



Climate and Polar Ice Caps Lesson 10		Grade 8, Science and Technology
Critical Learning		Guiding Questions
<ul style="list-style-type: none"> • Canada is unique because it contains a major portion of the Earth's Polar Regions within its borders. • It's important to attend to Canada's Polar Regions, in part because the Arctic regions are very sensitive to small changes in global climate. • Changes in Arctic conditions can have major impacts. For example, the amount of sea ice and ice caps is declining steadily. Less ice means the planet cannot reflect the sun's rays and cool itself. Warmer seas and oceans absorb more of the sun's heat, which in turn melts more ice. • The environment of the Polar Regions is particularly susceptible to human impacts such as pollution and the depletion of the ozone layer. Moreover, the effects of global warming on the Polar Regions are likely to have major repercussions in the rest of the world. 		<ul style="list-style-type: none"> • Why are changes to polar ice caps, glaciers, and ice sheets of major concern to scientists and environmentalists?
Curriculum Expectations		
Understanding Basic Concepts		Learning Goals
<p>3. demonstrate an understanding of the characteristics of the earth's water systems and the influence of water systems on a specific region.</p> <p>3.4 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</p>		<p>Students will be able to:</p> <ul style="list-style-type: none"> • identify factors that affect glaciers and polar ice caps • describe how changes to glaciers and polar ice caps might affect local water systems
Instructional Components and Context		
Readiness	Terminology	Materials
<ul style="list-style-type: none"> • Probable Passage • Think-Pair-Share 	<ul style="list-style-type: none"> • Polar (opposite extremes, e.g. of a sphere; related to polarity) • Impact on the environment • Facts • Opinions • Gist statement (sentence expressing the central idea, or essence) • Corroborating Information • Double-Entry Journal 	<ul style="list-style-type: none"> • paper with 2 columns for ranking activity • Probable Passage chart and means to display it • copies of the article "Global warming threatens Arctic" • access to computers and the Internet

Minds On (Elicit and Engage)

Whole Group/Pairs → Determining Issue Awareness

Generate a list of things students worry about. Suggest a few of your own, (e.g., arctic ice, elephants, your savings, rising population). Individually, students rank these in order of importance and in a **Think-Pair-Share** compare their ranking with a partner's.

Repeat the ranking process and sharing, this time in response to the question: Which of our concerns are most important to human survival?

Students share re-ranking with a partner. Volunteers share with the whole class.

Share today's learning goals.

Action! (Explore and Explain)

Pairs → Comprehending Sources of Information

Pose the following: "Since the polar regions are very sparsely inhabited, many people are unfamiliar with the characteristics of these areas and don't think about these parts of the world when they consider human impact on the environment."

Brainstorm and record what students know and want to know about the polar regions.

Individual/Pairs → Showing Meaning using Gist Statements

Display the **Probable Passage Chart** and clarify any vocabulary students are unsure of. Students individually use 8 of the words to compose a 1-2 sentence "gist statement," predicting what they expect to read about in the article, **Global warming threatens Arctic**. Students read the article once to confirm or adjust predictions. In a Think-Pair-Share, they discuss what they predicted. Students read the article a second time, highlighting facts and underlining opinions.

Whole Class → Evaluating Sources of Information

Discuss how to determine the difference between fact and opinion, the reliability of the information source, and of those quoted in the article.

Debrief, discussing which items are facts, which are opinion, and which are difficult to classify and why. Make this discussion visible in a **T-chart** labeled "fact" and "opinion." Pose the questions: Are opinions expressed in the article supported by the facts? Does the article make a convincing case?

Pairs → Determining the Credibility of Resources

Display a **Choice Board** of online resources (on the computer with direct links, if possible). Pairs select 3 resources. For each website, they read the article using **reading comprehension strategies** of their and take notes in a **comparison matrix**, labeling information as fact or opinion. Students highlight corroborating information across the 3 sources. They evaluate their 3 information sources: Are they credible? (Are authors trustworthy?) Is information reliable? (accurate?) Is information timely? (current, up-to-date?)

Debrief, discussing what factual information is corroborated among sources, whether they can believe their sources and why, and what to do about uncorroborated information.

Consolidation (Elaborate, Evaluate, Extend)

Individual → Reflecting

Students reflect in a double-entry journal in their Water Portfolio about their reactions to the articles and the discussion. On one side of the page, students summarize information from the article and discussion in their own words. On the other side of the page, they reflect on that information: How do they feel? What do they believe? What do they think should happen? What can they do?

Pause and Ponder

A for L Use information from brainstorming to inform instruction.

QuickTip

Brainstorming is an intense problem-solving strategy used by creative teams that rapidly generates ideas without editing or evaluating them. Model effective brainstorming. A **KWL** could be used to structure brainstorming.

QuickTip

Using think-pair-share, discuss as well: (1) If the Arctic is so critical for human survival, why do some people know about it? (issue: communication of scientific findings) and (2) If people do know, why don't they do something? (issues: social responsibility, controversy and conflicting opinions)

QuickTip

Refer to **The Ontario Curriculum, Grades 1-8: Science and Technology** (Revised, 2007), pages 15-16, for a Scientific Inquiry/Research Skills continuum. The continuum describes the development of skills such as locating information, and determining which sources are credible and reliable.

QuickTip

Students might print a copy of their article.

QuickTip

See **Think Literacy Subject-Specific Examples: Library Research, Grades 7-12** for strategies and handouts for evaluating information sources.

A for L Use the journal entry to check for understanding and to provide feedback to students.

Minds On

Think-Pair-Share

Bennett and Rolheiser (2001) describe Think-Pair-Share as “one of the simplest of all the tactics” (page 94). As pointed out by Bennett and Rolheiser and *Think Literacy* (page 152), students require skills to participate effectively in Think-Pair-Share, such as:

- active listening
- taking turns
- asking for clarification
- paraphrasing
- considering other points of view
- suspending judgement
- avoiding put-downs

These skills can be modeled and explicitly taught. During group work, teachers can provide oral feedback and reinforce expectations.

Bennett and Rolheiser (2001) note additional considerations:

- the level of thinking required in a think-pair-share
- accountability and level of risk, e.g., are all students expected to share with the whole group? (page 94).

See **Think Literacy Cross-Curricular Approaches, Grades 7-12**, pages 152-153.

See Bennett, Barrie, and Rolheiser, Carol (2001). *Beyond Monet: The artful science of instructional integration*. Ajax, ON: Bookation.

Action!

K-W-L (I Know-I Want to know-I Learned)

The **Know-Want to Know-Learned** (KWL) strategy (Ogle, 1986) is linked to the before, during, and after framework. The “Know” column prompts students to activate and inventory prior knowledge. The “Want to know” column prompts students to generate inquiry questions that provide a purpose for reading. The “Learned” column prompts students to summarize and consolidate their learning. KWLs can be completed individually or collaboratively. Variations include:

- reconfiguring the usual 3-column organizer as a 3-part square, with “Know” across the top and “Want to Know” and “Learned” juxtaposed beneath
- adding columns, (e.g., “Future” - “How I will apply this learning in the future”).

Whatever the format, it’s important to recognize that the three parts are dynamically related, “Want to know” questions arising out of what is known (implies what is yet to become known) and “Learned” summaries representing what has been discovered and understood in response to those questions.

The KWL strategy reflects key Literacy GAINS principles, (e.g., exposing and evoking students’ thinking in order to respond with appropriate levels of challenge and support). The strategy also supports an inclusive classroom environment and differentiated instruction by permitting a range of access, or entry points for students along a continuum of difficulty, depending on the questions asked.

Online resources include the following:

Instructional reading strategy: KWL (Know, Want to Know, Learned). L517: Advanced Study of the Teaching of Secondary School Reading.

KWL. North Central Regional Educational Laboratory. Learning Point Associates.

Strategies for Reading Comprehension: K-W-L. ReadingQuest.org.

Probable Passage Chart

Probable passage is a pre-reading strategy. It generates interest in the text by encouraging students to activate prior knowledge and make predictions based on evidence, (e.g., key words from the text. Making and adjusting predictions is a key comprehension strategy). The strategy introduces vocabulary and is useful for both narrative and expository text.

Select 8-14 key words from the text. Students categorize these in an open or closed sort, (e.g., using labels such as character, setting, conflict). This can be done individually or collaboratively in small groups. The task is completed by placing words into a table. Unknown words or words that don't seem to fit are set aside under the label "To discover". Students then compose a "gist," or prediction statement. Students share their gist statements. During reading, students compare their developing understanding to their predictions, making adjustments as necessary. They also attempt to figure out the "To discover" items. See **Think Literacy Subject-Specific Examples: Language/English**, Grades 7-10.

As for all strategies, it is important that the teacher model the strategy with a think-aloud before engaging students in shared and guided practice. See the **Strategy Implementation Continuum** (gradual release model). It is also important to provide feedback on effective strategy use as students use the strategy.

Probable Passage Chart

Nouns	Verbs	Adjectives	Numbers	To Discover
Arctic Circle	Recover	Melting	400 years	
End	Warned	Self-perpetuating	30 percent	
Sea ice	Vanished	Global	2060	
Tipping point	Shrunk	Dire	lowest figure on record	

Gist statement: _____

T-chart

A T-chart is a simple graphic organizer often used in brainstorming to compare or contrast.

Facts	Opinions

Choice Board

A choice board, sometimes called a learning menu or tic-tac-toe, is a differentiation strategy. Students select from a menu of choices, all of which address the same learning goal. The learning goals are non-negotiable; how students address the learning goals is non-negotiable.

See Differentiated Instruction Cue Card on Choice Boards on page 17 of the **Differentiated Instruction Scrapbook**.

Choice Board

Natural Resources Defense Council Global Warming Puts the Arctic on Thin Ice	How Stuff Works If the Polar Ice Caps Melted, How Much Would the Oceans Rise?
The Wild Classroom: Biomes of the World Ice Caps	United States Environmental Protection Agency Climate Change-Health and Environmental Effects



Climate and Polar Ice Caps Lesson 10

Reading Comprehension Strategies

These are strategies effective readers use to make sense of text. These include but are not limited to:

- making and adjusting predictions
- reading with a purpose
- making connections
- visualizing
- questioning
- summarizing
- using graphic organizers
- KWL
- Probable passage.

What students select to use in this lesson will depend on (1) which strategies have been taught and practised previously, and (2) what students know about their own learning strengths and needs. Anchor charts identifying strategies modeled and practised are helpful reminders.

Comparison Matrix

	Source #1:	Source #2:	Source #3:
Important facts			
Evidence or support for facts			
Opinions			
Credibility (trustworthiness) of site			
Reliability (accuracy) of information			
Timeliness (currency)			
Conclusions (a) information (b) sources			