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Reading Strategies

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Reading Different Text Forms:
Reading Informational Texts

SCIENCE Grade 10

Informational text forms (e.g., explanations, reports, news articles, magazine articles and instructions) are written to communicate information about a specific subject, topic, event, or process. These texts use vocabulary, special design elements, and organizational patterns to express ideas clearly and make them easier to read. Providing students with an approach to reading informational texts helps them to become effective readers.

Purpose

- Become familiar with the elements and features of informational texts used in any course.
- Explore a process for reading informational texts, using a range of strategies for before, during, and after reading.

Payoff

Students will:

- become more efficient at mining the text for information and meaning.
- practise essential reading strategies and apply them to different course-related materials.

Tips and Resources

- Some of the features of informational texts are headings, subheadings, questions, introductions, summaries, overviews, and illustrations. These work together to draw readers into the text at different levels. For example, in a magazine article, a heading is meant to grab your attention and give you an idea of what the article is about, while the accompanying photographs and captions might add information not included in the body of the article.
- Many informational texts are divided into sections or chapters, and are organized internally in ways that add meaning (e.g., by sequence, chronology, cause/effect, comparison/contrast, classification, description, or definition). For example, news articles use a special organizational pattern called the inverted pyramid to answer the 5WH questions (Who, What, When, Where, Why and How), and present the facts and supporting details in order of importance.
- Many informational texts use visual elements (e.g., typeface, size of type, colour, margin notes, photographs and diagrams) to emphasize important words and concepts. Different texts use these features in different ways to effectively present information.
- Words such as ‘then’, ‘next’, ‘while’, ‘beside’, and ‘following’ are often used to indicate a time or spatial relationship.
- How you read informational text will depend on your purpose for reading. If you want to find specific information in a textbook, you might refer to the table of contents to decide where to start reading, examine the headings and subheadings, and then skim through the section looking for key words and phrases related to the topic. Once you have located the appropriate section, a closer reading will help you to find the information and supporting details.
- See Student Resource, *Tips for Reading Informational Texts*. Focus on one or two tips at a time to help the students before, during, and after the assigned reading. Add tips as needed to guide the students as they read.

Further Support

- Provide students with an advance organizer to guide them as they read a particular text. This might be a series of prompts related to the reading task.

Reading Different Text Forms:
Reading Informational Texts

SCIENCE Grade 10 (Ecology Unit)

What teachers do

Before

Before reading, help students to connect new content and ideas to their prior knowledge by encouraging them to think about what they already know about the topic or the type of reading material. For example:

- Ask students to **brainstorm** related ideas, concepts and vocabulary, **recall** previous experiences and feelings related to the subject, recall what they have learned about the topic, or **list questions** they might have about the topic.
- Provide students with related experiences, discussion topics, readings, or background information to **increase background knowledge.**
- Pose questions to students before they read, to help them **determine a purpose** for reading.
- Invite students to ask questions about the content.
- Model (using a *Think Aloud*) how to predict the content based on the features of text, specialized vocabulary, illustrations, introductory information or personal experiences. Skim, scan and sample the text to make informed predictions.
- Identify and pre-teach unfamiliar vocabulary and concepts that appear in the text.

During

During reading, help students to connect the information and ideas in the text to what they already know as they monitor their understanding. *(Monitoring their understanding* means recognizing when confusion occurs and identifying strategies that help to regain meaning.) For example:

- Have students describe and model the different reading strategies they might use, such as **predicting, questioning, activating prior knowledge, inferring, monitoring, adjusting, rereading,** and **decoding.**
- Model (using a T*hink Aloud*) strategies for pausing and thinking about the text. Encourage students to **chunk** the text, **read, pause, think** and **ask questions** or **make notes** about the section of text.
- Demonstrate how to **use a graphic organizer** to **categorize** and select main ideas, important details, and questions as you read. For example, comparison charts, T-charts, or Venn diagrams can help students to identify the ideas being compared and how they are similar and different.
- Invite students to **visualize** the concepts as they read. Have partners share and compare the visualizations.
- Provide students with **focus** questions, such as the following:
  - What are the main ideas?
  - How has the writer organized them?
  - How does the writer support the main ideas?
  - What is the writer's viewpoint?
  - Is this a useful source of information?

After

After reading, help students to **consolidate** and **extend** their understanding of the content. For example:

- Ask partners to **restate** or **paraphrase** what they have read, and **note similarities and differences** in the retelling.
- Model how to **summarize** the reading selection (using a *Think Aloud*) by identifying the essence of the text, choosing the most important information, and organizing the information to convey the **key ideas** of the selection.
- Have students suggest possible diagrams or **graphic organizers** to illustrate connections among the topics, main ideas, supporting details, and prior knowledge.
- Review the process that students used for reading informational text, including strategies for before, during and after reading. See Student Resource, *Tips for Reading Informational Texts*.

Notes

Before Reading

- Set a purpose for reading. Ask yourself why you are reading this particular text.
- Look over the text to see which elements appear (such as headings, subheadings, illustrations and captions, etc.).
- Examine the titles, headings, and subheadings, and scan for words that stand out.
- Look for words and phrases that might give you clues about how the information is organized.
- Read any overviews, summaries or questions. In a shorter piece, read the opening and concluding sentences or paragraphs.
- Examine each illustration and read the titles or captions.
- Recall what you already know about the topic.
- Record some questions you might have about the topic.

During Reading

- Divide the reading task into smaller chunks (chunking the text into paragraphs, chunking sections by sub-headings, etc.). Read a chunk, pause and think about what you read, and write a brief one-sentence summary or brief point-form notes to help you remember important and interesting information.
- Read quickly, then slowly. Skim the sections you think will support your purpose for reading. When you find the specific information you want, slow down and read it word by word. You may need to reread the passage several times.
- Read the selection and jot down thoughts, responses to your questions, and new questions that occur to you.

After Reading

- Read the selection again to confirm the main idea and supporting details.
- Make connections to what you already know about the topic. How does the information you have read add to or alter what you already knew about the topic?
- Record your thinking about and responses to the text. For example, write a summary, complete a graphic organizer, create a sketch, or orally retell your ideas to yourself or a friend.

ARCTIC SEABIRDS AND TOXIC GUANO

Bioamplification of pesticides and the boomerang effect

Many agricultural chemicals, such as pesticides, seep into ground water and eventually make their way to the oceans. Most people think that once a chemical is in the ocean, it can no longer affect life on land. Not so! Canadian scientists have recently found that the land and water near the nesting sites of Arctic seabirds, like the northern fulmar, have unusually high pesticide concentrations. It seems that the fulmars, which hunt for food at sea, are returning to land with more than just lunch for their young!

Bioaccumulation up the food chain

Pesticides, such as DDT, and other chlorinated organic compounds, are not very soluble in water, but dissolve quite well in fats and oils. When these chemicals are washed into rivers, lakes and oceans by surface runoff, they are ingested by first order consumers and accumulate, in small concentrations, in the fat tissues of animals low in the food chain. As animals in higher trophic levels eat a large number of animals lower in the food chain, the concentration of pesticides in their fat tissues increases. The higher the animal is in the food chain, the higher the concentration of chlorinated pesticides found in its fat tissues. This process is called **bioamplification**.

Environmental contamination

Seabirds, like the northern fulmars, are top predators in an aquatic food chain and feed on small marine animals such as fish, shrimp and squid. An estimated 20 000 northern fulmars live on the cliffs at Cape Vera on Devon Island in the central Arctic. Generally, where there are a lot of birds, there's a lot of guano, otherwise known as, "bird poop." Fulmar guano contains small bits of the bird's undigested prey. Therefore, any contaminant that may be in this animal tissue is also "pooped" onto the rocks and into the water near the fulmar nesting sites. Researchers found that the ponds near nesting sites contain 60 times more DDT than ponds in areas unaffected by seabird populations. Furthermore, the closer the ponds are to the nesting area, the greater their contaminant concentration. Scientists describe the return of toxic chemicals from the ocean to contaminate the land as the "**boomerang effect**".

Boomerang effect on an ecosystem

Researchers suspect **the boomerang effect** happens with all seabirds. However, it is easier to detect it in the Arctic where there are fewer other sources of contamination. Guano, which is rich in nitrogen, promotes the growth of mosses on the rocks and plankton in ponds. These organisms provide food for insects, which in turn support larger forms of life, such as small birds. These Arctic ecosystems are very fragile and dependent on guano for their survival. They could easily disappear if the fulmar populations decline due to the toxins they carry.

What do you think?

Even though DDT has been banned in North America for many years, some Central and South American countries continue to use it. Many North American birds migrate south in winter. What effect could these migratory birds have on our ecosystem? Can the boomerang effect be stopped? How?

Reading Different Text Forms:
Reading Graphical Texts

SCIENCE Grade 10

Graphical text forms (such as diagrams, photographs, drawings, sketches, graphs, schedules, maps, charts, tables, timelines, and tables) are intended to communicate information in a concise format and illustrate how one piece of information is related to another. Providing students with an approach to reading graphical text also helps them to become effective readers.

Purpose

- Become familiar with the elements and features of graphical texts used in any course.
- Explore a process for reading graphical texts, using a range of strategies for before, during, and after reading.

Payoff

Students will:

- become more efficient at interpreting graphical texts for information and meaning.
- practise essential reading strategies and apply them to different course-related materials.

Tips and Resources

- Sometimes a complicated idea or concept can be communicated more easily through a chart, graph, diagram or illustration. Many informational texts include graphics to supplement the main ideas and provide clues to the important concepts in the text. Some of the features of graphical texts include:
    - print features (such as typeface and size of type, bullets, titles, headings, subheading, italics, labels, and captions);
    - organizational features (such as tables of contents, legends, keys, pronunciation guides, labels and captions);
    - design features (e.g., colour, shape, line, placement, balance, and focal point). Design features can also include images;
    - organizational patterns (such as sequential, categorical, and explanatory).
- Each graphical text uses these elements and features in different ways to effectively present information in a condensed format. For example, a line of best fit on a line graph communicates the relationship between independent and dependent variables.
- Many of the strategies for reading informational text can also be used effectively to read graphical texts.
- Note arrows in science graphics can have different purposes depending on the context. They could be used to express the consequence of a process (e.g., a chemical equation), a flow of materials (a food chain) or the movement of an object (position vector).
- Focus on one or two tips at a time to help students before, during, and after the assigned reading. Add tips as needed to guide the students as they read.
- See the following resources:
    - Student Resource, *Tips for Reading Graphical Texts* (p. 8).
    - Student/Teacher Resource, *Comparison of Two Sprinters* (p. 9, 10).

Further Support

- See *Reading Graphical Texts*. *Think Literacy: Cross-Curricular Approaches, Grades 7-12* (p. 84).
- See *Think/Pair/Share*, Think *Literacy: Science Grades 9-10. Oral Communication* (p. 2).

Reading Different Text Forms: Reading Graphical Texts

SCIENCE Grade 10

What teachers do

Before

Before reading, help students to connect new content and ideas to their prior knowledge by encouraging them to think about what they already know about the topic or the type of graphical text. For example:

- Ask students to brainstorm related ideas, concepts and vocabulary, recall previous experiences and feelings related to the subject, recall what they have learned about the topic, or list questions they might have about the topic.
- Provide students with related experiences, discussion topics, readings, or background information to increase background knowledge.
- Pose questions to students before they read, to help them determine a purpose for reading.
- Invite students to ask questions about the graphic's purpose and the information in it.
- Model (using a *Think Aloud*) how to predict the content based on the features of the graphic, specialized language, related written information, or personal experiences. Skim, scan and sample the graphical text to make informed predictions.
- Identify and pre-teach unfamiliar vocabulary and concepts that appear in the graphical text.

During

During reading, help students to connect the information and ideas in the graphical text to what they already know as they monitor their understanding. ("Monitoring understanding" means recognizing when confusion occurs and identifying strategies that help to regain meaning.) For example:

- Have students describe and model the different reading strategies they might use, such as predicting, questioning, activating prior knowledge, inferencing, reading slowly, and rereading.
- Model (using a *Think Aloud*) strategies for pausing and thinking about the text. Encourage students to examine parts of the text, read, pause, think, and ask questions or make notes about how this information relates to other parts of the text.
- Demonstrate how to paraphrase the information presented. For example, use the sentence stem- "This means ..."
- Invite students to organize the information in a different way. Ask students to share and compare their interpretations.
- Provide students with focus questions such as:
  - What is the purpose of this graphic?
  - What information is provided?
  - Is all important information included? What information is missing?
  - How is the information organized?
  - How does this information relate to what you already know about the topic?
  - Is this a useful source of information?

After

After reading, help students to consolidate and extend their understanding of the content. For example:

- Ask partners to restate or paraphrase what they have read and to note similarities and differences in rephrasing.
- Model (using a *Think Aloud*) how to make connections between prior knowledge and what the text is saying.
- Have students suggest possible ways to check the accuracy and reliability of the information presented.
- Review the process that students used for reading graphical texts, including strategies for before, during, and after reading. See Student Resource, *Tips for Reading Graphical Texts* (p.8).

Notes

Tips for Reading Graphical Text

SCIENCE Grade 10

Before Reading

- Set a purpose for reading. Ask yourself why you are reading this particular text.
- Look over the graphical text to determine what type it is and which elements are used.
- Recall what you already know about the topic or subject.
- Record some questions you might have about the information presented.

During Reading

- Read all the labels and examine how they are related to the graphic. Each label has a purpose. The most important labels may be in capital letters, bold type, or a larger font.
- Examine the titles, headings, captions and images. Start with the title. The title tells you what the graphic is about. The captions may also use words and phrases from the text to show how the graphic is related to the information in the written text (e.g., “Figure 1.6”).
- Follow the arrows and lines. They may be used to show movement or direction, or connect to the things they name.
- Look for the use of colour or symbols to emphasize important words and information. Some graphical texts have a legend or a key to explain the meaning of specific symbols and colours. Are the colours used for a specific purpose?
- Study the image carefully. See if you recognize the details in the image. Read the text near the picture to find an explanation of the information in the graphic. Use the figure number or title and key words to find and read the related information in the written text.
- Identify the links between the graphic and text (e.g., captions, figure number in the text)

After Reading

- Interpret the information conveyed in any of the graphics (e.g., diagrams, charts, graphs, maps). Ask yourself why this information might be important.
- Describe the information orally or in writing. Imagine that you are explaining the graphic to someone who has not read it.
- Create your own graphical text (e.g., graph, map, diagram, table, flow chart) to represent the important information.

Teacher Resource

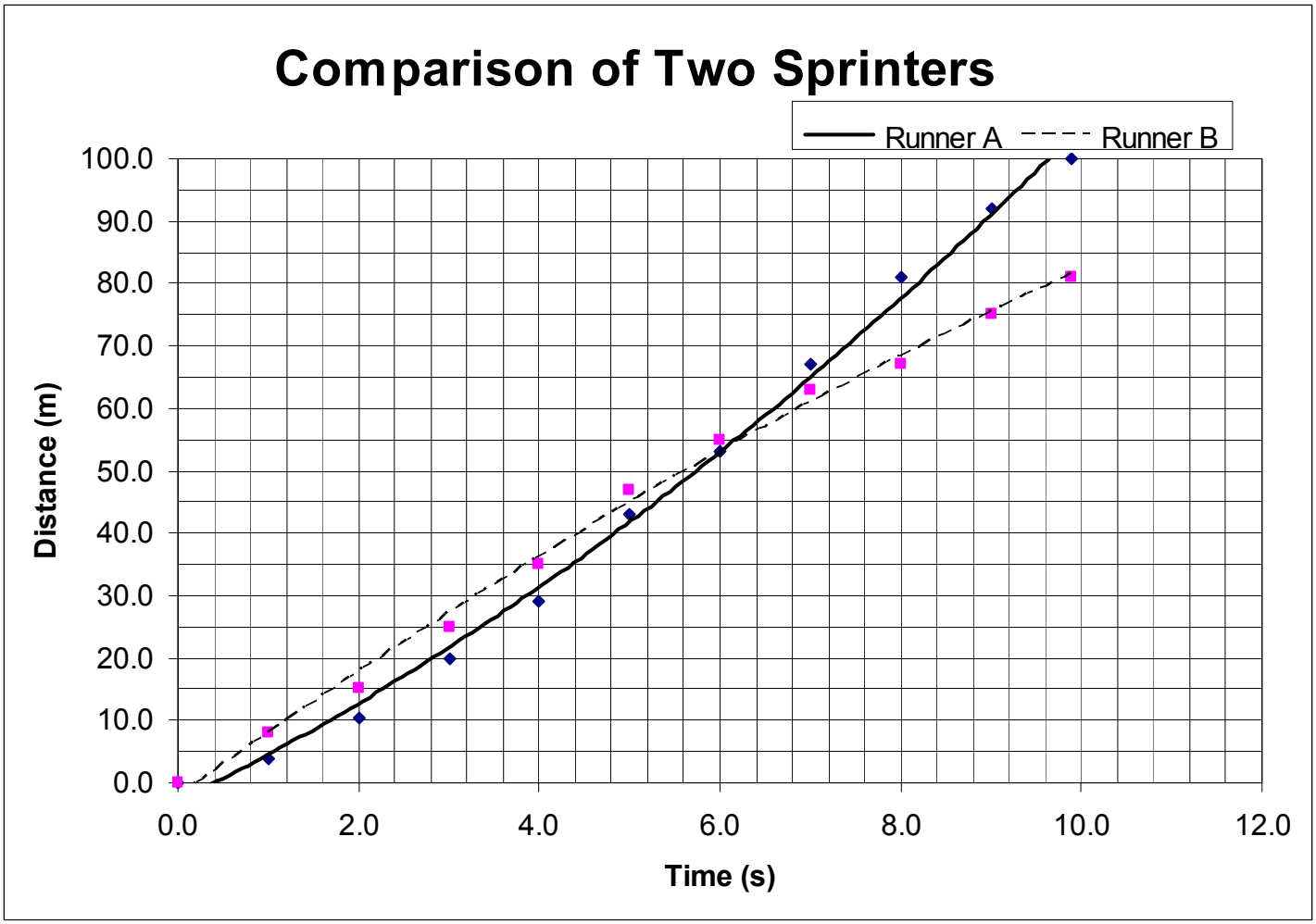
Questions to Guide Reading: Comparison of Two Sprinters

SCIENCE Grade 10

Questions to ask	Possible Answers
Before	
• How is this page organized?	• There is a graph, a legend that identifies each line on the grid, and a description of how the information in the graph was collected.
• How does this graphic relate to what we are currently studying?	• Answers may vary.
• What type of graph is it?	• This is an example of a line graph.
• Why did the author choose this type of graph?	• A line graph was chosen because it clearly shows the relationship between two variables in an experiment.
• Why did the author choose to put two plots on the same grid?	• Placing both plots on the same grid makes it easier to compare the data of the two runners.
During	
• What are the variables in this experiment? Where are they plotted?	• The variables are time and distance traveled by each runner. Time is plotted along the horizontal axis while distance is plotted along the vertical axis.
• (Optional) Identify the dependent and independent variables. (Note: Dependent variables are usually plotted along the vertical axis. Motion graphs are one of few exceptions to this generalization)	• Distance is the dependent variable because the amount of distance covered depends on the amount of time elapsed. Time is the independent variable.
• Why aren't all the data points on the lines?	• The plotted lines are trend lines or "lines of best fit". These lines average their way through the data points.
After	
• *Think/Pair/Share* the patterns that you see in the graphs. Use these patterns to identify the runners. Justify your predictions.	• The graph for runner B has a steeper slope than that of runner A for the first part of the race. This indicates that runner B has a faster start. The more gradual increase in distance with respect to time for runner B near the end of the race suggests he is slowing down in the later stages of the race. Conversely, runner A starts slowly (a gradual upward increase in the curve) and then speeds up towards the finish (a steeper positive slope.)
• Suggest reasons to explain the poor finish of the slowest runner.	• Answers will vary. Some students may suggest that the runner spent too much energy in the first part and hence didn't have enough to sprint to the finish.
• At what time did runner A pass runner B?	• Runner A passes runner B at 6.0s.

Reading Graphical Texts: Comparison of Two Sprinters

SCIENCE Grade 10 (Physics Strand)



This graph was produced using distance-time data for two sprinters competing in the 100m dash. A trend line or "line of best fit" was drawn for each sprinter. The race timer was stopped once the first runner crossed the finish line. One of the sprinters is known to be a faster starter. The other sprinter is famous for his strong finishing kick. Can you tell which sprinter has the strongest finishing kick?

Reading Graphical Texts: Weather Maps

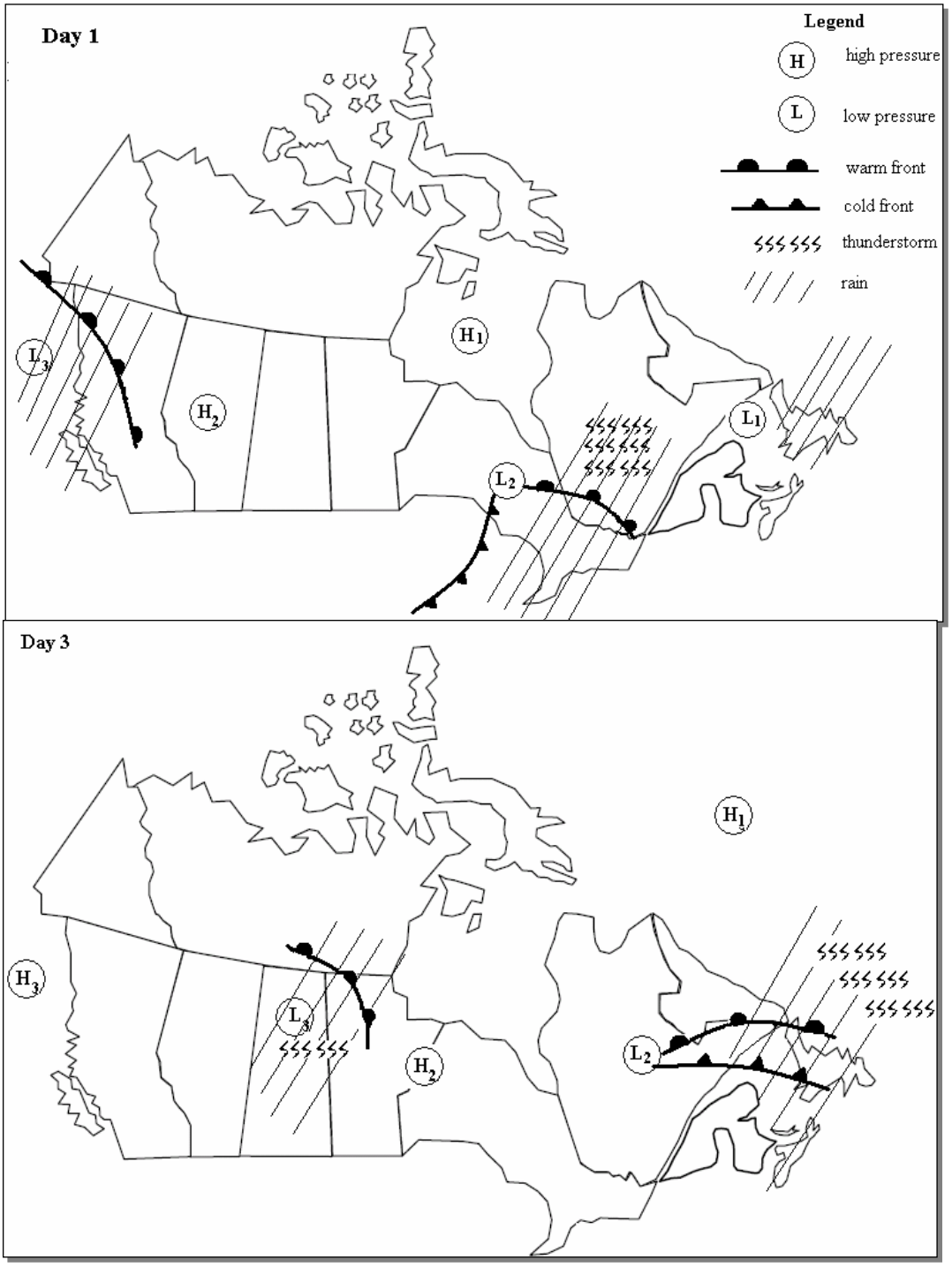
SCIENCE Grade 10 (Earth and Space Strand)

Questions to ask	Possible Answers
Before	
• How is this page organized?	• The page has two weather maps. The first map contains a legend that identifies the symbols used in both maps.
• How does this graphic relate to what we are currently studying?	• Answers may vary.
• How much time has elapsed between the times the maps were drawn?	• Three days.
• Why is it useful to see both maps on the same page?	• Having both maps on the same page makes it easier to see the differences in weather patterns over the elapsed time.
During	
• In which direction are the prevailing winds blowing? How can you tell?	• The prevailing winds must be blowing from west to east since the low and high pressure systems shifted east from day 1 to day 3.
• Which type of pressure system is most often associated with rainy weather? How can you tell?	• Low pressure systems are more often associated with rainy weather. This can be seen in both weather maps, since rain is falling near all the areas where a low pressure system is indicated.
• What other weather information would be useful to have on this map?	• Temperature information would be a useful addition for the map.
• How could differences in temperature be displayed on this map?	• Colour coding can be used to identify regions of different temperature. A legend indicating what temperature each colour corresponds to should be included.
After	
• Sketch a prediction of the weather map for day 5. (Note: blank maps of Canada are readily available on the Internet.)	• Answers will vary.
• Use you map to make a day 5 weather forecast for your area.	• Answers will vary.

Reading Graphical Texts: Weather Maps

SCIENCE Grade 10 (Earth and Space Strand)

These maps show changing weather patterns over a three day period.



Reading Different Text Forms: Following Instructions

SCIENCE Grade 10

Being able to accurately follow a set of instructions is a critical skill for all science students. This strategy asks students to examine different types of instructions, their features and elements, and how the features, language and organizational patterns can be used to help the reader understand and complete a task.

Purpose:

- Provide students with strategies for reading, interpreting, and following instructions to complete a specific task.
- Learn how instructions are organized.

Payoff

Students will:

- identify purposes for reading instructions.
- develop a process for reading and following instructions.

Tips and Resources

- Instructions give detailed step-by-step information about a process or a procedure (e.g., a lab procedure, and an activity or instructions on how to use a particular piece of lab equipment. Most instructions use organizational patterns, language, and features (e.g., diagrams and illustrations, bold or italic type, headings, numbers, lists) to help the reader identify the task and the best way to complete it; however, some instructions are complicated without any features to help the reader determine the sequence of steps.
- See Student/Teacher Resource: *Pop Rocks and Acidity* (p. 15,16).

Further Support

- Provide students with a list of typical signal or imperative words and task prompts that they may come across in science activities (e.g., measure, record, fill, and repeat). Highlighting imperative words helps many students understand.
- Highlighting the imperative words helps clarify instructions for some students.
- Provide students with flow charts and timelines to help track successful completion of oral or written instructions.
- Model the activity/lab, going step-by-step through the instructions. Perhaps ask students to predict the consequences of a particular step. Identify any potential “pitfalls” when conducting the activity/lab.
- Provide diagrams or flowcharts of lab procedures for those students who have difficulty following written instructions.
- Lab instructions are often complex because they contain both a command as well as other information. Sorting these out can be very challenging for some students. When given a choice, chose labs that have clear, concise instructions.

Reading Different Text Forms: Following Instructions: Pop Rocks and Acidity

SCIENCE Grade 10 (Chemistry Strand)

What teachers do	What students do
Before • Ask students to recall an important occasion when they had to follow a set of instructions (e.g., assembling new furniture, fixing a bike, completing a registration form). Discuss what was challenging and easy about following the instructions. • Provide each pair of students with 12 Lego® pieces and have them write instructions to construct a figure of their own design. • Select a set of instructions related to a current topic (e.g., Pop Rocks and Acidity). • Model for students how to preview the instructions (e.g., looking at the title, organization, some of the signal words such as sequence of steps and process verbs, graphics, illustrations, summary, and materials list).	• Students share their experiences with following instructions. • Students share each other's instructions and attempt to construct the figure the author had in mind. Students identify which specific instructions were well-written and which were ambiguous.
During • Model reading the introductory material and the first 2 or 3 steps aloud, noting the signal words and what they tell the reader to do. • Clarify any procedural steps that are unclear. • (Optional: Ask students to draw a diagram of the investigation including when each chemical is to be added. • Identify any changes that may be necessary (if you intend to do the investigation). • Model the procedure and setup. • Ask students to complete the investigation.	• Highlight signal words in the instructions. • (Optional: students sketch a diagram of the investigation).
After • Ask students to evaluate the effectiveness of the instructions. Ask them to identify what features make instructions clear and easy to follow.	• Students identify the features that make instructions clear and easy to follow.

Notes

Sample Instructions for a Scientific Investigation:
Pop Rocks and Acidity

Introduction:

Carbon dioxide is one of a number of gases that can alter the acidity of water. Because carbon dioxide is such a common gas, it is important to understand the effect that dissolved carbon dioxide has on the acidity of water. In this investigation, you will dissolve carbon dioxide into water and observe its effect on water's acidity using an acid/base indicator. However, the source of carbon dioxide you will use is rather unusual. Pop Rocks are a type of candy that, as their name suggests, "pop" in your mouth as they dissolve. When Pop Rocks are made tiny bubbles of pressurized carbon dioxide gas are trapped within each kernel. As the candy dissolves in your mouth, the pressurized carbon dioxide is released with a resounding POP!

Purpose:

To determine the effect that dissolved carbon dioxide gas has on the acidity of tap water?

Safety: Do not consume any of the materials used in this investigation.

Materials and Equipment:

- eye protection
- dropping bottles of: vinegar, tap water, bromothymol blue indicator, and baking soda solution (teaspoon of baking soda dissolved in a cup of tap water)
- Petri dish
- quarter of a package of Pop Rocks
- spot plate
- stirring rod

Procedure:

1. Put on eye protection.
2. Add 5 drops of vinegar (a mild acid) to one well of the spot plate.
3. Add 5 drops of the baking soda solution (a mild base) to another well.
4. Add 5 drops of tap water (approx. neutral) to a third well.
5. Add two drops of bromothymol blue indicator to each of the three wells. Note any colour changes that occur.
7. Half-fill a Petrie dish with tap water.
8. Add 5-10 drops of bromothymol blue indicator to the dish and swirl until the colour of the mixture is uniform.
9. Record the colour of the mixture.
10. Sprinkle a quarter of a package of Pop Rocks (about 0.5 g) into the dish. Stir the dish to mix its contents.
11. Record the colour of the mixture.

Analysis:

1. What evidence suggests that the acidity of water has changed?
2. Why was it necessary to add bromothymol blue to a sample of tap water?