

# Key Changes

## Ontario Science and Technology Curriculum, Grades 1 to 8, 2022

Topic	2007 Curriculum	2022 Curriculum
<b>Curriculum Context</b>		
<b>Introduction</b>	<ul style="list-style-type: none"><li>• Goals of the Science and Technology Curriculum</li><li>• Nature of Science and Technology</li><li>• Roles and Responsibilities in the Science and Technology Program<ul style="list-style-type: none"><li>○ Students</li><li>○ Parents</li><li>○ Teachers</li><li>○ Principals</li><li>○ Community Partners</li></ul></li></ul>	<ul style="list-style-type: none"><li>• Preface</li><li>• Vision and Goals</li><li>• The Importance of STEM Education</li><li>• Curiosity and Wonder in Science and Technology</li></ul>
<b>The Program in Science and Technology</b>	<ul style="list-style-type: none"><li>• The Program in Science and Technology<ul style="list-style-type: none"><li>○ Curriculum Expectations</li><li>○ Strands in the Science and Technology Curriculum</li></ul></li></ul>	<ul style="list-style-type: none"><li>• The Program in Science and Technology<ul style="list-style-type: none"><li>○ Curriculum Expectations</li><li>○ Teacher Supports</li></ul></li><li>• Fundamental Concepts and “Big Ideas” in Science and Technology</li></ul>

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	<ul style="list-style-type: none"> <li>○ The Skills Continua for Scientific Inquiry and Technological Problem Solving</li> <li>○ Topics in Science and Technology</li> </ul>	<ul style="list-style-type: none"> <li>• The Strands and Topics in the Science and Technology Curriculum               <ul style="list-style-type: none"> <li>○ Strand A – STEM Skills and Connections</li> <li>○ Strand B – Life Systems</li> <li>○ Strand C – Matter and Energy</li> <li>○ Strand D – Structures and Mechanisms</li> <li>○ Strand E – Earth and Space Systems</li> <li>○ Topics in Science and Technology</li> </ul> </li> <li>• Scientific and Engineering Design Processes               <ul style="list-style-type: none"> <li>○ Scientific Processes</li> <li>○ Engineering Design Process</li> </ul> </li> </ul>
<b>Program Planning and Cross-Curricular and Integrated Learning in Science and Technology</b>	<ul style="list-style-type: none"> <li>• Instructional Approaches</li> <li>• Health and Safety in Science and Technology Education</li> <li>• Planning Science and Technology Programs for Students with Special Education Needs</li> <li>• Program Considerations for English Language Learners</li> <li>• Antidiscrimination Education in the Science and Technology Program</li> <li>• The role of Information and Communication Technology in Science and Technology Education</li> </ul>	<p>Science and Technology content:</p> <ul style="list-style-type: none"> <li>• Health and Safety in Science and Technology Education</li> <li>• Coding and the Impact of Coding and Emerging Technologies</li> <li>• Skilled Trades</li> <li>• Climate Change</li> <li>• Food Literacy</li> </ul> <p>General “Program Planning” sections on the Curriculum and Resources website apply to all curriculum, including:</p> <ul style="list-style-type: none"> <li>• <a href="#">Environmental Education</a></li> </ul>

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	<ul style="list-style-type: none"> <li>• The Role of the Library in Science and Technology Program</li> <li>• Cross-Curricular and Integrated Learning</li> <li>• Environmental Education</li> <li>• Critical Thinking and Critical Literacy in Science and Technology</li> <li>• Literacy and Numeracy in the Science and Technology Program</li> <li>• Guidance in Science and Technology Education</li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Experiential Learning</a></li> <li>• <a href="#">Human Rights, Equity, and Inclusive Education</a></li> <li>• <a href="#">Indigenous Education</a></li> <li>• <a href="#">Planning for English Language Learners</a></li> <li>• <a href="#">Planning for Students with Special Education Needs</a></li> <li>• <a href="#">Transferable Skills</a></li> </ul>
<b>Assessment and Evaluation of Student Achievement</b>	<ul style="list-style-type: none"> <li>• Basic Considerations</li> <li>• The Achievement Chart for Science and Technology</li> </ul>	<ul style="list-style-type: none"> <li>• The Achievement Chart for Science and Technology</li> </ul>
<p align="center"><b>Strand A. STEM Skills and Connections</b></p> <p align="center">Note: This is a new strand in the 2022 curriculum</p>		
<b>STEM Investigation and Communication Skills</b>	<p>Curriculum expectations related to the following were included and repeated in all four strands:</p> <ul style="list-style-type: none"> <li>• scientific research</li> <li>• scientific inquiry/experimentation</li> <li>• technological problem solving</li> <li>• safety procedures</li> <li>• communication</li> </ul>	<p>Curriculum expectations related to the following are included in this overarching strand A:</p> <ul style="list-style-type: none"> <li>• scientific research</li> <li>• scientific experimentation</li> <li>• engineering design process</li> <li>• health and safety procedures</li> <li>• communication</li> </ul>

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<b>Coding and Emerging Technologies</b>	<ul style="list-style-type: none"> <li>• No references to coding</li> <li>• No references to emerging technology</li> </ul>	<ul style="list-style-type: none"> <li>• Grades 1 to 3: clear and precise instructions for algorithms, decomposing problems, and testing, debugging and refining solutions</li> <li>• Grades 4 to 6: input, storage, processing, and output</li> <li>• Grades 7 to 8: project management and program design, controlling large systems in action</li> <li>• Grades 1 to 3: impact of emerging technology and coding on everyday life</li> <li>• Grades 4 to 6: impact of emerging technology and coding on everyday life, including skilled trades</li> <li>• Grades 7 to 8: impact of emerging technology and coding, such as artificial intelligence systems, on everyday life, including skilled trades</li> </ul>
<b>Applications, Connections, and Contributions</b>	<ul style="list-style-type: none"> <li>• No references to practical applications of science and technology concepts</li> <li>• No references to cross-curricular application of science and technology</li> <li>• No references to contributions to science and technology</li> </ul>	<ul style="list-style-type: none"> <li>• Grade 1 to 3: practical applications of science and technology in home and community</li> <li>• Grade 4 to 8: practical applications of science and technology in occupations, including skilled trades</li> <li>• Grade 1 to 8: how science and technology can be used with other subject areas to address real-world problems</li> </ul>

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		<ul style="list-style-type: none"> <li>Grade 1 to 8: contributions to science and technology from people with diverse lived experiences and from various communities</li> </ul>
<b>Strand B. Life Systems</b>		
<b>Topics</b>	<ul style="list-style-type: none"> <li>Grade 1: Needs and Characteristics of Living Things</li> <li>Grade 2: Growth and Changes in Plants</li> <li>Grade 3: Growth and Changes in Animals</li> <li>Grade 4: Habitats and Communities</li> <li>Grade 5: Human Health and Body Systems</li> <li>Grade 6: Biodiversity</li> <li>Grade 7: Interactions in the Environment</li> <li>Grade 8: Cells</li> </ul>	<ul style="list-style-type: none"> <li>Grade 1: Needs and Characteristics of Living Things</li> <li>Grade 2: Growth and Changes in Plants</li> <li>Grade 3: Growth and Changes in Animals</li> <li>Grade 4: Habitats and Communities</li> <li>Grade 5: Human Health and Body Systems</li> <li>Grade 6: Biodiversity</li> <li>Grade 7: Interactions in the Environment</li> <li>Grade 8: Cells</li> </ul>
<b>Relating Science and Technology to Our Changing World</b>	<ul style="list-style-type: none"> <li>Named Relating Science and Technology to Society and the Environment</li> <li><b>Gr. 7 A1.2</b> analyse the costs and benefits of selected strategies for protecting the environment</li> </ul>	<ul style="list-style-type: none"> <li>Renamed Relating Science and Technology to Our Changing World</li> </ul> <p><b>Revised Expectation:</b></p> <ul style="list-style-type: none"> <li><b>Gr. 7 B1.2</b> assess the effectiveness of various ways of mitigating the negative and enhancing the positive impact of human activities on the environment</li> </ul> <p><b>New Expectations:</b></p> <ul style="list-style-type: none"> <li><b>Gr. 3 B1.3</b> assess the benefits and limitations of locally grown food</li> </ul>

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		<ul style="list-style-type: none"> <li>• <b>Gr. 5 B1.3</b> explain how food literacy can support decisions that affect physical and mental health</li> <li>• <b>Gr. 7 B1.3</b> analyse how diverse First Nations, Métis, and Inuit practices and perspectives contribute to environmental sustainability</li> </ul>
<b>STEM Investigation and Communication Skills</b>	<ul style="list-style-type: none"> <li>• Integrated within the Developing Investigation and Communication Skills overall expectation</li> </ul>	<ul style="list-style-type: none"> <li>• Restructured as STEM Investigation and Communication Skills in Strand A</li> <li>• Science and Technology concepts from the overall expectation on Developing Investigation and Communication Skills are included in Exploring and Understanding Concepts</li> </ul>
<b>Exploring and Understanding Concepts</b>	<ul style="list-style-type: none"> <li>• Named Understanding Basic Concepts</li> </ul>	<ul style="list-style-type: none"> <li>• Renamed Exploring and Understanding Concepts</li> </ul> <p><b>New expectations:</b></p> <ul style="list-style-type: none"> <li>• <b>Gr. 2 B2.2</b> describe the locomotion of various animals</li> <li>• <b>Gr. 3 B2.7</b> describe various plants used for food, including those grown by First Nations, Métis, and Inuit, and identify local settings where these plants are grown or found</li> </ul>

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		<ul style="list-style-type: none"> <li>• <b>Gr. 6 B2.7</b> explain how climate change contributes to a loss of biodiversity, and describe the impact of this loss</li> <li>• <b>Gr. 6 B2.8</b> describe the importance of biodiversity in supporting agriculture, including Indigenous agriculture around the world</li> <li>• <b>Gr. 7 B2.8</b> describe how different approaches to agriculture and to harvesting food from the natural environment can impact an ecosystem, and identify strategies that can be used to maintain and/or restore balance to ecosystems</li> </ul>
<b>Strand C. Matter and Energy</b>		
<b>Topics</b>	<ul style="list-style-type: none"> <li>• Grade 1: Energy in Our Lives</li> <li>• Grade 2: Properties of Liquids and Solids</li> <li>• Grade 3: Forces Causing Movement</li> <li>• Grade 4: Light and Sounds</li> <li>• Grade 5: Properties of and Changes in Matter</li> <li>• Grade 6: Electricity and Electrical Devices</li> <li>• Grade 7: Pure Substances and Mixtures</li> <li>• Grade 8: Fluids</li> </ul>	<ul style="list-style-type: none"> <li>• Grade 1: Energy in Our Lives</li> <li>• Grade 2: Properties of Liquids and Solids</li> <li>• Grade 3: Forces and Motion</li> <li>• Grade 4: Light and Sounds</li> <li>• Grade 5: Properties of and Changes in Matter</li> <li>• Grade 6: Electrical Phenomena, Energy, and Devices</li> <li>• Grade 7: Pure Substances and Mixtures</li> <li>• Grade 8: Fluids</li> </ul>

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<b>Relating Science and Technology to Our Changing World</b>	<ul style="list-style-type: none"> <li>Named Relating Science and Technology to Society and the Environment</li> <li><b>Gr. 6 C1.1</b> assess the short- and long-term environmental effects of the different ways in which electricity is generated in Canada, including the effect of each method on natural resources and living things in the environment</li> <li><b>Gr. 8 C1.2</b> assess the impact of fluid spills on society and the environment, including the cost of the cleanup and the effort involved</li> </ul>	<ul style="list-style-type: none"> <li>Renamed Relating Science and Technology to Our Changing World</li> </ul> <p><b>Revised expectations:</b></p> <ul style="list-style-type: none"> <li><b>Gr. 6 C1.1</b> assess the short- and long-term impacts of electrical energy generation technologies in Canada on society and the environment, including impacts on First Nations, Métis, and Inuit communities, and on climate change</li> <li><b>Gr. 8 C1.2</b> assess the environmental and social impacts of fluid spills, including impacts on First Nations, Métis, and Inuit communities, and including the cost and technical challenges related to cleanup and remediation efforts</li> </ul>
<b>STEM Investigation and Communication Skills</b>	<ul style="list-style-type: none"> <li>Integrated within the Developing Investigation and Communication Skills overall expectation</li> </ul>	<ul style="list-style-type: none"> <li>Restructured as STEM Investigation and Communication Skills in Strand A</li> <li>Science and Technology concepts from the overall expectation on Developing Investigation and Communication Skills are included in Exploring and Understanding Concepts</li> </ul>
<b>Exploring and Understanding Concepts</b>	<ul style="list-style-type: none"> <li>Named Understanding Basic Concepts</li> </ul>	<ul style="list-style-type: none"> <li>Renamed Exploring and Understanding Concepts</li> </ul>



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	<ul style="list-style-type: none"> <li>• <b>Gr 5 C3.2</b> identify properties of solids, liquids, and gases</li> <li>• <b>Gr. 8 C3</b> demonstrate an understanding of the properties and uses of fluids</li> </ul>	<p><b>Revised expectation:</b></p> <ul style="list-style-type: none"> <li>• <b>Gr. 5 C2.2</b> identify the states of matter, and describe characteristics and properties of solids, liquids, and gases</li> <li>• <b>Gr. 8 C2</b> demonstrate an understanding of basic fluid mechanics, including the properties and uses of fluids</li> </ul> <p><b>New expectation:</b></p> <ul style="list-style-type: none"> <li>• <b>Gr. 7 C2.8</b> describe pure substances as elements and compounds consisting of atoms and combinations of atoms</li> </ul>
<b>Strand D. Structures and Mechanisms</b>		
<b>Topics</b>	<ul style="list-style-type: none"> <li>• Grade 1: Material, Objects, and Everyday Structures</li> <li>• Grade 2: Movement</li> <li>• Grade 3: Strong and Stable Structures</li> <li>• Grade 4: Pulleys and Gears</li> <li>• Grade 5: Forces Acting on Structures and Mechanisms</li> <li>• Grade 6: Flight</li> <li>• Grade 7: Form and Function</li> <li>• Grade 8: Systems in Action</li> </ul>	<ul style="list-style-type: none"> <li>• Grade 1: Material, Objects, and Everyday Structures</li> <li>• Grade 2: Simple Machines and Movement</li> <li>• Grade 3: Strong and Stable Structures</li> <li>• Grade 4: Machines and Their Mechanisms</li> <li>• Grade 5: Forces Acting on Structures</li> <li>• Grade 6: Flight</li> <li>• Grade 7: Form and Function</li> <li>• Grade 8: Systems in Action</li> </ul>

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<b>Relating Science and Technology to Our Changing World</b>	<ul style="list-style-type: none"> <li>Named Relating Science and Technology to Society and the Environment</li> <li><b>Gr. 4 B1</b> evaluate the impact of pulleys and gears on society and the environment</li> <li><b>Gr. 5 B3</b> identify forces that act on and within structures and mechanisms, and describe the effects of these forces on structures and mechanisms</li> </ul>	<ul style="list-style-type: none"> <li>Renamed Relating Science and Technology to Our Changing World</li> </ul> <p><b>Revised expectations:</b></p> <ul style="list-style-type: none"> <li><b>Gr. 4 D1</b> evaluate the impacts of various machines and their mechanisms on society and the environment</li> <li><b>Gr. 5 D2</b> demonstrate an understanding of forces that act on structures, and how various structures withstand them</li> </ul>
<b>STEM Investigation and Communication Skills</b>	<ul style="list-style-type: none"> <li>Integrated within the Developing Investigation and Communication Skills overall expectation</li> </ul>	<ul style="list-style-type: none"> <li>Restructured as STEM Investigation and Communication Skills in Strand A</li> <li>Science and Technology concepts from the overall expectation on Developing Investigation and Communication Skills are included in Exploring and Understanding Concepts</li> </ul>
<b>Exploring and Understanding Concepts</b>	<ul style="list-style-type: none"> <li>Named Understanding Basic Concepts</li> <li><b>Gr. 4 B2</b> demonstrate an understanding of the basic principles and functions of pulley systems and gear systems</li> <li><b>Gr. 4 B3.5</b> distinguish between pulley systems and gear systems that increase force and those that increase speed</li> </ul>	<ul style="list-style-type: none"> <li>Renamed Exploring and Understanding Concepts</li> </ul> <p><b>Revised expectations:</b></p> <ul style="list-style-type: none"> <li><b>Gr. 4 D2</b> demonstrate an understanding of the basic principles and functions of machines and their mechanisms</li> <li><b>Gr. 4 D2.5</b> explain how forces are changed in a variety of machines</li> </ul>

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	<ul style="list-style-type: none"> <li><b>Gr. 8 B3.2</b> identify the purpose, inputs, and outputs of various systems</li> </ul>	<ul style="list-style-type: none"> <li><b>Gr. 8 D2.2</b> describe the purpose, inputs, and outputs of various systems, including systems related to food processing</li> </ul> <p><b>New expectations:</b></p> <ul style="list-style-type: none"> <li><b>Gr. 3 D2.2</b> demonstrate an understanding of the relationship between form and function for various structures</li> <li><b>Gr. 4 D2.2</b> identify the parts of various mechanisms and describe the purpose of each part</li> <li><b>Gr. 5 D2.4</b> describe ways in which physical characteristics of various animal and plant species help to protect them from potentially harmful effects of forces</li> <li><b>Gr. 6 D2.5</b> describe characteristics and adaptations that enable organisms to fly</li> </ul>
<b>Strand E. Earth and Space Systems</b>		
<b>Topics</b>	<ul style="list-style-type: none"> <li>Grade 1: Daily and Seasonal Changes</li> <li>Grade 2: Air and Water in the Environment</li> <li>Grade 3: Soils in the Environment</li> <li>Grade 4: Rocks and Minerals</li> <li>Grade 5: Conservation of Energy and Resources</li> <li>Grade 6: Space</li> </ul>	<ul style="list-style-type: none"> <li>Grade 1: Daily and Seasonal Changes</li> <li>Grade 2: Air and Water in the Environment</li> <li>Grade 3: Soils in the Environment</li> <li>Grade 4: Rocks, Minerals, and Geological Processes</li> <li>Grade 5: Conservation of Energy and Resources</li> </ul>

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	<ul style="list-style-type: none"> <li>Grade 7: Heat in the Environment</li> <li>Grade 8: Water Systems</li> </ul>	<ul style="list-style-type: none"> <li>Grade 6: Space</li> <li>Grade 7: Heat in the Environment</li> <li>Grade 8: Water Systems</li> </ul>
<b>Relating Science and Technology to Our Changing World</b>	<ul style="list-style-type: none"> <li>Named Relating Science and Technology to Society and the Environment</li> <li><b>Gr. 2 D1.1</b> assess the impact of human activities on air and water in the environment, taking different points of view into consideration, and plan a course of action to help keep the air and water in the local community clean</li> <li><b>Gr. 5 D1.1</b> analyse the long-term impacts on society and the environment of human uses of energy and natural resources, and suggest ways to reduce these impacts</li> </ul>	<ul style="list-style-type: none"> <li>Renamed Relating Science and Technology to Our Changing World</li> </ul> <p><b>Revised expectations:</b></p> <ul style="list-style-type: none"> <li><b>Gr. 2 E1.1</b> assess the impact of human activities on air and water, taking various perspectives into consideration, including those of First Nations, Métis, and Inuit, and plan a course of action to protect the quality of the air and/or water in the local community</li> <li><b>Gr. 5 E1.1</b> analyse long-term impacts of human uses of energy and natural resources, on society and the environment, including climate change, and suggest ways to mitigate these impacts</li> </ul> <p><b>New expectations:</b></p> <ul style="list-style-type: none"> <li><b>Gr. 5 E1.3</b> analyse how First Nations, Métis, and Inuit communities use their knowledges and ways of knowing to conserve energy and resources</li> <li><b>Gr. 6 E1.2</b> assess the role of space exploration technology in observing and</li> </ul>

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		<p>understanding environmental changes on Earth, including climate change</p> <ul style="list-style-type: none"> <li>• <b>Gr. 7 E1.2</b> analyse various social, economic, and environmental impacts, including impacts related to climate change, of using non-renewable and renewable sources of energy</li> <li>• <b>Gr. 8 E1.2</b> demonstrate an understanding of First Nations, Métis, and Inuit knowledges and values about water, connections to water, and ways of managing water resources sustainably</li> </ul>
<b>STEM Investigation and Communication Skills</b>	<ul style="list-style-type: none"> <li>• Integrated within the Developing Investigation and Communication Skills overall expectation</li> </ul>	<ul style="list-style-type: none"> <li>• Restructured as STEM Investigation and Communication Skills in Strand A</li> <li>• Science and Technology concepts from the overall expectation on Developing Investigation and Communication Skills are included in Exploring and Understanding Concepts</li> </ul>

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<b>Exploring and Understanding Concepts</b>	<ul style="list-style-type: none"> <li>Named Understanding Basic Concepts</li> <li><b>Gr. 8 D2.4</b> identify factors (e.g., annual precipitation, temperature, climate change) that affect the size of glaciers and polar ice-caps, and describe the effects of these changes on local and global water systems</li> </ul>	<ul style="list-style-type: none"> <li>Renamed Exploring and Understanding Concepts</li> </ul> <p><b>Revised expectations:</b></p> <ul style="list-style-type: none"> <li><b>Gr. 8 E2.4</b> identify factors, including climate change, that have contributed to the melting of glaciers and polar ice-caps, and describe the effects of this phenomenon on local and global water systems</li> </ul> <p><b>New expectations:</b></p> <ul style="list-style-type: none"> <li><b>Gr. 3 E2.4</b> explain the process of erosion, including its causes and its impact on soils</li> <li><b>Gr 3 E2.5</b> identify various strategies used to maintain and improve soil health in Ontario</li> <li><b>Gr. 4 E2.5</b> describe how fossils are formed and what information they can provide about Earth’s history</li> <li><b>Gr. 4 E2.6</b> demonstrate an understanding of First Nations, Métis, and Inuit geological knowledges that are used in the selection of different rocks and minerals for specific purposes</li> <li><b>Gr. 5 E2.6</b> explain how the use of energy derived from fossil fuels changes the composition of the atmosphere and how these changes contribute to climate change</li> </ul>

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		<ul style="list-style-type: none"> <li>• <b>Gr. 6 E2.2</b> distinguish between the concepts of mass and weight</li> <li>• <b>Gr. 6 E 2.3</b> describe the relationship between the force of gravity and the weight of a body</li> <li>• <b>Gr. 8 E2.6</b> describe various indicators of water quality, and explain the impact of human activity on those indicators</li> </ul>