the outcomes for entry–grade 3 and will also be expected to
• appreciate the role and contribution of science and technology in their understanding of the
  world
• realize that the applications of science and technology can have both intended and unintended
  effects
• recognize that women and men of any cultural background can contribute equally to science
• show interest and curiosity about objects and events within different environments
• willingly observe, question, explore, and investigate
• show interest in the activities of individuals working in scientific and technological fields
• consider their own observations and ideas as well as those of others during investigations and
  before drawing conclusions
• appreciate the importance of accuracy and honesty
• demonstrate perseverance and a desire to understand
• work collaboratively while exploring and investigating
• be sensitive to and develop a sense of responsibility for the welfare of other people, other living
  things, and the environment
• show concern for their own safety and that of others in planning and carrying out activities and
  in choosing and using materials
• become aware of potential dangers

By the end of grade 9, students will have achieved the outcomes for entry–grade 6 and will also be expected to
• value accuracy, precision, and honesty
• persist in seeking answers to difficult questions and solutions to difficult problems
• work collaboratively in carrying out investigations as well as in generating and evaluating ideas
• be sensitive and responsible in maintaining a balance between the needs of humans and a sustainable environment
• project, beyond the personal, consequences of proposed actions
• show concern for safety in planning, carrying out, and reviewing activities
• become aware of the consequences of their actions appreciate the role and contribution of science and technology in our understanding of the world
• appreciate that the applications of science and technology can have advantages and disadvantages
• appreciate and respect that science has evolved from different views held by women and men from a variety of societies and cultural backgrounds
• show a continuing curiosity and interest in a broad scope of science-related fields and issues
• confidently pursue further investigations and readings
• consider many career possibilities in science- and technology-related fields
• consider observations and ideas from a variety of sources during investigations and before drawing conclusions

By the end of grade 12, students will have achieved the outcomes for entry–grade 9 and will also be expected to
• value the role and contribution of science and technology in our understanding of phenomena that are directly observable and those that are not
• appreciate that the applications of science and technology can raise ethical dilemmas
• value the contributions to scientific and technological development made by women and men from many societies and cultural backgrounds
• show a continuing and more informed curiosity and interest in science and science-related issues
• acquire, with interest and confidence, additional science knowledge and skills, using a variety of resources and methods, including formal research
• consider further studies and careers in science and technology-related fields
• confidently evaluate evidence and consider alternative perspectives, ideas, and explanations
• use factual information and rational explanations when analysing and evaluating
• value the processes for drawing conclusions
• work collaboratively in planning and carrying out investigations, as well as generating and evaluating ideas
• have a sense of personal and shared responsibility for maintaining a sustainable environment
• project the personal, social, and environmental consequences of a proposed action
• want to take action for maintaining a sustainable environment
• show concern for safety and accept the need for rules and regulations
• be aware of the direct and indirect consequences of their actions

Principles of Teaching and Learning Science

The central goal of science education is scientific literacy. All activities that fall under the umbrella of instruction (teaching and learning) should therefore be aimed at that central goal. An effective approach to science education places the instruction in the context of a contemporary societal or environmental situation, question, or problem. The desire to investigate the situation, answer the question, or solve the problem creates in the students a meaningful context in which to address the skills, concepts, and understandings of the course.

Explanations, Evidence, and Models in Science

Science is a way of understanding the natural world using 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 laws, theories, and hypotheses 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:

• 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 adequately explain. 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 in order to facilitate study of complex systems such as the atom, climate change, and biogeochemical cycles. Scientists spend considerable time and effort building and testing models to further understanding of the natural world.

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 in order to investigate or understand different aspects of the phenomena.

Investigative Activities

The National Research Council (2006, p. 3) defines a school laboratory investigation as an experience in the laboratory, the classroom, or the 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.

While investigative activities are not unique to science, they are more commonly associated with science programs than with any other area of the curriculum. Investigative activities include a variety of activities ranging from the traditional experiment done in a science laboratory to a quick field trip to the school yard. All such activities are characterized by active student involvement in attempting to find answers to questions about the natural or constructed world. Many activities involve the use of scientific and technological tools and equipment; others simply involve observation using the senses.

A strong science program includes a variety of individual, small, and large group classroom and field experiences for students. Most importantly, these experience needs to go beyond conducting confirmatory "cook-book" experiments. Similarly, computer simulations and teacher demonstrations are valuable but should not serve as substitutions for hands-on student laboratory activities.

Assessment and evaluation of student performance must reflect the nature of the experience by addressing scientific and technological skills. As such, the results of student investigations and experiments do not always need to be written up using formal laboratory reports. Teachers may consider alternative formats such as narrative lab reports for some experiments. The narrative lab report enables students to tell the story of their process and findings in a less structured format than a typical lab report.

The investigation is a special instructional format that provides students with the opportunity to do science, not just learn science. Without activities of this sort it is extremely difficult, if not impossible, for students to develop an understanding of the nature of science, to develop the

cognitive, scientific, and technical skills associated with doing science, or to construct the important ideas of science.

Resources

One of the characteristics of the science curriculum that will help all students become scientifically literate is that it should utilize a wide variety of print and non-print resources that have been developed in an interesting and interactive style. Teachers should consider the following in the selection of resources:
• the use of hands-on activities is an essential learning strategy in all science programs
• even with the advent of new media, print materials remain a dominant type of resource for science teaching and learning
• computer soft ware and online resources can offer simulations and models of real-life situations that permit the investigation of phenomena that are not available because of cost, safety, or accessibility
• resources used in all activities should be appropriate to the grade level

Technology

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. 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 which support student inquiry. Technology should enhance, but not replace, essential hands-on science activities.

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

Data Collection and Analysis
• Data loggers (e.g., temperature probes, motion detectors) permit students to collect and analyze data in real-time.
• Databases and spreadsheets can facilitate the analysis and display of student-collected data or data obtained from scientists.

Visualization and Imaging
• Simulation and modeling soft ware provide opportunities to explore concepts and models which are not readily accessible in the classroom.
• 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.

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.

Safety

Safety in the classroom is of paramount importance. To create a safe classroom requires that a teacher be informed, aware, and proactive and that the students listen, think, and respond appropriately. Safety cannot be mandated solely by teacher's rules or school regulations. Safety and safe practice are an attitude.

Safe practice in the laboratory is the joint responsibility of the teacher and students. The teacher's responsibility is to provide a safe environment and to ensure the students are aware of safe practice. Teachers must also follow the guidelines outlined in the Prince Edward Island *Science Safety Resource Manual*. 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 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, 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

Science and Literacy

Aside from developing students' scientific literacy, the outcomes undertaken by students in the science curriculum build on, reinforce, and enhance certain aspects of the language arts and mathematics curricula. Fostering students' communication skills is an important part of the teachers' role in the science classroom. Students need to be able to use oral communication, reading, writing, and media literacy skills to gain new learning in science and to communicate their understanding of what they have learned.

Students' understanding is revealed through both oral and written communication. Writing in science employs special forms and therefore requires specific and direct learning opportunities, but it is not necessary for all science learning to involve a written communication component. To develop their oral communication skills, students need numerous opportunities to listen to information and talk about a range of subjects in science and technology. When reading science texts, students use a different set of skills than they do when reading fiction. They need to understand vocabulary and terminology that are unique to science, and must be able to interpret symbols, charts, and diagrams. To help students construct meaning, it is essential that science teachers model and teach the strategies that support learning to read, write, and communicate in this subject area.

The Department of Education and Early Childhood Development has materials to support literacy instruction across the curriculum. Helpful advice for integrating literacy instruction in science and technology may be found in the document *Cross-Curriculuar Reading Tools.*

Grade 1 Science Specific Curriculum Outcomes

Skills and Process of Science (SP)
SP – 1 Share their own observations and ideas in a variety of ways

Physical Science (PS) - Materials, Objects and Our Senses
PS – 1 Describe a wide range of materials using their senses
PS – 2 Evaluate the suitability of materials for a specific purpose
PS – 3 Create a model or toy from scrap material

Life Science (LS) - *Needs and Characteristics of Living Things*
LS – 1 Distinguish between characteristics that make plants and animals unique
LS – 2 Classify the characteristics and needs of living things

Earth and Space Science (ESS) - Daily and Seasonal Changes
ESS – 1 Analyze daily and seasonal changes in the environment
ESS – 2 Evaluate the characteristics of the four seasons.

Science 1 - *Skills and Process of Science (SP)*

Specific Curriculum Outcome
Students will be expected to...   SP – 1 Share their own observations and ideas in a variety of ways

Kindergarten	Grade 1	Grade 2
Oral Language – Speaking and Listening Express feelings and opinions and describe personal experiences and interests	SP - 1 Share their own observations and ideas in a variety of ways	Discuss their ideas and record their discoveries in diagrams.

Achievement Indicators

Students who have achieved this outcome should be able to...

- Record observations in a variety of written formats (e.g., notes, graphic organizers)
- Communicate their observations, experiences, and thinking in a variety of ways (e.g., verbally, pictorially, graphically, digitally)
- Describe findings using appropriate/scientific vocabulary (e.g., habitat, absorb, offspring, trait, sprout, stem, conservation)

Elaboration

Focus Question: How can we show what we have learned in a variety of ways?

Throughout this unit, students are encouraged to use their five senses when making observations of classroom or visiting pets, and of plants grown in the classroom or out in the school yard. Exploration could begin by comparing humans to other animals and then comparing animals to plants.

Terms such as legs, wings, ears, roots, and stems could be used to describe living things. A bird feeder set up at home or at school would attract various types of birds for students to observe, noting their characteristics. Students could collect insects in clear, plastic bottles with holes in the lids, and record observations such as the number of wings, legs, and antennae. Students should be encouraged to return the insects to their natural environment. These experiences can be extended with visits to farms, nature parks, or other settings with live animals and plants. This will encourage students to inquire about living things within their immediate environment. Other extensions could include exploring living things through the use of print resources, videos, and software.

In the classroom, teachers can model recording strategies as they tally information to create concrete graphs, picture graphs, and pictographs. This will also make connections with outcomes from the Data Management strand in the grade 1 mathematics program. For example, students could use pictures of chickens, pigs, and cows to make a picture graph of the number of animals at a farm they visited. They could use nonstandard units of measuring, such as "longer stem" or "shorter ears". They could make a concrete graph using themselves to illustrate the number of students in the class with certain eye colours. This could be done with one half of the class at a time so that the other half can see the graph.

Cross Curricular Links

Health:	
Language Arts:	
Mathematics:	N1, N2, N3, N4, N5, SS1
Social Studies:	Throughout all Outcomes
Technology:	A4.3, A4.4, A4.5, A5.1, A9.1, B9.1
Visual Arts:	CP1.1, CP1.3, RRA1.2

Science 1 - Physical Science (PS) - Materials, Objects and Our Senses

Specific Curriculum Outcome
Students will be expected to... PS1 – Describe a wide range of materials using their senses

Kindergarten	Grade 1	Grade 4
Exploring the World Using Our Senses Become aware of the five senses.	PS1 – Describe a wide range of materials using their senses	Light and Sound Perform a number of investigations that examine sight and hearing.

Achievement Indicators
   Students who have achieved this outcome should be able to...

- Identify each of the five senses and associate those senses with parts of humans or other animals

- Identify characteristics used to describe the range of observations related to each sense (such as: smooth, rough, bright, dull, sour, sweet, loud, quiet…)

- Recognize how each of the senses helps us to identify, describe, and safely use materials, and recognize potential dangers in the environment

Elaboration

Focus Question: How do we use our senses to make sense of our world?

Observation using all of the senses is one of the foundations of scientific exploration. Through hands-on activities students will identify and describe the main body parts with which the five senses are associated. Students will also investigate how each of the senses help to keep us safe as we recognize dangers in the environment. Teachers can emphasize safety precautions for using their senses (e.g., the use of safety goggles, wafting techniques for smelling materials, tasting only when given permission, not touching hot objects or corrosive materials).

Caution: Before doing any activity involving foods or scents, students with allergies should be identified. Show students how to waft odours towards their noses as a safe technique for smelling unknown materials.

Students will be familiar with relying on their sense of sight for making most observations, and may not realize how much they can sense without the use of their eyes. Once students are making observations using all of their senses, every classroom or outside experience can be used as an opportunity to practice making observations. Students could go on a field trip or a walk around the school grounds to explore using their senses. Students could draw pictures of things they hear, touch, smell, and see. Try playing "I Spy", with a senses twist: "I Hear", "I Feel", "I Smell" or "I Taste".

This outcome can be reinforced in the Daily and Seasonal Changes unit, as students use their senses to describe the changes that occur from one season to the next. For example, in autumn they see the leaves changing colour and they feel the dryness of the fallen leaves. Students could try to identify and describe objects without the use of one or more of their senses. For example, have students identify objects while blindfolded, with mittens on, with their ears covered, or with their nose pinched. Students could explore paper bags containing several objects of different sizes, shapes, and textures and identify the objects using their sense of touch. Record observations of various environments (e.g., classroom, gymnasium, school yard, library, and cafeteria) using all of their senses.

Cross Curricular Links

Health:	W-1.4, W-1.6, W-1.8, W-1.9, L-1.2
	Relationship Choices: *Some Kids are Deaf*
	Some Kids are Blind
	Poisons Make you Sick
Language Arts:	Literacy Place: Shared Reading – *Making Ice Cream*
	Read Aloud – *Bubblegum, Books, and Bugs*
	– Cinnamon Toast
Mathematics:	PR1, PR2,
	The Warlord's Puzzle, The Dragon's Scales
Social Studies:	1.2.1, 1.2.2
Technology:	A5.1
Visual Arts:	FC1.1, CP1.3, RRA1.2

Science 1 - Physical Science (PS) - Materials, Objects and Our Senses

Specific Curriculum Outcome
Students will be expected to... PS-2 Evaluate the suitability of materials for a specific purpose

Kindergarten	Grade 1	Grade 3
Express ideas and feelings creatively through artistic expression.	PS-2 Evaluate the suitability of materials for a specific purpose	Materials and Structures Build structures using various materials and test their strength and suitability.

Achievement Indicators
    Students who have achieved this outcome should be able to...

- Describe characteristics of materials using their sensory observations as well as technologies, such as hand lenses, cameras, and microphones, which enhance the senses

- Predict the characteristics (e.g., hardness, insulating ability, water resistance, absorbency, and flexibility) of common materials and carry out a procedure to test those predictions
- Distinguish between the materials used to construct an object and the object itself

Elaboration

Focus Question: Why are specific materials chosen to build specific objects?

Through exploration students will use their senses to examine objects and the materials that are used to construct those objects. Students will learn that materials used to construct objects are chosen because of the specific characteristics the materials possess. The understanding of these characteristics will assist students in the construction of their own object in outcome PS – 3.

Students can make observations using their senses to name and describe various parts of familiar objects (e.g., the legs of a chair, windows in a house, eraser on a pencil). Students could collect and display a variety of similar objects that are made of different materials:

- writing instruments
- books/magazines

- shoes
- leaves

- containers
- musical instruments

Through exploratory activities, students will investigate the properties of materials; they will do this naturally by bending, stretching, rolling, and smelling the materials. Encourage students to describe what they are observing as they explore the various materials and make predictions about similar materials. This should lead to discussions about the type of objects that could be made from a material with the determined properties. For example, students can suggest which materials would be appropriate for building a bridge, a house, a bowl, or a swing. Literature can be used as a context. Students may try to predict which material would be the best to build a fence in *Grandpa's Garden*, or to make a beak in, *A Wild Eagle Needs a Beak*.

Students will start to look more closely at various types of materials, the different forms they can take, and their properties. Through their explorations, students should come to the understanding that constructed objects are made from a variety of materials depending on the purpose of the object.

Cross Curricular Links

Health:	
Language Arts:	Literacy Place: Guided Reading – *Grandpa's Garden, A Wild Eagle Needs a Beak*
Mathematics:	SS1
	The Warlord's Puzzle
Social Studies:	1.2.1
Technology:	A3.1, A3.2, B3.1
Visual Arts:	CP1.4

Science 1 - Physical Science (PS) - Materials, Objects and Our Senses

Specific Curriculum Outcome
Students will be expected to…   PS – 3 Create a model or toy from scrap material

Kindergarten	Grade 1	Grade 3
Geometry Build and describe 3-D objects	PS – 3 Create a model or toy from scrap material	Materials and Structures Build structures using various materials and test their strength and suitability.

Achievement Indicators

Students who have achieved this outcome should be able to...

- Use appropriate tools, such as safety glue and scissors, for manipulating materials when building objects
- Collaborate to propose answers to identified problems during the design process
- Compare and evaluate personally constructed objects with respect to their design and function
- Demonstrate ways to reduce, reuse, and recycle materials during classroom learning experiences.
- Create a product that is functional and aesthetically pleasing to the user by safely selecting, combining, and modifying materials

Elaboration

Focus Question: How can we build objects which meet specific needs?

When students have identified properties of various materials they should be prepared to use their knowledge to select appropriate materials for the objects that they will construct. Students should also explore how objects can be made from recycled or reused material. Students are expected to solve a problem or task involving a variety of senses. Students could design and create:

- a simple device that can make a variety of sounds
- a trophy for Sailor in *The Stayashore Newfoundland Dog*
- a container that can hold sand

- a container that can hold the most marbles without breaking
- a house for *Mrs. Chicken and the Hungry Crocidle*

Before they create their product, students should engage in activities that demonstrate various ways of joining materials. Twisted paper clips with straws, soaked peas stuck on toothpicks and left to dry, safety glue with stir sticks, Velcro $_{TM}$, marshmallows stuck on toothpicks, and other methods of joining materials can be used.

Working in pairs, students can plan their design, discuss the materials they are going to use and how they will join them together. As problems arise during the design and construction phases, students should be encouraged to work together to create solutions. When they have finished their construction, they can show their product to the rest of the class, explain what it does, and why they chose those particular materials and design. The products they create should be of their own design, and as such, should not be the same as others in their class.

Cross Curricular Links

Health:	L-1.2, L-1.2, L-1.3
Language Arts:	Literacy Place: Read Aloud – *Mrs. Chicken and the Hungry Crocodile, Sailor: The Hangashore Newfoundland Dog*
Mathematics:	*The Quiltmakers Gift*
Social Studies:	1.2.3
Technology:	
Visual Arts:	CP1.1, CP1.4, RRA1.4

Science 1 - Life Science (LS) - *Needs and Characteristics of Living Things*

Specific Curriculum Outcome
Students will be expected to…   LS – 1 distinguish between characteristics that make plants and animals unique

	Grade 1	Grade 2
	LS – 1 Distinguish between characteristics that make plants and animals unique	Animal Growth and Change Contrast human growth and development with that of other organisms.

Achievement Indicators

Students who have achieved this outcome should be able to…

- Identify and use common terms for parts of humans, other animals, and plants
- Record observations and measurements about animals* and plants, using written language, pictures, and charts
- Classify animals and plants in groups according to one or more characteristic (such as: size, colour, where they live, …)

*Excerpt from: *The PEI Science Safety Resource Manual*

Teachers are responsible for familiarizing themselves with any local, provincial, or federal statutes pertaining to the care of plants or animals. If in doubt, inquire. Pet shops or plant shops may have useful information. Remember that there are regulations preventing the picking of wild flowers, or the captive use of migratory birds or endangered species. The following are some guidelines for the care of plants and animals in the classroom:
• Be wary of any possible signs of allergic reactions among students to any plants or animals.
• Inform the administration before bringing any animals into the school.
• Inquire about specific feeding and facility requirements for classroom pets.
• Be wary of possible diseases that may be spread by animals, or by people to animals.
• Poisonous animals and plants, or other potentially dangerous animals such as venomous snakes and spiders should not be kept in the classroom.
• Wear gloves when handling animals in the classroom. Over-handling can put the animals under excessive stress.
• Involve students in helping to care for plants and animals.
• Make arrangements to have the plants and animals looked after over holidays and on weekends.

Elaboration

Focus question: What makes plants and animals unique?

Through many hands-on experiences students should have the opportunity to explore what makes each plant and animal unique within their species. What makes a dog different from a cat? A cactus different than a dandelion?

Students should be given the chance to investigate various plants and animals in their natural environment. In cases where plants and animals are not local, there should be a variety of pictures or videos of living things for students to examine and classify. By comparing a number of different plants and animals, students should identify similarities and differences among the living things.

Students should experience opportunities for communicating their observations and discoveries in a variety of ways (e.g., verbally, pictorially, graphically, digitally, and through demonstration). One way this could be done is through listening and responding to another student's description of an animal or plant.

Students should try to recognize which group of animals will fly, which will crawl, which will jump, or which will slide. Have them look at pictures of fish, birds, reptiles, and other types of animals and try to predict how they will move. Opportunities should be provided for students to use a variety of sources of information, such as observing living things, books, videos, software, Internet, to find answers to their questions.

Cross Curricular Links

Health:	W-1.4, W-1.11, W-1.11, W-1.12, W-1.13, W-1.14
Language Arts:	Literacy Place:
	Guided Reading – *Whose Teeth are These, Memories, I am Big, A Pod for a Baby Orca, Come Home Bailey, A Wild Eagle Needs a Beak*
	Shared Reading – *Is this a Moose, The Best Pet, The Bug Hotel*
	Read Aloud – *Mrs. Chicken and the Hungry Crocodile, Sailor: The Hangashore Newfoundland Dog*
Mathematics:	SS1
	Measuring Penny, Equal Shmequal
Social Studies:	
Technology:	A3.1, A3.2, B8.1
Visual Arts:	CP1.3, RRA1.2

Science 1 - *Needs and Characteristics of Living Things*

Specific Curriculum Outcome
Students will be expected to...   LS – 2 Classify the characteristics and needs of living things

	Grade 1	Grade 2
	LS – 2 Classify the characteristics and needs of living things	Animal Growth and Change Assist in setting up and maintain a life-supporting environment for an organism such as a mealworm or caterpillar

Achievement Indicators

Students who have achieved this outcome should be able to...

- Compare common characteristics of humans, other animals, and plants
- Observe and identify similarities and differences in living and non-living things
- Describe ways that humans use their knowledge of living things in meeting their own needs and the needs of plants and animals

Elaboration

Focus Question: What are the characteristics and needs of living things?

Classroom activities will generate questions like "Which of these things is alive?" and "What does it need to live?". These questions can provide a focus for this part of the unit. Living things grow and change, and require air, food and water. Some questions that might be posed are "How do they eat?", "How often should I water this plant?", or "How much water do I use?". Students could discuss how they care for pets and/or plants. Students could observe and care for their classroom plants as well as focus on a wide range of animals using a variety of resources (e.g., videos, internet, software, print) to learn how animals meet their needs.

Students could explore ways that different animals adapt to changes in temperature (e.g., hibernation, migration) and the ways that the various animals move (e.g., flying, swimming, running) that help them live in their environment. Similarities and differences in the ways different animals get their food and protect themselves from danger can be explored. Students can also grow simple plants from seeds, take care of the plants as they grow, and recognize the needs of their plants.

Invite the students to brainstorm characteristics of humans. This could be done together using Inspiration software. These characteristics could be divided into two categories – characteristics that are common to most people (e.g., such as hands and eyes) and characteristics that are unique to people (e.g., such as eye and hair colour).♥ **Be sensitive to student's feelings, and do not do activities in which individual students are stigmatized for physical characteristics.** Teachers could use classroom literature and other resources to illustrate the diversity of characteristics of living things.

Using their knowledge of the needs of living things, students could investigate how people care for plants and animals in order to make sure their needs are met. This can be compared to how plants and animals meet their needs while growing in the wild.

Cross Curricular Links

Health:	W – 1.4, W-1.5
	Literature Resources in the Wellness Choice Package
Language Arts:	Literacy Place:
	Guided Reading – *Grandpa's Garden, Getting Ready for Winter, Who Did Jake's Chores, A Wild Eagle Needs a Beak, A pod for a Baby Orca, Whose Teeth are These*
	Shared Reading – *Is This a Moose, School Days – The Bug Hotel, How Does a Chick get out of the Egg, Caring for Speedy*
	Read Aloud – Pipaluk and the Whales
Mathematics:	SS1
Social Studies:	1.1.1, 1.4.1, 1.4.2
Technology:	A5.1, A4.1, A4.3, A4.4, A4.5
Visual Arts:	

Specific Curriculum Outcome
Students will be expected to...   ESS – 1 Analyze daily and seasonal changes in the environment

	Grade 1	Grade 5
	ESS – 1 Analyze daily and seasonal changes in the environment	Weather Display the weather data they have collected on charts and graphs and in their science logs.

Achievement Indicators

Students who have achieved this outcome should be able to...

- Use appropriate vocabulary related to changes in the environment. (e.g., dryer, colder, warmer, more than, less than)
- Use a variety of tools (e.g., rain container, thermometer, and wind sock and techniques (e.g., chart, diagram, and table) to record changes in weather conditions that occur in daily and seasonal cycles.
- Illustrate and record changes that occur in the environment throughout the seasons (e.g., flowers blooming, snow melting, leaves falling, puddles freezing)
- Compare changes in the environment over time. (e.g., daily, weekly, monthly)

Elaboration

Focus Question: How does the environment change every day?

Introduce charts and calendars as an efficient means for students to record their observations regarding daily and seasonal changes. Teachers may wish to have a "Calendar Time" every morning, in which the date, day of the week, and month are identified.

Students could display pictures (drawn, from magazines, or through multimedia) of seasonal activities of humans and living things as well as weather typical of various seasons. Have students describe their favourite weekly and seasonal activities to introduce the concept that the days of the week and the seasons have a sequence, and that this sequence is repetitive.

To prepare for collecting and recording data around seasonal changes in weather, discuss with students what kinds of information that can be collected and how they will go about recording the data. Focus on the types of language, drawings, and nonstandard measurements that can be used to describe temperature (e.g., hot, warm, cold), light (e.g., light or dark, cloudy or sunny), position of the sun (e.g., drawing a picture of what they see when they look out the window, and then drawing the sun at various times of the day), and types of precipitation (e.g., rain, fog, snow, sleet, hail; perhaps using a bucket to measure the amount of rain or snow). This will prepare them for observing and recording environmental changes that occur in daily and seasonal cycles.

Students should keep track of their activities throughout the week to see what things they do on a daily basis (e.g., sleep at night, eat meals, brush their teeth after eating). Discussions should describe characteristics about themselves such as sleepy, alert, or hungry as well as their location over the course of a day such as bed, kitchen, playground and school. If students have pets, they can observe and record the activities of their pets to recognize their daily pattern. They could note natural habits and routines, such as when they sleep, as well as habits and routines that are established by the care they receive. Students could note the times of the day that the birds come to feed at a school or home bird feeder. Do different kinds of birds arrive at different times? Birds make excellent subjects to study, since they have daily cycles that are easily observable and well known. Many stories relate how a rooster crows at dawn, or how an owl is active at night.

Cross Curricular Links

Health:	W-1.1
Language Arts:	Literacy Place:
	Read Aloud – *Bubble Gum, Books, and Bugs- Things to do if you are the Snow, Call me Polar Bear, Sailor: The Hangahore Newfoundland Dog, Pipaluk and the Whales*
Mathematics:	N1, N3, SS1
Social Studies:	
Technology:	A4.3, A4.5, A4.6, A5.1, A9.5, B8.2, B9.1
Visual Arts:	CP1.1, CP1.2, CP1.3, RRA1.2

Specific Curriculum Outcome
Students will be expected to… ESS – 2 Evaluate the characteristics of the four seasons.

	Grade 1	Grade 5
	ESS – 2 Evaluate the characteristics of the four seasons.	Weather Display the weather data they have collected on charts and graphs and in their science logs.

Achievement Indicators

Students who have achieved this outcome should be able to…

- Contribute to class discussion on changes in weather conditions (e.g., hot/cold, warm/cool, more windy/less windy, type of precipitation,…) that occur in daily and seasonal cycles.
- Explain the relationship between weather and seasons (e.g., hot in the summer, snows in the winter, rains in the spring)
- Predict the types of weather for a certain season, based on their observations of the patterns of weather during the year   (e.g., *length of day, type of precipitation, temperature*)
- Sequence or group objects, materials, and events according to one or more attributes related to daily and/or seasonal changes (e.g., group pictures by season, sequence activities according to time of day, group clothing items by season, and sequence stages of garden growth).

- Explain safety procedures related to dressing appropriately for the weather and why they are needed (e.g., wearing hats and mitts in the winter, rain gear when it is raining)

Elaboration

Focus Question: What are the characteristics of the weather during each season?

Through experience and observation students can make simple weather predictions related to the seasons. For example, students could predict what the weather will be like in June or December. Throughout the year, students could keep track of the weather on a daily basis and then group these records by season in order to make conclusions.

Students could investigate the changes that take place in plants during different seasons. Students could observe the leaves and seeds falling from trees in the fall, seeds germinating in the spring, and new leaves budding in the spring. They can draw pictures that show how the trees change over the seasons or use pictures from print resources. Students could attempt to predict when the leaves will fall in autumn, or predict that certain animals will hibernate during the winter.

Students could question workers in their community about how they prepare for the winter. A field trip to a farm, zoo, fish plant, fishing village, or other areas that need to prepare for the seasons would be a valuable experience. A guest speaker involved in a related industry could describe the seasonal preparations that they have to complete.

Students' behaviours, places visited, and activities vary throughout the year as well. Students can collaborate to design posters and murals that illustrate their seasonal activities, dress, and places where they like to go. They may even identify foods that they like to eat during different seasons. Recess and lunch times that are "outside" days can be used to reinforce the concepts of dressing appropriately for the weather.

Students could display pictures of seasonal activities of humans and living things as well as weather typical of various seasons. Have students describe their favourite weekly and seasonal activities to introduce the concept that the days of the week and the seasons have a sequence, and that this sequence is repeated over and over.

Cross Curricular Links

Health:	
Language Arts:	
Mathematics:	
Social Studies:	1.2.2
Technology:	A5.1, B5.1
Visual Arts:	CP1.1, CP1.2, CP1.3, RRA1.2