

# Science 7

*Curriculum At a Glance*

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# Background

An important and universal goal of science education is to equip learners with an understanding of the roles that science and technology play in society. The Nova Scotia science curriculum aims to develop learners' Scientific Literacy and their ability to problem solve and apply the principles of scientific inquiry to real-world situations and familiar problems. In so doing, learners will develop skills and competencies. Additionally, Science 7 seeks to develop scientific literacy through designing and building for technological innovation, writing for scientific communication and data analysis.

Learners in grade 7 will have opportunities to design scientific inquiries, evaluate evidence, use evidence for argumentation and use technology to solve problems. They will explore fundamental concepts of the Nature of Science such as:

- Scientific Reasoning
- Patterns
- Cause and Effect
- Systems and Models
- Energy and Matter
- Structure and Function
- Change and Stability
- Stewardship and Sustainability
- Similarity and Diversity

## Learning in Context:

The nature of science asks learners to question the phenomena of the world around them, then test those questions in controlled environments. Themes create authentic purpose for learning and facilitate cross curricular, project-based learning opportunities. Learners will see the context for what they are learning which will improve transfer of skills and knowledge. It is important that learners view themselves as scientists and as an integral part of the learning process. Teaching through themes is one way to make the learning meaningful for all learners. Each of the themes in Science 7 provide opportunities for learners to engage with inquiry based learning in a hands-on way that is crucial to science literacy and the development of critical thinking skills.

## Science 7 Themes:

- Environmental Action - Learners explore concepts related to particle theory, solutions, and mixtures in the context of pollution in the environment. Learners will examine the impacts of pollution in the environment while exploring ecosystem components and adaptation of organisms for survival and evolution.
- Engineering Structures - Learners explore concepts related to engineering, forces and the design process through applications to the construction of structures. Learners make connections between manufactured structures and those found in nature.
- Geological Evolution - Learners explore concepts of plate tectonics and geographical formations in the context of change over time and they will explore evidence of geological evolution and its implications.

# Learners will **analyse** particle theory in relation to substances in environments.

## Environmental Action

### Rationale

Particle theory is essential to understanding how substances in the environment impact living things as well as how we can separate pollutants from natural systems. Exploration of solubility and concentration will help learners analyse ways to determine environmental health. Inquiry into particle theory provides the foundation for future studies in chemistry. In grade 8, concepts related to particle theory will be further refined as students explore heat and the kinetic molecular theory through the theme of climate change.

### Competencies

- Citizenship (CZ)
- Communication (COM)
- Creativity and Innovation (CI)
- Critical Thinking (CT)
- Personal Career Development (PCD)
- Technological Fluency (TF)

### Indicators

- **Investigate** pure substances and mixtures in relation to particle theory (COM/PCD/CI/TF)
- **Investigate** methods of separation in solutions and mixtures (COM/CI/CT)
- **Analyse** the factors that affect solubility and concentration (COM/CT/TF)
- **Measure** the indicators of health of a local waterway with probeware (CZ/CI/TF)
- **Analyse** the health of a local waterway (CZ/COM/CI/CT)
- **Investigate** methods of water purification and pollution cleanup (CZ/COM/PCD/CI/CT)

## Concepts (and Guiding Questions)

### Particle Theory

- How does the Particle Theory of Matter relate to mixtures and solutions?
- How does the particle theory of matter relate to the dissolution of substances?

### Pure substances vs. Mixtures

- How do pure substances and mixtures compare?
- How do various mixtures and solutions compare?

### Separation of Mixtures

- How can various mixtures be separated?
- How can pollutants be separated from our drinking water?

### Solubility and Concentration

- How do solubility and concentration impact the effect of pollutants in the environment?
- How do different variables affect solubility and concentration?

### Determining Environmental Health

- How can the health of an environment be determined?
- How can water be kept clean for drinking and as a habitat?
- How does pollution enter the environment?

## Skills

### Analyse

Gather and select appropriate information; determine accuracy, validity, and relevance of the information; identify perspectives, communicate findings.

### Investigate

Ask and revise questions; locate several relevant and dependable details to support an answer; organize and compare details; identify relationships, recognize represented perspectives and communicate findings.

## Learners will **analyse** the interconnectiveness of living things and the environment, in relation to the concept of Netukulimk.

### Environmental Action

#### Rationale

Netukulimk, provides the perspective for a study of ecosystems. The interconnectiveness of biotic and abiotic components in ecosystems will lead to an understanding of energy input and matter cycling through food webs. Analysis of the impact of humans on ecosystems further demonstrates the interconnectiveness of living things.

#### Competencies

- Citizenship (CZ)
- Communication (COM)
- Creativity and Innovation (CI)
- Critical Thinking (CT)
- Technological Fluency (TF)

#### Indicators

- **Analyse** the interactions of various organisms within an ecosystem (CZ/CT/COM)
- **Analyse** the impact of humans on ecosystems, including pollution and green technologies (CZ/CT/TF)
- **Analyse** choices about resource management and sustainability in relation to Netukulimk (CZ/COM/CI/CT)
- **Investigate** energy input and matter recycling in an ecosystem (COM/CT)
- **Analyse** the interconnectiveness of biotic and abiotic components in nature, inclusive of a Mi'kmaw perspective (COM/CZ/CT)
- **Investigate** biological indicators of environmental health (COM/CT/TF)

### Concepts (and Guiding Questions)

#### Ecosystems

- What are some characteristics that different ecosystems have in common?
- How is the size of an ecosystem determined?

#### Biotic and abiotic components

- How can the impacts of abiotic components be determined?
- How do abiotic and biotic components compare?

#### Interconnectiveness

- What are some of the interconnections that can be observed in various ecosystems?
- How do abiotic and biotic components interact in various ecosystems?
- How can biological indicators be used as a marker for environmental health?

#### Energy input and matter recycling

- How does the flow of energy and the flow of matter in an ecosystem compare?
- How can we design a sustainable biosphere?

#### Food Webs

- How do organisms interact within an ecosystem?
- How do producer populations impact consumer populations?

#### Netukulimk

- How can natural resources be used in a sustainable way?
- How does environmental racism impact various local and global communities?
- How have human relationships with the environment changed over time?

#### Human Impact

- How are humans impacting ecosystems?
- How has the impact of humans on ecosystems changed over time?
- How are green technologies changing the impact of humans on ecosystems?

## **Skills**

### **Analyse**

Gather and select appropriate information; determine accuracy, validity, and relevance of the information; identify perspectives, communicate findings.

### **Investigate**

Ask and revise questions; locate several relevant and dependable details to support an answer; organize and compare details; identify relationships, recognize represented perspectives and communicate findings.

# Learners will **investigate** factors that affect species adaptation and evolution.

## Environmental Action

### Rationale

An exploration of various systems of classification demonstrates the diversity of life, which provides an avenue to explore adaptations and how species have evolved over time. Investigating evidence for evolution will allow learners to understand how environmental pressures and species interactions lead to natural selection and affect biodiversity.

### Competencies

- Communication (COM)
- Creativity and Innovation (CI)
- Critical Thinking (CT)

### Indicators

- **Investigate** multiple ways that species can be classified (COM/CI/CT)
- **Hypothesize** ways in which organisms may adapt in response to environmental and predation factors (COM/CT)
- **Investigate** the concept of natural selection and its role in evolution (COM/CT)
- **Investigate** evidence of evolution (COM/CT)

## Concepts (and Guiding Questions)

### Classification

- How can organisms be grouped?
- How does classification help us learn about organisms?

### Adaptation

- How do organisms adapt to survive?
- How have local organisms adapted to their specific environmental demands?

### Evolution

- Why do living things change over time?
- How can we see evidence of species evolution?

### Natural Selection

- How do living things change over time?

- Why can't a single organism evolve?

### Evidence of evolution

- How can we observe geological evidence of evolution in the local environment?
- How can we infer information about the past in the absence of direct evidence?

## Skills

### Investigate

Ask and revise questions; locate several relevant and dependable details to support an answer; organize and compare details; identify relationships, recognize represented perspectives and communicate findings.

## Learners will implement an environmental stewardship plan.

### Environmental Action

#### Rationale

This outcome is the application of concepts explored throughout the environmental action theme. Learners will evaluate and plan ways to mitigate environmental harm as well as how they can have a positive impact on their community and environment.

#### Competencies

- Citizenship (CZ)
- Communication (COM)
- Creativity and Innovation (CI)
- Critical Thinking (CT)
- Personal Career Development (PCD)
- Technological Fluency (TF)

#### Indicators

- **Select** strategies for conservation and sustainability (CZ/CT)
- **Investigate** community environmental stewardship initiatives (CZ/COM/PCD/CT)
- **Formulate** an environmental stewardship plan to mitigate environmental harm in relation to the concept of Netukulimk (CZ/PCD/CI/CT)

### Concepts (and Guiding Questions)

#### Netukulimk, Sustainability and Conservation

- How can we live according to Netukulimk?
- Why is it important to care for the environment?

#### Environmental Stewardship

- How can it be determined whether a local environment needs to be protected?
- How can the impact of local environmental initiatives be determined?

- How do people in my community take care of the environment?
- How can I take care of the environment?

#### Mitigating Environmental Harm

- How can more green space be created?
- How can you determine if conservation and sustainability strategies are effective?

#### Skills

#### Implement

**Select** - Locate several relevant and dependable details to support an answer

**Plan – FORMULATE** Identify a topic of interest; brainstorm ideas; choose, prioritize, and refine ideas; evaluate choices. Devise a process to solve the problem. Execute the steps, modifying as necessary.

**Evaluate** - Review processes and results from an inquiry; consider and communicate varying perspectives and alternative solutions; identify potential new problems and/or issues; justify decisions and/or findings.

**Apply** - Carry out, use or complete a procedure/technique.

#### Select

Locate several relevant and dependable details to support an answer.

#### Investigate

Ask and revise questions; locate several relevant and dependable details to support an answer; organize and compare details; identify relationships, recognize represented perspectives and communicate findings.

#### Formulate

Identify a topic of interest; brainstorm ideas; choose, prioritize, and refine ideas; evaluate choices.

## Learners will **test** the strength and efficiency of shapes and materials used in construction.

### Engineering Structures

#### Rationale

Different materials are more efficient for building particular structures. Similarly, by modifying the shapes used in construction, strength and efficiency can be adjusted according to the criteria, goal or design. Comparing manufactured structures and those found in nature demonstrates the properties of various shapes and materials.

#### Competencies

- Communication (COM)
- Creativity and Innovation (CI)
- Critical Thinking (CT)
- Personal Career Development (PCD)
- Technological Fluency (TF)

#### Indicators

- **Evaluate** the strength of a variety of shapes and materials (COM/CI/CT/TF)
- **Evaluate** the applications of shapes and materials used in construction (CT/PCD/TF)
- **Investigate** properties of materials used in construction
- **Compare** features of manufactured and natural structures (COM/CT)

### Concepts (and Guiding Questions)

#### Features of natural structures

- How do various natural structures compare?
- How are natural structures reflected in manufactured structures?

#### Features of manufactured structures

- How do engineers use different shapes to improve strength?
- How have structures changed over time and across cultures?

### Shapes used in construction

- How do shapes impact strength and stability of structures?
- How can I test the strength and efficiency of shapes used in construction?

### Properties of construction materials

- How can advantages and disadvantages of construction materials be determined?
- How does geographic location impact the materials used to build structures?

### Skills

#### Test

Formulate a testable question and a reasonable hypothesis; identify dependent and independent variables; identify variables to intentionally control; design an experiment; execute the steps; collect and record evidence; conduct data analysis; develop conclusions based on evidence; communicate findings and possible limitations

#### Evaluate

Review processes and results from an inquiry; consider and communicate varying perspectives and alternative solutions; identify potential new problems and/or issues; justify decisions and/or findings.

#### Investigate

Ask and revise questions; locate several relevant and dependable details to support an answer; organize and compare details; identify relationships, recognize represented perspectives and communicate findings.

#### Compare

Make observations; identify similarities and differences; identify relationships and offer an interpretation; communicate the findings.

## Learners will **test** various forces affecting structures.

### Engineering Structures

#### Rationale

Structures are impacted by various forces that hold them together and those that lead to structural failure. Understanding how to balance these forces is best done through hands-on inquiry. Testing structures also allows learners to apply the scientific skills of controlling variables and scientific reasoning.

#### Competencies

- Communication (COM)
- Creativity and Innovation (CI)
- Critical Thinking (CT)
- Personal Career Development (PCD)
- Technological Fluency (TF)

#### Indicators

- **Investigate** forces that act on and within structures (CT/ TF)
- **Test** structures to determine failure points (COM/PCD/CI/CT)
- **Analyse** forces that lead to structural failure (COM/CT)
- **Compare** static and dynamic forces that impact structures

### Concepts (and Guiding Questions)

#### Internal and External Forces

- How do internal forces affect structures?
- How do external forces affect structures?
- How are joints strengthened?
- How can the direction of forces be controlled?
- What natural forces threaten local manufactured structures?

#### Static and Dynamic Forces

- How can structural forces be assessed?
- How do static and dynamic forces compare?

#### Loading

- How can loading forces be used to effectively test a structure?
- How does adding a load to a structure affect its integrity?

#### Balance and unbalanced forces

- Why do structures fail?
- How are the concepts of balanced and unbalanced forces incorporated in construction?
- How do engineers use unbalanced forces to destroy structures?

#### Skills

##### Test

Formulate a testable question and a reasonable hypothesis; identify dependent and independent variables; identify variables to intentionally control; design an experiment; execute the steps; collect and record evidence; conduct data analysis; develop conclusions based on evidence; communicate findings and possible limitations

##### Investigate

Ask and revise questions; locate several relevant and dependable details to support an answer; organize and compare details; identify relationships; recognize represented perspectives and communicate findings.

##### Analyse

Gather and select appropriate information; determine accuracy, validity, and relevance of the information; identify perspectives, communicate findings.

##### Compare

Make observations; identify similarities and differences; identify relationships and offer an interpretation; communicate the findings.

## Learners will **construct** a structure in response to a design challenge.

### Engineering Structures

#### Rationale

Design challenges encourage inquiry and problem solving. Learners will be able to apply what they have learned about materials, shapes, strength, stability efficiency and forces in solving a real-world problem.

#### Competencies

- Communication (COM)
- Creativity and Innovation (CI)
- Critical Thinking (CT)
- Personal Career Development (PCD)
- Technological Fluency (TF)

#### Indicators

- **Apply** concepts of shapes, forces, strength, stability and efficiency to a design challenge (CI/CT/TF)
- **Evaluate** materials in relation to a design challenge (COM/CT)
- **Implement** a plan for a structural design challenge (COM/PCD/CI/CT)
- **Test** a constructed structure according to design challenge criteria (CT/CI/TF)

### Concepts (and Guiding Questions)

#### Forces affecting structures

- How can a structure be built to withstand forces?
- Which forces need to be considered in construction?

#### Shape/Form

- How can aesthetics influence construction?
- How does form/shape impact function?

#### Construction materials

- How can the features of construction materials be determined?
- How can the efficient use of resources be incorporated in construction?

### Design Process

- How can the design process be used in construction?
- How can the structure's stability be assessed during the design process?

#### Stability

- How can the stability of a structure be affected by various factors?
- How can the structure's stability be tested?

### Skills

#### Construct

Identify a purpose; brainstorm ideas; gather and select information to support a plan; identify and choose options within the plan; offer reasons to support choices; build a model; test and revise, modify as necessary; evaluate the results at each stage of the process; consider alternative options.

#### Apply

Carry out, use, or complete a procedure/technique.

#### Evaluate

Review processes and results from an inquiry; consider and communicate varying perspectives and alternative solutions; identify potential new problems and/or issues; justify decisions and/or findings.

#### Implement

**Select** - Locate several relevant and dependable details to support an answer

**Plan – FORMULATE** Identify a topic of interest; brainstorm ideas; choose, prioritize, and refine ideas; evaluate choices. Devise a process to solve the problem. Execute the steps, modifying as necessary.

**Evaluate** - Review processes and results from an inquiry; consider and communicate varying perspectives and alternative solutions; identify potential new problems and/or issues; justify decisions and/or findings.

**Apply** - Carry out, use or complete a procedure/  
technique.

## **Test**

Formulate a testable question and a reasonable hypothesis; identify dependent and independent variables; identify variables to intentionally control; design an experiment; execute the steps; collect and record evidence; conduct data analysis; develop conclusions based on evidence; communicate findings and possible limitations

## Learners will **analyse** how geographic features are formed and changed.

### Geological Evolution

#### Rationale

An understanding of plate tectonics and an exploration of observable geographic features, like mountains and ocean basins, informs the big questions in science around change versus stability and how scientists can use models to gain understanding. Using a Nova Scotia context will allow learners to explore erosion and deposition in an authentic and personal way.

#### Competencies

- Communication (COM)
- Critical Thinking (CT)
- Technological Fluency (TF)

#### Indicators

- **Analyse** the relationship between geographic features and plate boundaries (COM/CT)
- **Analyse** the evidence for plate movement (COM/CT/TF)
- **Investigate** erosion and deposition (COM/CT)
- **Investigate** technologies used to measure geological change (COM/CT/TF)

### Concepts (and Guiding Questions)

#### Plate Tectonics

- How does the movement of Earth's tectonic plates cause observable changes and effects?
- How do we know plates are moving?

#### Geographic Features

- How have the geographic features of Nova Scotia changed over time?
- How quickly does/can geological change happen?

#### Seismology

- How can we prepare for seismic events?

- How does human development in areas with dramatic geologic change impact communities?

### Erosion and Deposition

- How do human activities impact geological change?
- How have local landforms been impacted by erosion and deposition?

### Skills

#### Analyse

Gather and select appropriate information; determine accuracy, validity, and relevance of the information; identify perspectives, communicate findings.

#### Investigate

Ask and revise questions; locate several relevant and dependable details to support an answer; organize and compare details; identify relationships, recognize represented perspectives and communicate findings.

## Learners will **analyse** factors that affect coastline change.

### Geological Evolution

#### Rationale

The study of tides and waves provides real-time evidence that geological changes affect how and where we live. Learners also explore the impact of humans on geographic formations as well as the technologies and strategies that can mitigate coastal degradation.

#### Competencies

- Citizenship (CZ)
- Communication (COM)
- Creativity and Innovation (CI)
- Critical Thinking (CT)
- Personal Career Development (PCD)
- Technological Fluency (TF)

#### Indicators

- **Investigate** weathering and erosion (COM/CT)
- **Analyse** the impact of waves and tides on rivers and coastlines (COM/CT)
- **Compare** possible strategies for mitigating coastal degradation (CZ/PCD/CT/TF)

### Concepts (and Guiding Questions)

#### Waves and Tides

- How do beaches/coastlines change from season to season?
- How do coastlines change naturally over time?

#### Erosion and Weathering

- How do geological features and processes affect where and how we live?
- How does the shape of coastlines affect erosion?

#### Mitigating Coastal Degradation

- How do humans interact with the natural processes of coastline erosion?

- How can we control erosion without causing more erosion?

#### Mitigating Coastal Degradation

- How do humans interact with the natural processes of coastline erosion?
- How can we control erosion without causing more erosion?

### Skills

#### Analyse

Gather and select appropriate information; determine accuracy, validity, and relevance of the information; identify perspectives, communicate findings.

#### Investigate

Ask and revise questions; locate several relevant and dependable details to support an answer; organize and compare details; identify relationships, recognize represented perspectives and communicate findings.

#### Compare

Make observations; identify similarities and differences; identify relationships and offer an interpretation; communicate the findings.