



# Water Systems

Grade 8 Science and Technology

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# Water Systems

Grade 8 Science and Technology

## Purpose of the Unit

This unit develops knowledge and skills required for scientific investigation: research and experimentation.

The lessons:

- support the revised Ontario curriculum, 2008
- integrate literacy strategies
- highlight sound assessment practices
- embed environmental education standards.

## Writers attended particularly to the following:

- Developing conceptual understanding of:
  - cause and effect relations
  - the role of models in science
  - the concept of stewardship
- Applying the gradual release model (modeling, shared and guided practice, independent practice)
- Including a variety of learning activities
- Explicitly teaching a range of text types and media, and integrating comprehension strategies for listening, reading, and viewing
- Showing how to integrate low-risk literacy strategies and activities in which students learn to take a critical stance (critical literacy)
- Highlighting metacognition through students gradually assuming the role of scientists who observe; record what they see, hear, and do; and articulate what meaning they make of it

## Curriculum What will students learn?

### Fundamental Concepts

- A. Water is **crucial** to life on Earth. (1,2)
- B. Water systems **influence** climate and weather patterns. (3)
- C. Water is an important resource that needs to be **managed** sustainably. (1,2)

### Overview

Building on their prior learning, students will investigate the importance of sustainably managing water systems locally, regionally, nationally, and globally, and use their knowledge and skills to design a device or system that treats, manages, and/or alters the sustainable use of water.

### Overall Expectations

- 1. assess the impact of human activities and technologies on the sustainability of water resources (A,C)
- 2. investigate factors that affect local water quality (A,C)
- 3. demonstrate an understanding of the characteristics of the earth's water systems and the influence of water systems on a specific region (B)

### Guiding Questions

- What is our personal responsibility related to water?
- How can we think globally by acting locally?
- What is the impact of scientific discovery and technological innovation on water systems both locally and globally?
- How do humans and other natural factors affect the water cycle/water systems?
- What influence do the media have on our perception and understanding of water-related issues?

## Assessment How will students demonstrate their learning?

### A<sup>of</sup>L Assessment of Learning

Students complete a Water Gallery performance task in which they conduct scientific inquiry and research on a water-related topic; communicate with a specific audience using a graphic form; and communicate with a different specific audience using a prose form. Throughout the process, there are opportunities for students to reflect on their thinking and their process.

### A<sup>for</sup>L Assessment for Learning

Throughout the unit, students' achievement of the identified learning goals is monitored, using a variety of assessment strategies and tools. The core practices and strategies have been identified and embedded in the sample lessons.

<b>Instructional Trajectory</b>	
<b>Lesson 8.1 Introduction to the Water Audit</b>	Assessment Checkpoints
<p>Prompted by images and objects, students access prior knowledge of sources and uses of water and of water-saving devices. To understand the relative amounts of water, freshwater, and potable water, students engage in proportional reasoning activities. Students address big ideas by responding orally and in writing to the guiding questions.</p> <p>Students are introduced to (1) the Word Wall and (2) the Water Portfolio, both of which are utilized throughout the unit.</p>	<p><b>A</b> for <b>L</b> Students respond to the guiding questions in the lesson.</p>
<b>Lesson 8.2 The Water Audit</b>	Assessment Checkpoints
<p>After using a Share One-Get One strategy to practise academic vocabulary, students are introduced to the water audit, an activity designed to increase awareness of water consumption and personal responsibility. This activity provides an opportunity to (1) teach document use and the structure of tables (intersected lists), and (2) to introduce issues of reliability (accuracy) and scientific habits of mind. A video shows students that information can be represented and communicated in a variety of media and text types.</p>	<p><b>A</b> for <b>L</b> Students mind map a variety of water conservation strategies</p>
<b>Lesson 8.3 Water Consumption</b>	Assessment Checkpoints
<p>This lesson increases empathetic awareness of inequities in water consumption globally in order to sharpen students' self-awareness with respect to water use. It incorporates critical literacy by focusing on the use of literacy to deepen understanding of issues and to take action in making the world a better place.</p>	<p><b>A</b> for <b>L</b> Students create a Start-Stop-Continue Plan of Action.</p>
<b>Lesson 8.4 Water Gallery Performance Task</b>	Assessment Checkpoints
<p>Students are introduced to the what, why, and how of the <b>unit performance task</b>. They begin the research process and provide input into the kinds of texts they are interested in learning about and creating.</p>	
<b>Lesson 8.5 Where in the World Does Our Water Go?</b>	Assessment Checkpoints
<p>Students deepen their understanding of the relationship between <i>states</i> of water and the process of the water cycle. Of particular importance are the implications for conservation and sustainability of the fact that "there is no new water" to add to the system.</p> <p>Attention is given to reading for meaning and using visualization strategies. Students summarize understanding from multiple sources of information.</p>	<p><b>A</b> for <b>L</b> Students pose hypotheses based on prior knowledge and reasoning.</p>
<b>Lesson 8.6 Communicating Science</b>	Assessment Checkpoints
<p>Students compare and contrast a variety of possible forms for communicating science using a comparison matrix and RAFTS to organize their thinking. Using writing process and team members as resources for feedback, each student drafts and revises one of their pieces for the Water Gallery Performance Task.</p>	<p><b>A</b> for <b>L</b> Students complete a comparison matrix and RAFTS as work-in-progress</p>

<b>Instructional Trajectory</b>	
<b>Lesson 8.7 How Does a Body of Water Affect Climate?</b>	Assessment Checkpoints
<p>Students consider how the water cycle is related to weather and in particular how proximity to a large body of water affects weather. The teacher models how to locate and evaluate sources of information and interpret graphic texts (line graphs and tables), and introduces students to the skills described in the <b>Continuum for Scientific Inquiry and Research Skills</b>, pp.15.</p>	
<b>Lesson 8.8 Watersheds</b>	Assessment Checkpoints
<p>Understanding how human actions impact the condition of our watersheds is critical to understanding why cities and municipalities have increasingly sophisticated water monitoring and treatment facilities.</p> <p>Students use strategies to interpret a range of graphic texts, including a cross-section diagram and a watershed map. Building academic vocabulary receives significant attention in this lesson. Students build a functional watershed model for their scientific investigation. Students practise skills described in the <b>Continuum for Technological Problem Solving Skills</b>, pp. 17. Two important foci are communication of findings, using a RAFTS strategy, and taking a critical literacy stance through the application of critical questions.</p>	
<b>Lesson 8.9 Water Treatment</b>	Assessment Checkpoints
<p>This lesson looks at how water is managed and treated to ensure that we have safe water to use. Students investigate filtration systems as means of water conservation and sustainability. They design, build and test a functional model of a filtration system through problem solving and an aquifer by following instructions. Students engage in higher-order thinking when they compare the results from three investigations.</p>	<p><b>A<sup>for</sup>L</b> Students build a filtration model and receive feedback based on <b>Continuum for Technological Problem Solving Skills</b>, pp. 16-18.</p>
<b>Lesson 8.10 Climate and Polar Ice Caps</b>	Assessment Checkpoints
<p>This lesson focuses on water issue awareness and reading strategies for online texts. Students practise distinguishing fact from opinion and evaluating information sources for credibility, reliability, and timeliness. They also engage in higher-order thinking when they use a comparison matrix for note-taking. This lesson sets the stage for a focus on critical literacy in later lessons.</p>	<p><b>A<sup>for</sup>L</b> Students research online texts and receive feedback based on <b>Continuum for Scientific Inquiry and Research Skills</b>, pp. 15-16.</p>
<b>Lesson 8.11 Water Issues in the Media</b>	Assessment Checkpoints
<p>Referring to three science articles in the media and using a variety of comprehension strategies, students examine (1) the range of perspectives from which people can respond to science information in the media, and (2) the range of perspectives from which science information in the media can be written.</p> <p>Students practise taking a critical stance toward two self-selected articles on water and evaluate the sources of information.</p>	



## Instructional Trajectory

### Lesson 8.12 **Water Testing**

In order to more purposefully assume the role of scientists and practise scientific habits of mind and actions, students explore attributes of scientists. Students focus particularly on safe lab procedures and criteria for a “good” lab. They select from a range of methods for summarizing information and representing their understanding. Students then complete two water-testing labs, recording their observations in tables.

### Assessment Checkpoints

**A<sub>for</sub>L** Students complete data tables for two water-testing labs, receiving feedback on lab procedures and communication of findings.

### Lesson 8.13 **Water Gallery Writing and Performance**

Students select one piece from their Water Portfolios to revise for publication in the Water Gallery. They draft, revise, and polish a second piece. One should be predominantly prose (sentences and paragraphs) and the other predominantly graphic.

### Assessment Checkpoints

**A<sub>for</sub>L** Students represent their understanding and communicate science information for a particular audience and purpose using self-selected forms.



# Water Systems

## Literacy and Learning Strategy Overview

Lessons 8.1-8.5 page 1 of 3

	Lesson 8.1 Introduction to Water Audit	Lesson 8.2 Water Audit	Lesson 8.3 Water Consumption	Lesson 8.4 Water Gallery Performance Task	Lesson 8.5 Where in the world does our water go?
Explicit Attention to academic <b>Vocabulary</b>	Word Wall	Share One-Get One	Vocabulary activity, e.g., Share One-Get One		Vocabulary strategies Word Wall
Reading, Listening, or Viewing <b>Comprehension Strategies</b>		E.g., Read with a purpose Make and adjust predictions	E.g., Read with a purpose Make and adjust predictions	RAFTS	Using pictures, illustrations Visualizing and sequencing instructions
Possible <b>Anchor charts</b>	Question matrix	Scientific habits of mind Mind Map, Brainstorming Intersected Lists, Video texts	Action Plan criteria Collaborative learning skills Active listening strategies	Question matrix	Model building criteria
<b>Productive talk and structured thinking</b>	Think-Pair-Share		RAFTS	RAFTS Pair work on research	Think-Pair-Share
Generating ideas		Brainstorming	Brainstorming	Graffiti	
<b>Graphic organizers</b> to structure thinking and discussion	KWL Question Matrix	Mind Map	Mind map RAFTS	Mind map RAFTS	KWL
<b>Writing</b>	Graphic text, e.g., bar, pie or circle graphs Water Portfolio response to guiding questions	Water Portfolio reflection	Mind map note-taking Water Portfolio reflection on personal responsibility	Note-taking during research	Graphic text, e.g., schematic Water Portfolio: (1) self-selected representation of Water Cycle (2) Changes of State organizer
<b>Critical Literacy</b>				Considering perspectives in research sources	
<b>Metacognition</b> (reflection and self-assessment)			Reflection on personal responsibility Assessment of collaborative learning skills		
<b>Strategy Implementation Continuum</b> (Gradual release of responsibility)	Modelling of portfolio response to guiding questions Guided writing of graphic text (review)	Modelling and Think-Aloud for mind map Guided practice creating mind map Shared data analysis	Shared Reading Modeling and guided practice for action plan development	Model research process, e.g., narrowing focus, posing questions, note-taking	Read-Aloud
<b>Differentiated</b> Instruction and assessment				Choice Board	



# Water Systems

## Literacy and Learning Strategy Overview

Lessons 8.6-8.9 page 2 of 3

	Lesson 8.6 Communicating Science and Technology	Lesson 8.7 How does a body of water affect climate?	Lesson 8.8 Watersheds	Lesson 8.9 Water Treatment
Explicit Attention to academic <b>Vocabulary</b>			Academic vocabulary	
Reading, Listening, or Viewing <b>Comprehension Strategies</b>	RAFTS	Active Listening	RAFTS Reading strategies for graphic texts Active Listening	
Possible <b>Anchor charts</b>			Collaborative learning Scientific habits of mind Observing and recording Effective models	Active listening strategies Collaborative norms Scientific habits of mind
<b>Productive talk and structured thinking</b>		Think-Pair-Share	Think-Pair-Share	Active listening
Generating ideas				
<b>Graphic organizers</b> to structure thinking and discussion	Comparison matrix RAFTS			
<b>Writing</b>	Water Portfolio: writing process for one Water Gallery self-selected piece on the topic/couplet, either prose or graphic	Note-taking, e.g., jot notes Cornell note-taking Water Portfolio: entry from choice menu, e.g., on interpreting a table	Water Portfolio: choice of topics	Water Portfolio: Record results of investigation
<b>Critical Literacy</b>			Questions for taking a critical literacy stance	
<b>Metacognition</b> (reflection and self-assessment)				
<b>Strategy Implementation Continuum</b> (Gradual release of responsibility)		Modelling explaining, reading a line graph, note-taking, and critically evaluating information sources Think-Aloud		
<b>Differentiated</b> Instruction and assessment		Choice Board		





# Water Systems

## Literacy and Learning Strategy Overview

Lessons 8.10-8.13 page 3 of 3

	Lesson 8.10 Polar Ice Caps	Lesson 8.11 Water Issues in the Media	Lesson 8.12 Water Testing	Lesson 8.13 Water Gallery Writing and Performance
Explicit Attention to academic <b>Vocabulary</b>		Vocabulary		
Reading, Listening, or Viewing <b>Comprehension Strategies</b>	Probable Passage Reading comprehension passages	Active Listening		
Possible <b>Anchor charts</b>		Questions for taking a critical stance	Scientific habits of mind Criteria for a good lab	
<b>Productive talk and structured thinking</b>	Think-Pair-Share	Think-Group-Share Role Play Graffiti		
Generating ideas		Brainstorming		
<b>Graphic organizers</b> to structure thinking and discussion	T-Chart Comparison Matrix KWL	Both Sides Now	E.g., T-Chart Mind Map Venn Combined list	
<b>Writing</b>	Water Portfolio: double-entry journal in response to an article	Water Portfolio: entry on interpreting and evaluating sources of science information	Writing to consolidate understanding Water Portfolio: double-entry journal	
<b>Critical Literacy</b>		Taking a critical stance: examining perspectives in the media	Taking a critical stance to detect stereotypes	
<b>Metacognition</b> (reflection and self-assessment)	Double-entry journal		Students reflect on learning in comparison to criteria	Assessment of Water Gallery and Self- assessment
<b>Strategy Implementation Continuum</b> (Gradual release of responsibility)		Read-Aloud Think-Aloud		
<b>Differentiated</b> Instruction and assessment	Choice board			



# Water Gallery Performance Task

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**n this unit of study, you will take the role of scientist.**

You will:

- conduct scientific inquiry and research on a water-related topic
- communicate with a specific audience, using a graphic form
- communicate with a different specific audience, using a prose form

## Steps

1. **Select your topic**, using the couplets from the **Water is Life** resource to identify your focus.
2. **Record information** and ideas related to your topic from each lesson on water. Record this information in your portfolio. This task is ongoing throughout the unit.
3. **Gather information** from two self-selected sources of information.
4. **Select your way of communicating** from a Choice Board. You will have studied and practised each of these forms.
  - Comic strip
  - Informal essay
  - Picture book
  - Slide presentation
  - Position statement
  - Science magazine article
  - Storyboard for a flash animation, picture book
  - News report
  - Mind map
  - Slide presentation
  - Podcast
  - Public Service Announcement (PSA)
  - Science report
  - Web page

5. **Use a RAFTS graphic organizer** to clarify your role, your audience, your goal, form of communication, and topic (content).

Possible communication goals are:

- increasing awareness
- increasing understanding
- engaging the audience in water issues, e.g., through entertainment
- persuading the audience to become responsible water consumers

Possible audiences are:

- students aged 5-8 years
- students in another science class
- local politician, e.g., member of parliament or city councillor
- school administrators
- parents
- general public in the local area
- teachers in the school
- a Canadian scientist, e.g., David Suzuki
- an organization, e.g., World Wildlife Fund

6. **Collaborate with your Inquiry and Research Team** members to ensure that each of you is successful. Team members will collaborate on inquiry and research during the unit and take responsibility for helping each team member be successful, for example, by providing support and feedback to each other, to get some feedback on your draft so that you can make necessary improvements.

# Water Gallery Performance Task

## RAFTS

Question Prompts		Your Response
<b>Role</b>	What is your role? What part are you playing? What are the habits of mind, attitudes, knowledge, and skills that a person in this role needs to have?	
<b>Audience</b>	Who is the intended audience? What does the audience already know? What attitude does the audience have? What does the audience need to know?	
<b>Form</b>	What is the most appropriate way to communicate your information and ideas to a specific audience? What are the characteristics of the form? What are its features?	
<b>Topic</b>	What is the form of communication about? What are the most important concepts and facts? What can't be answered?	
<b>Strong Verb</b>	What change in audience knowledge, attitudes, and actions do you want? What verb best expresses what you hope to achieve? For example, increase awareness, persuade, engage.	



# Water Gallery Performance Task Rubric

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	Level 1	Level 2	Level 3	Level 4
<b>Knowledge and Understanding</b> <ul style="list-style-type: none"> <li>Demonstrate an understanding of the characteristics of the earth's water systems and the influence of water systems on a specific region</li> </ul>	Explains characteristics of the earth's water systems and the influence of water systems on a specific region with limited understanding	Explains characteristics of the earth's water systems and the influence of water systems on a specific region with some understanding	Explains characteristics of the earth's water systems and the influence of water systems on a specific region with considerable understanding	Explains characteristics of the earth's water systems and the influence of water systems on a specific region with a high degree of understanding
<b>Thinking</b> <ul style="list-style-type: none"> <li>Use scientific inquiry/research skills with</li> <li>Assess the impact of human activities and technologies on the sustainability of water resources</li> </ul>	Uses scientific inquiry/research skills with limited effectiveness Evaluates the impact of human activities and technologies on water resource sustainability with limited insight	Uses scientific inquiry/research skills with some effectiveness Evaluates the impact of human activities and technologies on water resource sustainability with some insight	Uses scientific inquiry/research skills with considerable effectiveness Evaluates the impact of human activities and technologies on water resource sustainability with considerable insight	Uses scientific inquiry/research skills with a high degree of effectiveness Evaluates the impact of human activities and technologies on water resource sustainability with a high degree of insight
<b>Communication</b> <ul style="list-style-type: none"> <li>Use a variety of forms (e.g. oral, written, graphic, multimedia) to communicate with different audiences for a variety of purposes</li> <li>Use appropriate science and technology vocabulary, including water table, aquifer, potable, and freshwater, in oral and written communication</li> </ul>	Uses a graphic form to communicate with a specific audience for a particular purpose with limited effectiveness Uses a prose form to communicate with a specific audience for a particular purpose with limited effectiveness Uses appropriate science and technology vocabulary with limited accuracy and frequency	Uses a graphic form to communicate with a specific audience for a particular purpose with some effectiveness Uses a prose form to communicate with a specific audience for a particular purpose with some effectiveness Uses appropriate science and technology vocabulary with some accuracy and frequency	Uses a graphic form to communicate with a specific audience for a particular purpose with considerable effectiveness Uses a prose form to communicate with a specific audience for a particular purpose with considerable effectiveness Uses appropriate science and technology vocabulary with considerable accuracy and frequency	Uses a graphic form to communicate with a specific audience for a particular purpose with a high degree of effectiveness Uses a prose form to communicate with a specific audience for a particular purpose with a high degree of effectiveness Uses appropriate science and technology vocabulary with a high degree of accuracy and frequency