

## CONTENTS: Grade 7 Science and Technology

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### READING STRATEGIES

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## Getting Ready to Read: Extending Vocabulary (Creating a Word Wall)

### Grade 7 Science and Technology

Students are required to learn, on average, over 2 000 words each year in various subject areas. Those who have trouble learning new words will struggle with increasingly complex tasks that they encounter in the middle and senior school years. A *word wall* is a wall, chalkboard or bulletin board listing key words that will appear in a new unit of study, printed on card stock and taped or pinned to the wall/board. The word wall is usually organized alphabetically.

#### Purpose

Identify unfamiliar vocabulary and create a visible reference in the classroom for words that will appear often in a topic or unit of study.

#### Payoff

Students will:

- ☒ practise skimming and scanning an assigned reading before dealing with the content in an intensive way. Students will then have some familiarity with the location and with various elements of the text.
- ☒ develop some sense of the meaning of key words before actually reading the words in context.
- ☒ improve comprehension and spelling because key words remain posted in the classroom.

#### Tips and Resources

- ☒ **Word Anticipation Guide:** A Word Anticipation Guide allows students to use prediction skills based on context when learning new vocabulary. As students are asked to predict word meaning, they are also asked to confirm their predictions by conferencing with a partner and looking the word up using another source. Consider using the Word Anticipation Guide template found in Student Resources.
- ☒ **Word Splash Activity:** The Word Splash is a visually appealing, random arrangement of key words from the Word Wall around a specific topic. Students could examine the words and write a paragraph predicting the main idea of the unit. Refer to the Student Resources for a sample Splash.
- ☒ **Word Development Guide:** The language of science includes special terms that are recognized as belonging to primarily specific fields, as well as words that in the context of science are used in new or distinctive ways. Introducing vocabulary carelessly or too soon may result in an ample vocabulary, but only cosmetic understanding of terms for students. To facilitate learning by engaging more of the brain to enhance retention, two senses - writing words and drawing images - are used. Refer to the Student Resources for a Word Development Guide template.
- ☒ **Word Connections:** Word wall words can be mapped to show connections and relationships. Refer to Student Resources for a Word Connections template and a sample Grade 7 model. The teacher should field test the word selection prior to instruction, as this activity is not applicable to all word wall words.
- ☒ **Word Wall Games:** Refer to Teacher Resources for strategies how to use Word Walls.
- ☒ **Word Wall Words:** Refer to Teacher Resources for strand specific words and definitions.
- ☒ There are classroom environments (particularly secondary) where bulletin board or blackboard space is at a premium. Some classrooms are also used for multiple subjects. This may make the development and maintenance of a word wall challenging. Consider the purchase of a portable word wall from commercial suppliers (~\$35). Words are written on cards, and placed in see-through pockets of the word wall chart. These charts can be temporarily fastened to a blackboard or bulletin board, and rolled up/taken down each class. Be sure to write the words large enough so students at the back of the room can see them clearly. Do not laminate cards, as glare can result. Alternately, use a display board (similar to those used in Science Fair projects), and attach strips of Velcro to each panel of the board. Attach Velcro also to each word card.
- ☒ Students can create graphic organizers/visual words from the word wall to facilitate understanding. *Smart Ideas* is Ministry-licensed software that could be used for this purpose. Alternately, students could use online sources to collect graphics to represent and further clarify word wall words.
- ☒ To align instructional strategies, and assessment and evaluation, be sure to include word wall words in evaluation. Scaffold concept maps and Power notes using word wall words as a beginning. Consider use of cloze activities (fill in the blank), using word wall words, for evaluation purposes. As the unit and year progresses, have students develop sentences and information paragraphs using word wall words.

#### Further Support

- ☒ The use of colour is very helpful to visual learners. Examples: Teacher generated word wall words could be one colour, student suggestions could be another colour or all words from one unit could be in the same colour, with cross strand or other unit words in another colour. Use different colours for different concepts (e.g., use blue for water words, orange for energy words, green for plant words, etc.)
- ☒ Use the Internet to find free software to produce use of word match, word search, crossword puzzles and vocabulary hints

**Getting Ready to Read: Extending Vocabulary (Creating a Word Wall)**


**Grade 7 Science and Technology**

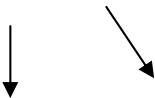
What teachers do	What students do
<p><b>Before</b></p> <ul style="list-style-type: none"> <li>• Before class, preview the text for key vocabulary.</li> <li>• Prepare strips of card stock (approximately 4" x 10") for words.</li> <li>• Divide students into groups of 3.</li> <li>• Provide stick-on notes, markers, and masking tape or pins for each group of students.</li> <li>• Explain to students that together the class will find key vocabulary in the assigned text, and will help each other to understand and spell the key vocabulary by creating a "word wall" in the classroom that they can refer to for the duration of that particular topic.</li> <li>• Distribute Student Resource, Skimming and Scanning to Preview Text, and read and clarify the techniques with students.</li> </ul>	<ul style="list-style-type: none"> <li>• With their group, find an appropriate space where they can talk face-to-face and write down the words.</li> <li>• Find the chapter or get a copy of the assigned text.</li> <li>• Follow along on the handout as the teacher reviews skimming and scanning.</li> </ul>
<p><b>During</b></p> <ul style="list-style-type: none"> <li>• Ask students to skim the text to get a general sense of what is in it and where it is located.</li> <li>• Engage students in some general discussion of the topic, making a few brief notes on the board about big ideas.</li> <li>• Direct the students to independently scan the text for unfamiliar words.</li> <li>• Ask students to create a personal list of 10 unfamiliar words.</li> <li>• Direct the students to small groups and ask the groups to compare personal lists and create a group master list.</li> <li>• Distribute eight pieces of card stock (approx. 4" x 10"), markers and pieces of masking tape to each group.</li> </ul>	<ul style="list-style-type: none"> <li>• Skim the text, looking at illustrations and subtitles to get a general idea of the topic of the text.</li> <li>• Scan the text for words they do not know, marking them with stick-on notes (optional) and then making a personal list of the words.</li> <li>• Compare personal lists. Choose the words for a group master list.</li> <li>• In each group, print the key vocabulary words in large letters on card stock and tape or pin them to the blackboard or bulletin board, preferably alphabetically.</li> </ul>
<p><b>After</b></p> <ul style="list-style-type: none"> <li>• Lead some discussion of the words and ask students to speculate on their meaning. If appropriate, describe prefixes and suffixes that are unique or common to the subject area.</li> <li>• Ask each group to look up the meaning of their words and then to explain the meaning to the rest of the class.</li> </ul>	<ul style="list-style-type: none"> <li>• Use the glossary in the textbook dictionary(ies) to find the meaning of the words.</li> <li>• Present their words to the rest of the class.</li> <li>• Add the meaning of the words to the cards in smaller letters.</li> </ul>

**Notes**



### Skimming and Scanning to Preview Text

Skimming	
What is it?	When you SKIM, you read quickly to get the main idea of a paragraph, page, chapter, or article, and a few (but not all) of the details.
Why do I skim?	Skimming allows you to read quickly to get a general sense of a text so that you can decide whether it has useful information for you. You may also skim to get a key idea. After skimming a piece, you might decide that you want or need to read it in greater depth.
How do I skim?  Read in this direction.  	<ol style="list-style-type: none"> <li>1. Read the first few paragraphs, two or three middle paragraphs, and the final two or three paragraphs of a piece, trying to get a basic understanding of the information.</li> <li>2. Some people prefer to skim by reading the first and last sentence of each paragraph, that is, the topic sentences and concluding sentences.</li> <li>3. If there are pictures, diagrams, or charts, a quick glance at them and their captions may help you to understand the main idea or point of view in the text such as "Cycle of Life", "AIDS", "Physical Fitness" or "Healthy Eating".</li> <li>4. Remember: you do not <b>have to read every word when you skim</b>.</li> <li>5. Generally, move your eyes horizontally (and quickly) when you skim.</li> </ol>

Scanning	
What is it?	When you SCAN you move your eyes quickly down a page or list to find one specific detail.
Why do I scan?	Scanning allows you to quickly locate a single fact, date, name, or word in a text without trying to read or understand the rest of the piece. You may need that fact or word later to respond to a question or to add a specific detail to something you are writing.
How do I scan?  Read in this direction.  	<ol style="list-style-type: none"> <li>1. Knowing your text well is important. Make a prediction about where in a chapter you may find the word, name, fact, term or date.</li> <li>2. Note how the information is arranged on a page. Will headings, diagrams, or boxed or highlighted items guide you? Is information arranged alphabetically or numerically as it might be in a glossary, nutrition guide or sequentially as in a sport rulebook?</li> <li>3. Move your eyes vertically or diagonally down the page, letting them dart quickly from side to side and keeping in mind the exact type of information that you want. Look for other closely associated words that might steer you towards the detail for which you are looking.</li> <li>4. Aim for 100% accuracy!</li> </ol>



## Word Connections Template

### Word Connections

A mind map shows how all of the words for a concept are connected or related.

Title:

1. Title the mind map.

2. Use the following words to complete the mind map.

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3. Put each word on the mind map.

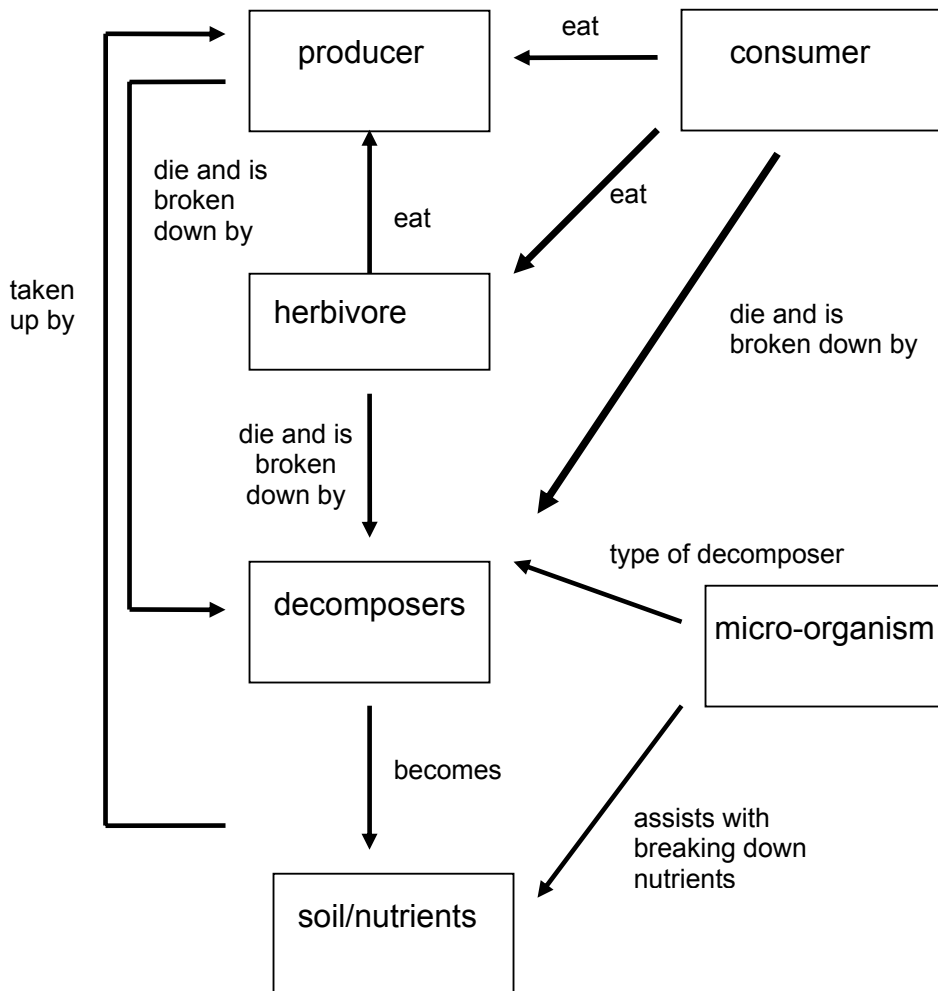
4. Draw arrows to show the relationship between the words. Each arrow must be labeled to show how the words are connected or related.

Word Connections Sample – Grade 7

Word Connections

A mind map shows how all of the words for a concept are connected or related.

Title: Role of an Organism



1. Title the mind map.

2. Use the following words to complete the mind map.

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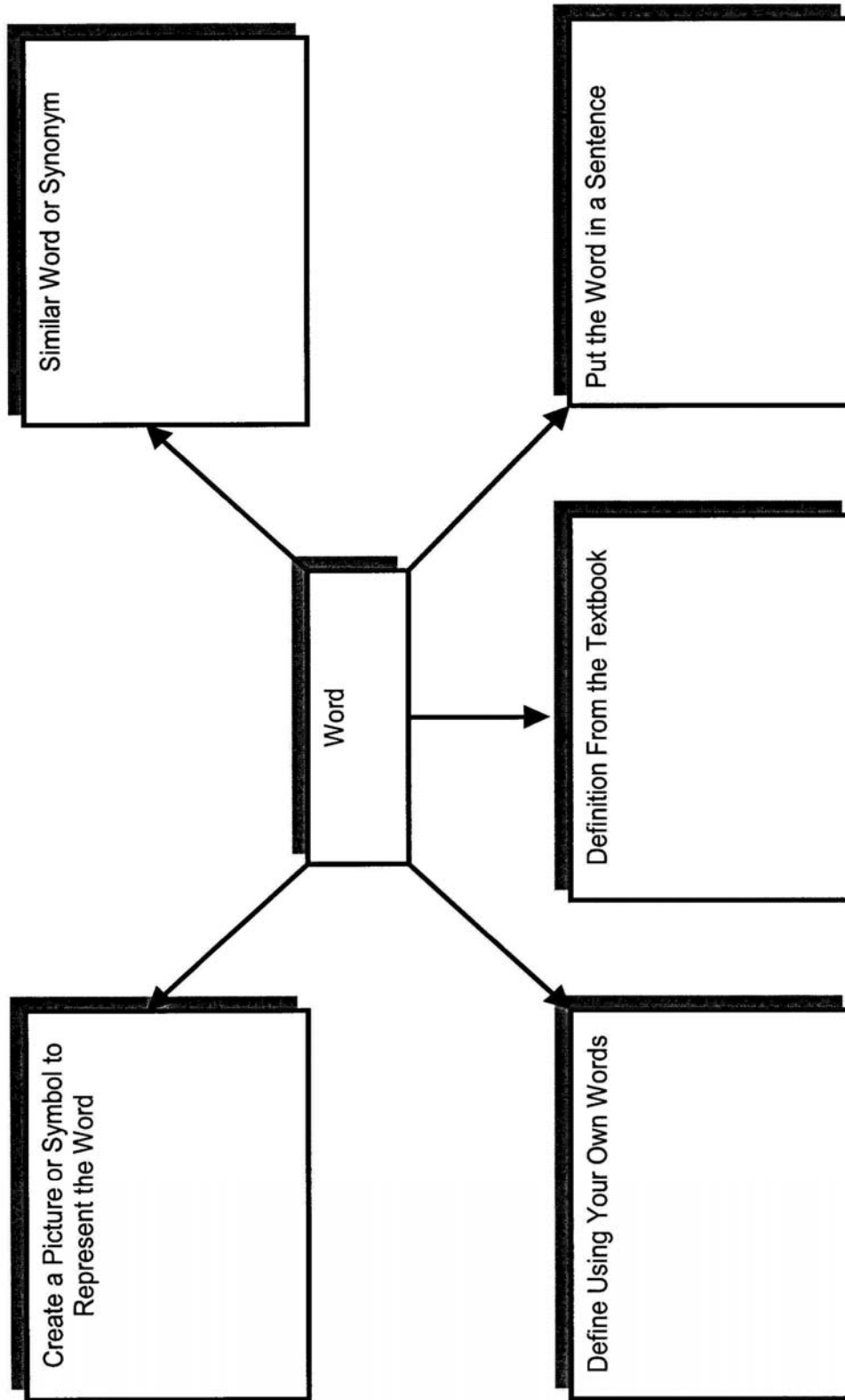
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3. Put each word on the mind map.

4. Draw arrows to show the relationship between the words. Each arrow must be labeled to show how the words are connected or related.



Word Development Guide



Student/Teacher Resource

## Word Splash Activity



This word splash is a random arrangement of key words around the topic we will be studying. Examine the words and write a paragraph predicting the main idea of the unit. Your prediction must be supported. Use your textbook or a dictionary if you do not know the meaning of some of the words.



## Word Wall for Science and Technology: Grade 7, Earth and Space Systems

### The Earth's Crust

bedrock

continental drift

core

crust

deposit

erosion

horizons

humus

igneous

magma

mantle

metamorphic

minerals

sediment

sedimentary

subduction

tectonic plate

topsoil

volcano

weathering

### Word Cards with Definitions

bedrock - the layer of rock just underneath soil

deposit - a high concentration of minerals

horizons - the series of layers in soil

Teacher Resource

## The Earth's Crust (Grade 7) - Definitions

bedrock - the layer of rock just underneath soil

continental drift - the theory proposed by Alfred Wegener in 1912 that the continents move on the Earth's surface like huge rafts

core - it is the matter at the centre of the Earth; the outer core is liquid, while the inner core is solid due to the immense pressure acting on it

crust - a thin layer of solid, rock that is underneath the soil on the Earth's surface

deposit - a high concentration of minerals

erosion - the gradual wearing away over time of material on the Earth's surface

horizons - the series of layers in soil

humus - decaying plant and animal matter in the topsoil

igneous - this rock is formed when magma cools

magma - hot, liquid or partially molten rock from under the Earth's surface

mantle - a hot, partly molten layer of material just below the Earth's crust

metamorphic - rock formed as the result of extreme heat and pressure

minerals - the non-living building blocks of rocks

sediment - small rocks and eroded soil that moving water carries

sedimentary - rock that is produced as a result of immense pressure acting over a period of time that drives the water out of accumulated sediments

subduction - when one plate plunges into the hot mantle below another one

tectonic plate - one of the huge rafts of the Earth's crust that float and carry continents on the Earth's surface

topsoil - the upper layer of soil directly beneath leaves, plants, and trees

volcano - a mountain built up as result of the eruption of magma from inside the Earth's crust

weathering - erosion as the result of physical action caused by the wind, water, or ice (mechanical weathering), as a result of the actions of living things like moss and lichens (biological weathering), or as a result of chemical action like acid rain (chemical weathering)



## Word Wall for Science and Technology: Grade 7, Life Systems

### Interactions within Ecosystems

abiotic	adaptations	biodegradable
biome	biosphere	biotic
carnivore	community	consumer
ecosystem	decomposer	food chain
food web	habitat	herbivore
micro-organism	population	producer
species	succession	

### Word Cards with Definitions

biotic - all living things  
in an ecosystem

herbivore - an animal that  
eats only plants

species - one kind of  
organism

Teacher Resource

## Life Systems (Grade 7) - Definitions

abiotic - all nonliving things in an ecosystem

adaptations – special features or characteristics that help an organism to survive in a certain environment

biodegradable – when matter decomposes and is recycled into the environment

biome – a region of land with certain organisms (biotic) living within a specific environment (abiotic)

biosphere – the thin layer of life as it exists on this planet

biotic – all living things in an ecosystem

carnivore – an animal that eats other animals

community – a group of organisms living together in a series of relationships

consumer – any organism that feeds on other organisms

ecosystem – how a community of living things exists in a certain environment

decomposer – an organism that breaks down dead organisms, to be recycled into the environment

food chain - organisms linked into a simple pathway by who eats who

food web – a complex network of feeding relationships within an ecosystem

habitat – is the physical setting, in the environment, which an organisms lives

herbivore – an animal that only eats plants

micro-organism – living things that can only be seen with a microscope

population – a group of organisms that are all the same kind (species) sharing the same environment

producer – an organism (green plants) that can make its own food

species – one kind of organism

succession – how the key species change within an ecosystem over time



## Word Wall for Science and Technology: Grade 7

### Energy and Control

boiling point	condensation	contraction
convection	conduction	evaporation
expansion	heat	heat capacity
insulator	particle theory	radiation
sublimation	solidification	water cycle
temperature	thermometer	thermostat
vapourization		

### Word Cards with Definitions

expansion – the increase in volume of an object

insulator – a substance that prevents the passage of heat, sound or electricity

water cycle – the cycle that collects, purifies and redistributes the Earth's water

Teacher Resource

## Energy and Control (Grade 7) - Definitions

boiling point - the temperature at which a liquid begins to boil and turns into a gas

condensation - the process of changing from a gas or vapour into a liquid

contraction - a decrease in the volume of an object

convection - the transfer of heat by the movement of a fluid from one part to another [or the transfer of heat by the movement of particles from one part of a fluid to another]

conduction - the transfer of heat by the collision of particles inside a material

evaporation - the change of state from a liquid to a gas

expansion - the increase in volume of an object

heat - thermal energy transferred from one object or substance to another [or a form of energy that molecules of a substance have]

heat capacity - the measure of the amount of heat [thermal energy?] needed to raise the temperature of 1 Kg of a substance by 1°C

insulator - a substance that prevents the passage of heat, sound, or electricity

particle theory - a theory used to explain heat and pressure that suggests that all matter is made of tiny moving particles too small to be seen

radiation - the transfer of energy by means of waves such as light waves or infrared rays

sublimation - the change of state from a solid directly to a gas or from a gas directly to a solid

solidification - the change of state from a liquid to a solid, sometimes called freezing

water cycle - the cycle that collects, purifies and redistributes the Earth's water

temperature - a measure of the average energy of motion of the particles of a substance

thermometer - a device that uses the expansion and contraction of a liquid to measure temperature

thermostat - a device that uses the expansion and contraction of solids to measure temperature

vapourization - the rapid conversion of a liquid into a gas or vapour, sometimes known as boiling



## Word Wall for Science and Technology: Grade 7, Matter and Materials

### Pure Substances and Mixtures

concentrated	dilute	dissolve
distillation	filtration	homogeneous
heterogeneous	insoluble	manufactured products
mechanical mixture	particle theory	pollutant
pure substance	raw material	saturated
soluble	solute	solution
solvent	unsaturated	WHMIS symbols

### Word Cards with Definitions

insoluble - a substance that does not dissolve in a solvent

pollutant- a harmful substance to life forms

unsaturated - a solution that can dissolve more solvent

Teacher Resource

## Matter and Materials (Grade 7) - Definitions

concentrated - a solution with a high amount of dissolved solute

dilute – a solution that can dissolve much more solute; having a low concentration

dissolve – when the particles of one substance totally mix with the particles of another substance

filtration – a method used to separate a mixture of substances having particles of different sizes

homogeneous – particles of pure substances mix completely, appearing as one substance

heterogeneous – a mixture with visibly different substances mixed together

insoluble – a substance that does not dissolve in a solvent

manufactured products – creating something new through a process, using raw materials

mechanical mixture – contains 2 or more pure substances that do not blend when put together and therefore, can easily be separated

particle theory – how substances behave based on physical and chemical properties

pollutant – a harmful substance to life forms

pure substance – matter that contains only one kind of particle

raw material – matter that is not pure and needs to be processed to separate out the various substances

saturated – a solution that cannot dissolve any more solvent at a given temperature

soluble – how easily a substance dissolves in a solvent

solute – the substance that is dissolved in a solution

solution – when 2 or more substances combine to look like only one substance

solvent – the substance, like water, that does the dissolving in a solution

unsaturated – a solution that can dissolve more solvent

WHMIS symbols – coded pictures from the workplace hazardous material information system



## Word Wall for Science and Technology: Grade 7, Matter and Materials

### Structures and Mechanisms

buckle	centre of gravity	compression
force	frame structure	load
shear	shell structure	solid structure
stability	stress	structure
strut	structural failure	structural function
tension	torsion	truss

### Word Cards with Definitions

buckle – to fold under a compressive force

force – a push or a pull

structure – a supporting framework

Teacher Resource

## Structures and Mechanisms (Grade 7) - Definitions

buckle – to fold under a compressive force

centre of gravity – the point at which all of the gravitational force of an object may be considered to act

compression – a force that compresses or squeezes together a structure or material

force – a push or pull, or anything that attempts to cause a change in the motion or shape of an object

frame structure – a type of structure in which a skeleton [of materials] supports the weight of other parts

load – the force of gravity of an object that is not part of the structure exerted downward on a structure [the weight of an object down on a structure]

shear – two forces that act on an object in opposite directions, a sideways force on a structure [or the attempt of a part of a structure under pressure to slide over another part of the structure]

shell structure – a type of structure consisting of a thin, carefully shaped outer layer of material without a skeleton or internal frame underneath of it

solid structure – a type of structure consisting of solid material distributed throughout [?]

stability – a feature of a structure that enables it to maintain its shape and position

stress – forces created inside a structure by other forces acting on it from the outside trying to change its shape

structure – a supporting framework

strut – a part of a structure whose function is to resist compressive forces

structural failure – the failure and breakdown of a structure under external or internal forces

structural Function – the main purpose of a structure

tension – a force that pulls on a structure to stretch it apart

torsion – a force that causes an object to twist along its axis

truss – a structural element made up of a series of triangular frames [or an arch with ends that are tied together by a tie beam]



## Word Wall Games

**Be a Mind Reader Game:** Word Walls can be used to play motivating games. This game can be played individually or in teams. The teacher thinks of a word wall word and gives five clues to that word. Your clues could include parts of the definition, synonyms or how it is used. Students number their papers as usual from 1 to 5 and try to “read the teacher’s mind”. By the time the teacher gives the fifth clue, everyone in the class should guess the word and have it written down on their papers.

**Word Jar Game:** Place all word wall cards in a jar. Students break into 2 teams. Teams alternately send members to the jar to select a word and state its definition. Award 2 points for each correct team definition. The opposing team can earn 1 point if they can correctly define the word if the original team fails to correctly define the word.

**Word Mixer Game:** Play a “mixer” game with the students. Some students will receive word wall words. The remaining half of the class receives the definitions. Students move around the room trying to find their partner. Variation: Some words may have more than one meaning, hence there may be more than two students partnering.

**Word Mimes Game (especially suitable for Earth and Space):** Students are divided into two teams. Students select a word from the word wall, and attempt to act out the meaning of the word.

**Wordo Game:** Teacher determines the number of words to focus upon from the Word Wall. Students make a grid of 8 squares (e.g., a 4 x 2 matrix, similar to a bingo card) on a blank sheet of paper. Each square must be large enough for words to be written. There are two options for filling in the grid:

Option 1 - A student begins the game by calling out a word from the word wall. Classmates respond by writing the word in any space on their grid. Some teachers have students spell them as they write them, to ensure accuracy. The student who gave the first word calls on another classmate to select a second word, which all students again write in a space on their grid. As students select words from the wall and write them in their grids, the teacher writes the same words on a piece of paper and places them in a pile. This process continues until the students have all the spaces on their grids filled. Then, the teacher begins to draw words from the pile. Students mark or stamp the words in the same way (e.g., with a checkmark) until someone marks all words in a straight or diagonal line as in bingo and calls, “Wordo”.

Option 2 - Instead of having all students add the same words to their grids, have students fill in their grids with any words from the wall, so that everyone has different words on their cards. Then, either the teacher calls words from the wall until a winner is declared, or students call out a word from their card, that is marked by other students that have included the same word on their own cards.



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**Reading Different Text Forms: Reading Informational Texts**

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**Grade 7 Science and Technology (The Earth's Crust)**

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Informational text forms are written to communicate information about a specific subject, topic, event or process. These texts use subject specific vocabulary, organizational patterns and diagrams to express ideas clearly and make them easier to read. Providing students with an approach to reading informational texts helps them to become more effective readers

**Purpose**

- Become familiar with the elements and organization of informational texts used in the text example.
- 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
- practise reading strategies using the organizational patterns to assist and consolidate understanding

**Tips and Resources**

- Some of the features of informational texts are headings, subheadings, introductions, and diagrams. These work together to draw readers into the text at different levels. For example, the diagram after each text section provides a visual to help students consolidate their understanding.
- Many informational texts are divided into sections that add meaning, by description or definition. For example, the sections each describe or define the layers of the earth.
- Many informational texts use visual elements (such as typeface, size of type) to emphasize important words and concepts. Different texts use these features in different ways to effectively present information.
- How you read informational text will depend on your purpose for reading. If you want to find specific information in a textbook, you might examine the headings and subheadings, and then skim through the section looking for key words and phrases related to the topic (e.g., layers of the earth). 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*.
- See Student/Teacher Resource, *The Earth and Its Layers*. This reading passage refers to the importance of heat in the formation of the Earth's crust. Students can make connections with the Energy and Control strand: Heat.
- See Teacher Resource, *Questions to Guide Reading: The Earth and Its Layers*. These questions can be adapted for a variety of informational texts, depending on the features of the text on which you want to focus.
- See Student Resource, *Organizer for The Earth and Its Layers*.
- See Teacher Resource, *Organizer for The Earth and Its Layers*. This is a suggested completed version of the student template.

**Further Support**

- See strategies for *before reading*, such as **Previewing a Text**, and **Analysing the Features of a Text** in *Think Literacy: Cross-Curricular Approaches, Grades 7 – 12*. Refer to these to support and reinforce the ideas described here.

## Reading Different Text Forms: Reading Informational Texts

### Grade 7 Science and Technology (The Earth's Crust)

#### 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 (see Student/Teacher Resource, *The Earth and its Layers*). 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 “think 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. See Student Resource, *Tips for Reading Informational Texts*.



## Tips for Reading Informational Texts

### 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, captions, and more).
- 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 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 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 to yourself or a friend.

## The Earth and its Layers

Scientists have puzzled over the mysteries of how the Earth was formed and what it is made of for years. With the evidence they have scientists have made a model of what they think happened. Billions of years ago, *gravity* pulled together gases and dust, which created a star, our sun. The leftover material formed planets, including the Earth. The gravity pulling the leftover material together caused tremendous high-speed collisions. The collisions created such high temperatures that the rocks in the leftover material melted. Much of the Earth is still extremely hot and still in a liquid state.

Only the **Earth's crust** that part of the Earth on which we live, has cooled. This crust is rather thin, compared to the rest of the earth. Its thickness varies from 5 to 50 km. Because the crust cooled and became rigid so rapidly, cracks and breaks occurred over its surface. These broken sections are called *tectonic plates*.

Below the crust is the **mantle**, which is about 2900 km thick. The mantle is partially melted rock, which flows very slowly. It is kept in this state by the high temperatures below it and the pressure from the material above it. Scientists say that the Earth's crust is floating on the mantle.

Inside the mantle, the material is always melting, mixing and cooling. *Convection currents* carry the hot, molten material (*magma*) to the surface. When the material cools and becomes denser, it sinks back down again. Sometimes the magma breaks through the Earth's crust, causing *volcanoes*. *Forces* within the mantle cause the tectonic plates on the Earth's crust to move. When those plates collide with tremendous force it produces *earthquakes*.

Below the mantle is **the outer core**. The outer core is 2200 km thick. Because the temperature is so high, it is completely *liquid*. It contains molten iron and some nickel.

Finally, the **inner core** of the earth is a solid sphere, 2400 km in diameter, made of solid iron and nickel. The *temperature* is 3870° C, which is almost as hot as the surface of the sun. Huge pressure keeps the inner core solid.

The search for answers to the mystery of the formation of the Earth continues. One of the most recent investigations began in 1997. NASA launched a probe named Cassini from Cape Canaveral to investigate Saturn's rings and its moons. Scientists hope that the images that the probe sent back in the summer of 2004 will help them understand how our solar system, including the Earth was not formed 4.6 billion years ago.

## Questions to Guide Reading: **The Earth and its Layers**

Questions to ask	Possible answers
<p><b>Before</b></p> <ul style="list-style-type: none"> <li>• Why are we going to read this particular section on the Earth's layers?</li> <li>• How do we know what the big idea or main topic is?</li> <li>• What are the sub-topics in this passage and how do you know?</li> <li>• Why are some words in italics? Where would you find the meaning of those words?</li> <li>• What do you already know about this topic?</li> </ul>	<ul style="list-style-type: none"> <li>• To know more about how the Earth was formed and what it is made of</li> <li>• Main heading at the top of the page, in bold print, about the Earth's layers.</li> <li>• The writing is divided into paragraphs, and each paragraph has words written in bold. Sub-topics: the Earth's crust, mantle, outer core and inner core.</li> <li>• Words are found in the glossary. The italics are a clue that they are important words.</li> <li>• Students respond based on their prior knowledge. Teacher to record ideas on chart paper or on the board.</li> </ul>
<p><b>During</b></p> <ul style="list-style-type: none"> <li>• Read the first paragraph. What is the main idea? Where did you find the main idea? Paraphrase the key points, using your words.</li> <li>• Continue to read each paragraph slowly for details.</li> </ul>	<ul style="list-style-type: none"> <li>• Main idea is that the Earth formed billions of years ago out of gases and dust, with the help of gravity. The main idea is in the third and fourth sentences. Paraphrase: Scientists think that gravity pulled gases and dust together. Huge collisions created high temperatures that melted dust and rock. The Earth is still really hot.</li> </ul>
<p><b>After</b></p> <ul style="list-style-type: none"> <li>• Use the organizer to record the important points.</li> <li>• What connections can you make between this reading and your own experiences?</li> </ul>	<ul style="list-style-type: none"> <li>• Refer to Teacher Resource, <i>Organizer for the Earth and its Layers</i>.</li> <li>• Answers may vary; students could connect to movies or television programs they have seen.</li> </ul>



Student/Teacher Resource

<i>Organizer for the Earth and its Layers</i>					
<b>Parts of the Earth</b>					
<b>Features</b>					
<b>Temperature</b>					
<b>Thickness</b>					
<b>Composition</b>					

## *Organizer for the Earth and its Layers*

Parts of the Earth	Crust	Mantle	Outer Core	Inner core
<b>Features</b>	Surface of the earth covered with cracks, breaks	Kept in molten state by high temperatures below, high pressure from above Convection currents carry magma to surface=volcanoes Forces move	Completely liquid because of high temperature	Solid because of pressure of material above 3.5 million times greater than what we are used to on surface
<b>Temperature</b>	-50 C to +50 C	High	Very high	As hot as surface of the sun (over 3800 <sup>0</sup> C)
<b>Thickness</b>	5 – 50 km	2900 km thick	2200 km thick	2400 km in diameter
<b>Composition</b>	Rocks Soil (Inferred)	Partially melted rock Like thick syrup	Molten iron and nickel	Solid iron and nickel



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**Reading Different Text Forms: Reading Informational Texts**

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**Grade 7 Science and Technology (Interactions within Ecosystems)**

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Informational text forms are written to communicate information about a specific subject, topic, event or process. These texts use subject specific vocabulary, organizational patterns and diagrams to express ideas clearly and make them easier to read. Providing students with an approach to reading informational texts helps them to become more effective readers

**Purpose**

- Become familiar with the elements and organization of informational texts used in the text example.
- 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
- practise reading strategies using the organizational patterns to assist and consolidate understanding

**Tips and Resources**

- Some of the features of informational texts are headings, subheadings, introductions, and diagrams. These work together to draw readers into the text at different levels. For example, the diagram after each text section provides a visual to help students consolidate their understanding.
- Many informational texts use visual elements (such as typeface, size of type) to emphasize important words and concepts. Different texts use these features in different ways to effectively present information.
- How you read informational text will depend on your purpose for reading. If you want to find specific information in a textbook, you might 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 Text*.
- See Student/Teacher Resource, *Producers or Consumers?*
- See Teacher Resource, *Questions to Guide Reading: Producers or Consumers?* These questions can be adapted for a variety of informational texts, depending on the features of the text on which you want to focus.
- See Student Resource, *Organizer for Reading Producers or Consumers? 5 - 4 - 3 - 2 - 1*. Students complete the organizer, using the material they have just read. They are to find 5 key words from the text, 4 facts related to the main topic, 3 new words and their meanings, 2 facts you already know, and one question they still have after reading the passage.
  - It might be helpful to do one example for the first four to begin.
  - Record a representative sample of questions on chart paper to check later in the unit.

**Further Support**

- See strategies for *before reading*, such as **Previewing a Text**, and **Analysing the Features of a Text** in *Think Literacy: Cross-Curricular Approaches, Grades 7 – 12*. Refer to these to support and reinforce the ideas described here.
- See strategies for reading at the website <http://www.readingquest.org>

## Reading Different Text Forms: Reading Informational Texts

### Grade 7 Science and Technology (Interactions within Ecosystems)

#### 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 (see Student/Teacher Resource, *Producers or Consumers*). 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 “think 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. See Student Resource, *Tips for Reading Informational Texts*.

#### Notes



## Tips for Reading Informational Texts

### 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, captions, and more).
- 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 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 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 to yourself or a friend.



Teacher Resource

### Questions to Guide Reading: **Producers or Consumers?**

Questions to ask	Possible answers
<p><b>Before</b></p> <ul style="list-style-type: none"> <li>• What words do you think of when you hear the words <b>producers</b> and <b>consumers</b>?</li> <li>• What is the purpose of our reading (the main reason for reading)?</li> <li>• What is the purpose of the question at the top of the reading passage?</li> <li>• Why are some words in italics? Where might you find the meaning of those words in a textbook? What italicized words have you seen before but you are not sure of the meaning? What words do you know the meaning of?</li> </ul>	<ul style="list-style-type: none"> <li>• Student will probably suggest a variety of ideas, some of which are associated with this reading passage. Record all, with no comment other than “we will be reading to see if you are correct”.</li> <li>• To learn more about producers and consumers and think about the differences</li> <li>• The question gets the reader thinking as they read the passage.</li> <li>• These are words that are important to this topic. You might find them in a glossary at the back of the book. Create a list of known and unknown words.</li> </ul>
<p><b>During</b></p> <ul style="list-style-type: none"> <li>• Read the first paragraph. Why does the author start with this story? How does it relate to the main idea?</li> <li>• Continue to read each paragraph, making dot jot notes (point -form notes) of important points.</li> </ul>	<ul style="list-style-type: none"> <li>• The author is setting the tone and giving some background information so that readers have a purpose for reading.</li> </ul>
<p><b>After</b></p> <ul style="list-style-type: none"> <li>• Use the organizer to record the main ideas.</li> <li>• Answer the final question and discuss the responses. What connections can you make to what you have just read and what you knew before?</li> </ul>	<ul style="list-style-type: none"> <li>• Students might share various menus from their experiences, and classify themselves as herbivores or omnivores.</li> </ul>



**Organizer for Reading: *Producers or Consumers?***

**5 - 4 - 3 - 2 - 1**

<b>5</b>	<b>Key words from the text</b> 1. 2. 3. 4. 5.
<b>4</b>	<b>Facts related to the main topic</b> 1. 2. 3. 4.
<b>3</b>	<b>New words and what they mean</b> 1. 2. 3.
<b>2</b>	<b>Facts you already know</b> 1. 2.
<b>1</b>	<b>Question you still have</b>

## Producers or Consumers?

**As you read the following, think about:** What did you have for breakfast this morning?

Anik and Jasmine are good friends. As they walked to school together one morning, Anik told Jasmine about this new breakfast bar she had tried. Jasmine had never heard of it. That led to a discussion about what they had each eaten for breakfast. Anik's breakfast was rather simple – a glass of orange juice, the new breakfast bar made of nuts and oats, and a bowl of sliced strawberries. Jasmine's breakfast was different. She'd eaten two sausages, a scrambled egg, some toast with jam, and a strawberry milkshake.

Anik's and Jasmine's breakfasts were quite different. Anik's breakfast had foods from producers. Jasmine's breakfast included foods from producers and consumers. What are the differences between producers and consumers?

The world of living things is made up of two main categories: **producers** and **consumers**. **Producers** are green plants. They have a special feature that allows them to use sunlight to produce their own *energy* from water and *carbon dioxide*. This process is called *photosynthesis*. The orange juice, nuts, oats, and strawberries are foods from producers.

**Consumers** are animals. We are consumers because we cannot produce our own food or energy. Consumers need to eat to get the energy they require to live. The sausages, eggs and milk came from consumers.

Consumers can be divided into three smaller categories. *Carnivores* are animals that eat mainly other animals. *Herbivores* are animals that eat mainly plants. *Omnivores* eat both plants and animals.

Anik is a vegetarian (she eats no meat products) so she is an herbivore. Cows and horses are herbivores as well. Jasmine has meat in her diet (the sausages) but also plant products (the toast, made from grain plants). She is an omnivore. Bears, humans, and raccoons are omnivores. Animals such as cats, seals and praying mantises are considered carnivore, because they eat mainly animals for food.

Producers or consumers? Did your breakfast look more like Anik's or Jasmine's?

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**Reading Different Text Forms: Reading Graphical Texts (Photographs)**

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**Grade 7 Science and Technology (Structural Strength and Stability)**

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Graphical text forms (such as diagrams, photographs, graphs, charts, and tables) are intended to communicate information in a concise format and illustrate how one piece of information is related to another.

**Purpose**

- Become familiar with the elements and features of graphical texts.
- 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 “mining” 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, titles, headings, subheadings, italics, labels and captions)
  - design features (such as colour, shape, line, placement, and focal point).
  - 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 chart or table may illustrate key information and show how pieces of information relate to each other. A table uses columns and rows to organize the information and may include a title that describes the main idea or subject, and a caption to explain the purpose of the table. The information in a table can be read horizontally and vertically. Tables are often used to help the reader quickly grasp key information (such as number patterns).
- Many of the strategies for reading informational and literacy texts can also be used effectively to read graphical texts.
- See Student Resource, *Tips for Reading Graphical Texts*.
- See Student Resource/Teacher Resource, *Getting Over It*.
- See Teacher Resource, *Questions to Guide Reading: Getting Over It*. These questions can be adapted for use with a variety of photographs, depending on the instructional focus of your lesson.
- As a follow-up to the class discussion, students are to use their own words to paraphrase the information they have learned from the photographs. Some suggested prompts are given in the Teacher Resource, *Questions to Guide Reading: Getting Over It*.

**Further Support**

- See **Reading Graphical Texts**, *Think Literacy: Cross-Curricular Approaches, Grades 7 – 12*.

## Reading Different Text Forms: Reading Graphical Texts (Photographs)

### Grade 7 Science and Technology (Structural Strength and Stability)

#### 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 (see Student/Teacher Resource, *Getting Over it*). 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** the 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 graphic, specialized language, related written 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 graphical 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**, **reading slowly**, and **rereading**.
- Model (using "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 the following:
  - What is the purpose of this graphic?
  - What information is provided?
  - Is all of the 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 **note similarities and differences** in the 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*.

#### Notes

## Tips for Reading Graphical Texts

### Before Reading

- Set a purpose for reading. Ask yourself why you are reading this particular text.
- Look over the text to determine what type it is and which elements are used.
- 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”).
- 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.
- 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.
- 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 relationships among the visuals and information presented.

### 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.
- Rephrase 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.



**Questions to Guide Reading: Getting Over It**

Questions to ask	Possible answers
<p><b>Before</b></p> <ul style="list-style-type: none"> <li>• Why are we looking at these photographs?</li> <li>• What do you already know about bridges? Record responses on chart paper. Ensure that correct vocabulary has been learned before this exercise.</li> <li>• What are captions and what is their purpose?</li> <li>• Why did the author choose to use photographs and not drawings?</li> </ul>	<ul style="list-style-type: none"> <li>• We want to learn more about how bridges are built.</li> <li>• Answers will vary, the teacher should ensure the correct vocabulary and meaning is developed at this time.</li> <li>• Captions help to identify the photo and provide relevant data about the subject.</li> <li>• Photographs are realistic and can help us make connections with our own experiences.</li> </ul>
<p><b>During</b></p> <ul style="list-style-type: none"> <li>• In what ways are the bridges similar?</li> <li>• What do you notice about the construction of each bridge?</li> <li>• How do these photos help you understand the text?</li> </ul>	<ul style="list-style-type: none"> <li>• All bridges have supports, spans etc.</li> <li>• Two of them use trusses; triangles are used a lot; one has an arch shape above, another below; one is cantilevered etc.</li> <li>• It makes a visual connection to the words.</li> </ul>
<p><b>After</b></p> <ul style="list-style-type: none"> <li>• How did you read this page? Discuss strategies.</li> <li>• With your partner, talk about the information you learned from the photos.</li> <li>• How are these bridges similar to ones you've seen or traveled on?</li> <li>• Find another photo of a bridge. With your partner, discover as many details as you can, using the same process as we have just used. Record them in your journal or notes. Write a brief reflection, using one of these prompts (or one of your own):             <ul style="list-style-type: none"> <li>- As I looked at the photos, I was surprised...</li> <li>- I've seen this type of construction in...</li> <li>- I would like to know more about...</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Possible strategies are: read whole page of text first, then focus on photos, or vice versa, or read in thirds.</li> <li>• Discussion should reinforce the points above.</li> <li>• Answers will vary.</li> <li>• Answers will vary.</li> </ul>

## Getting Over It

Bridges are structures for getting over something. But no one wants to travel over a bridge that is unsafe. Civil engineers must look at many factors when they are designing bridges, including what the bridge will be crossing and what kinds of **loads** the bridge will be supporting.



Figure 1 Bridge crossing a river and a railway yard.



Figure 2 Bridge crossing a valley

Will the bridge be **stable**, in all kinds of weather conditions, and with all kinds of loads? A **static load** is the weight of a structure. It could also be a heavy ice build up. A **dynamic load** is also an **external force** that moves or changes. How would cars, or a sudden wind or an earthquake affect these structures?

Will the bridge be able to withstand the effect of various forces no matter the **magnitude**, **point and plane of application**, or the **direction** of the force? Sometimes wind coming through a valley can strike a bridge in such a way that it becomes unstable.

What should we consider regarding internal forces, such as **torsion**, **tension**, **compression** and **shearing**? These are forces caused by one part of a structure acting on another part of the same structure.

**Centre of gravity** is important. A structure will remain stable if its centre of gravity is between the points where it is supported.

As you examine these photos, what factors did the engineers keep in mind when they designed these bridges?

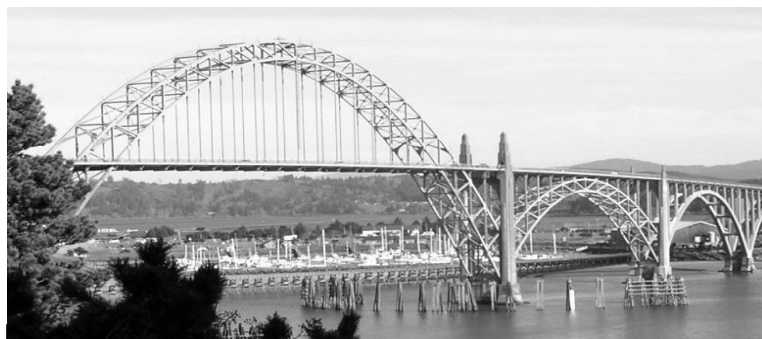


Figure 3 Bridge crossing a river.



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**Reading Different Text Forms: Reading Graphical Texts (Graph)**

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**Grade 7 Science and Technology (Pure Substances and Mixtures)**

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Graphical text forms (such as diagrams, photographs, graphs, charts, and tables) are intended to communicate information in a concise format and illustrate how one piece of information is related to another.

**Purpose**

- Become familiar with the elements and features of graphical texts.
- 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 “mining” 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. 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, titles, headings, subheadings, italics, labels and captions)
  - design features (such as colour, shape, line, placement, and focal point).
  - 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 chart or table may illustrate key information and show how pieces of information relate to each other. A table uses columns and rows to organize the information and may include a title that describes the main idea or subject, and a caption to explain the purpose of the table. The information in a table can be read horizontally and vertically. Tables are often used to help the reader quickly grasp key information (such as number patterns).
- Many of the strategies for reading informational and literacy texts can also be used effectively to read graphical texts.
- See Student/Teacher Resource, *Is It Pure Yet?*.
- Connections can be made to the Life Systems strand and the use of harmful and useful microorganisms, specifically bacteria and their role in breaking down sewage.
- See Student Resource, *Tips for Reading Graphical Text*.
- See Teacher Resource, *Questions to Guide Reading: Is It Pure Yet?* These questions can be adapted for use with a variety of graphical texts, depending on the instructional focus of your lesson.
- See Student Resource, *Organizer for Reading: Is It Pure Yet?* Students complete the organizer, using the graphic they have just read. Students are to use their own words to paraphrase the information they have learned from the graphic. They should complete the organizer by making connections to their own experiences or prior knowledge by completing *My Thoughts* section. Some suggested prompts are given. A chart could be created for the classroom for future activities.

**Further Support**

- See **Reading Graphical Texts**, *Think Literacy: Cross-Curricular Approaches, Grades 7 – 12*.

**Reading Different Text Forms: Reading Graphical Texts (Graph)**

**Grade 7 Science and Technology (Pure Substances and Mixtures)**

**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 graphic, specialized language, related written 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 graphical 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**, **reading slowly**, and **rereading**.
- Model (using “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 the following:
  - What is the purpose of this graphic?
  - What information is provided?
  - Is all of the 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 **note similarities and differences** in the 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*.

**Notes**

## Questions to Guide Reading: *Is It Pure Yet?*

Questions to ask	Possible answers
<p><b>Before</b></p> <ul style="list-style-type: none"> <li>Look at the title, sub-headings and bold print. Predict what this reading passage will be about and why we would want to read it?</li> <li>What do you already know about how sewage is treated? Record on chart paper.</li> <li>What is the title of the graphic “Chart 1” and why is it included with the text?</li> </ul>	<ul style="list-style-type: none"> <li>It is about how Canadian cities treat sewage. We want to find out how our own community treats sewage. This is something that affects us.</li> <li>Answers will vary.</li> <li>Sewage Treatment in our Cities is the title and it will compare the number of cities using the different levels of sewage treatment.</li> </ul>
<p><b>During</b></p> <ul style="list-style-type: none"> <li>What is the information to be found on the x-axis?</li> <li>What is the information on the y-axis? How do you read that information?</li> <li>How does the bar graph help you to understand the text?</li> <li>In what year was the data collected and by whom? Does this make it a source of reliable information?</li> </ul>	<ul style="list-style-type: none"> <li>The different types of sewage treatment</li> <li>The number of cities using a particular type of treatment is on the y-axis. You read the information vertically from bottom (0) to the top (7), following the bars up for each type of treatment.</li> <li>Answers will vary but should include the idea that it makes a visual comparison of the information.</li> <li>1999, from the Sierra Legal Defence Fund Report, 1999 National Sewage Report Card. It does not tell us which municipalities, but we could check the website.</li> </ul>
<p><b>After</b></p> <ul style="list-style-type: none"> <li>Use the <i>Organizer for Reading: Is It Pure Yet?</i> to record the main ideas.</li> <li>Discuss the information learned from the graph.</li> <li>Why did the author choose this type of graph? Is there another way that this information could have been presented? Explain.</li> </ul>	<ul style="list-style-type: none"> <li>Answers may vary.</li> <li>A bar graph gives a visual comparison. A pie graph could be used to show percentages. A table could be used but it would not be as effective visually.</li> </ul>

## Tips for Reading Graphical Texts

### Before Reading

- Set a purpose for reading. Ask yourself why you are reading this particular text.
- Look over the text to determine what type it is and which elements are used.
- 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”).
- 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.
- 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.
- 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 relationships among the visuals and information presented.

### 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.
- Rephrase 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.



### Organizer for Reading: *Is It Pure Yet?*

**Title**

**In my own words**

**My thoughts** (use your own prompt, or choose one below)

- 1) Something that surprised me was...
- 2) I used to think.... but now I...
- 3) I'd like to know more about....
- 4) This relates to my life because...

Student/Teacher Resource

## Is It Pure Yet?

Sewage is one of the types of waste found in Canadian cities. Cities have four options when it comes to **sewage disposal**. Some municipalities treat the wastewater (and the water to which it is returned) more completely than others. A few municipalities do nothing with sewage and allow it to flow straight into a large body of water. One city purifies the waste so completely that it is drinkable.

Some changes are being made slowly. Sometimes the residents of the community have to become actively involved in encouraging politicians to be more environmentally concerned.

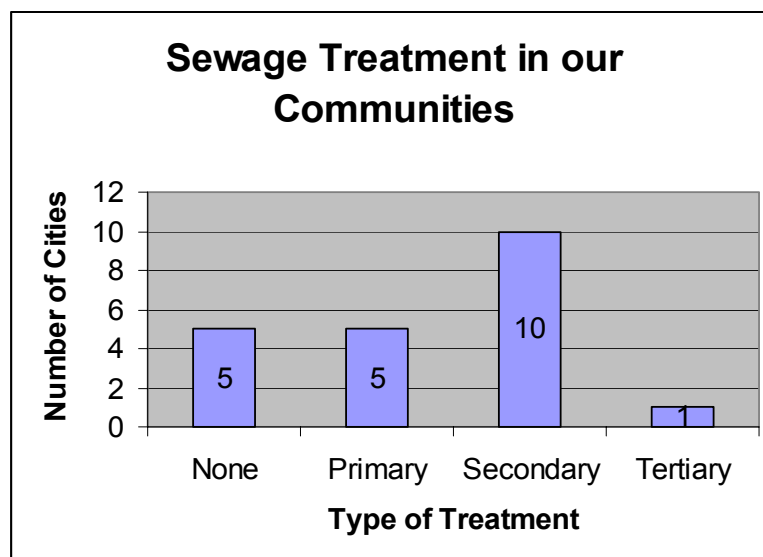
In addition to doing nothing with sewage there are three levels of sewage treatment used by Canadian communities. See Chart #1.

**Primary treatment.** Only 60 per cent of the large lumps of waste are removed. The 'water' is not fit to drink or to swim in.

**Secondary treatment.** Most of the waste is removed (almost 90%). Air and bacteria work together to break down the sewage into less harmful materials. We could swim in this water.

**Tertiary treatment.** All remaining particles, harmful bacteria and chemicals are removed with chemicals, filters and radiation (exposure to sunlight). This water is drinkable.

Chart 1



Data adapted from the Sierra Legal Defence Fund Report: [The National Sewage Report Card](http://www.sierralegal.org/reports/Sewage.pdf), 1999 <http://www.sierralegal.org/reports/Sewage.pdf>

**How does your community treat its sewage? How can you find out?**

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## Reading Different Text Forms: **Following Instructions**

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### Grade 7 Science and Technology (Heat)

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Students are expected to read and follow instructions in Science and Technology or Science especially for experiments. 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 purpose 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 procedure (e.g., directions, recipes, experiments, manuals, tests). They are sometimes called procedures or how-tos. Most instructions use organizational patterns, language, and features (charts, 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, *Reading Different Text Forms: Butter Up!*.
- See Teacher Resource, *Process to Guide Reading: Butter Up!* These questions can be adapted for a variety of following instructions.
- See Student Resource, *Flowchart for Reading Butter Up!*.

#### **Further Support**

- Provide students with a list of typical signal words and task prompts and suggestions/strategies for responding to them (e.g., place, fill, mark, repeat, record).
- Provide students with flow charts, diagrams and timelines to help track successful completion of oral or written instructions.
- Create a class framework for reading instructions such as:
  - Preview.
  - Highlight and annotate.
  - Think aloud and visualize.
  - Reread.
  - Go step-by-step.
  - Read the diagrams or charts.
  - Ask questions.
- See **Following Instructions**, *Think Literacy: Cross-Curricular Approaches, Grades 7-12*.

## Reading Different Text Forms: Following Instructions

### Grade 7 Science and Technology (Heat)

#### What teachers do

##### Before

- Select a set of instructions typical for science, science and technology related to a current topic or process.
- Ask students to **recall** an important occasion, when they had to follow a set of instructions (e.g., an exam, making a table, fixing a bike, installing software). Discuss what was challenging and easy about following the instructions.
- Ask students to **recall** what they know about effective instructions.
- Make a list of the elements and features of instructions with the class.
- Make copies of another set of instructions and cut them into slips of paper with a step on each slip (unnumbered). Place one set of jumbled instructions in as many envelopes as there are groups or pairs. Provide partners or small groups with an envelope, and ask students to **recreate** the instructions and discuss the decisions they made. Identify the strategies they used to determine the task and the sequence.
- Provide students with a copy of the selected instructions. Model for students how to **preview** the instructions (e.g., looking at title, organization, some of the signal words [sequence of steps an process verbs], graphics, illustrations, summary, materials list).

##### During

- Model reading the introductory material (see Student/Teacher Resource, *Reading Different Text Forms: Butter Up*) and the first 2 or 3 steps aloud, noting the **signal words** and what they tell the reader to do.
- Ask students to continue reading the instructions to **identify** the task to be completed. Suggest that students imagine themselves completing the instructions.
- Ask small groups to **discuss** the **strategies** they used to read the instructions and determine what they were expected to do.

##### After

- **Clarify** any confusing sections of the instructions. Use a flow chart to **outline** the steps, if necessary.
- Have students individually or in pairs **complete** the instructions. **Compare** the completed tasks.
- Discuss how students figured out what to do.
- **Identify** confusing or challenging parts and suggest additional strategies.

#### Notes

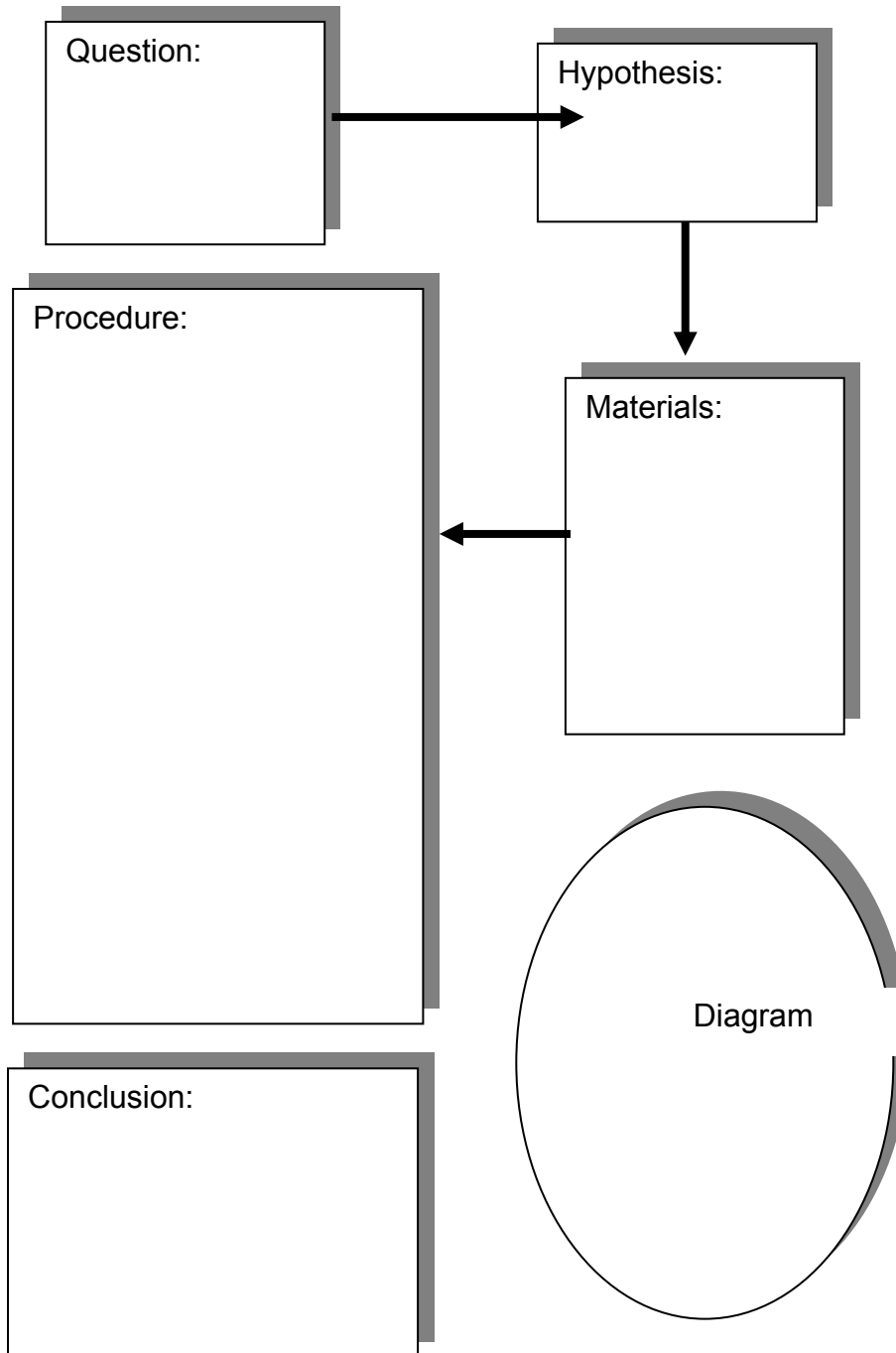


### Process to Guide Reading: Butter Up!

What teachers do	What students do
<p><b>Before</b></p> <ul style="list-style-type: none"> <li>Use the Think/Pair/Share strategy to have students recall a situation in which they had to follow a set of instructions. Create a list of elements and features of effective instructions, and record on chart paper or board.</li> <li>What additional requirements does a scientific set of instructions include?</li> <li>Provide students with a copy of the instructions and model how to preview the instructions.</li> </ul>	<ul style="list-style-type: none"> <li>The list should include a title, a numbered or bulleted series of steps in sequence, clear organization and sub-headings.</li> <li>Scientific instructions should include a question, hypothesis, materials, procedure, observations and a conclusion.</li> <li>Identify the title, read the introduction, check out the italicized or bold words for meaning, and note the sequence.</li> </ul>
<p><b>During</b></p> <ul style="list-style-type: none"> <li>Read the instructions aloud with the students, noting the signal words - place, fill, add, repeat, and mark.</li> <li>Using think/pair/share strategy, students paraphrase to identify the task to be completed and what they are expected to do.</li> <li>Draw a diagram to assist in visualizing the task.</li> </ul>	<ul style="list-style-type: none"> <li>Students note the signals, highlight or underline, and clarify what they tell the reader to do.</li> <li>Students use their own words to clarify the instructions in the experiment. Students may create a diagram to assist in visualizing the steps.</li> <li>Students draw a rough sketch to consolidate understanding of the instructions.</li> </ul>
<p><b>After</b></p> <ul style="list-style-type: none"> <li>What parts of the instructions are not clear?</li> <li>Use the Organizer to outline the required steps</li> <li>Review safety procedures before conducting the investigation.</li> <li>Compare results with a partner.</li> <li>What problems did you run into as you tried to follow the instructions? What strategies did you use to solve the problems?</li> </ul>	<ul style="list-style-type: none"> <li>Answers may vary.</li> <li>Students complete the organizer.</li> <li>Think/Pair/Share investigation and results.</li> <li>Answers may vary.</li> </ul>

Student Resource

### Flowchart for Reading *Butter Up!*



## Reading Different Text Forms: Butter Up!

Robert was helping his father get dinner one night, when he noticed something odd about the saucepans he was using to cook the pasta and the sauce. One pot had a metal body and a plastic handle. The other pot also had a metal body, but its handle was metal. He was able to pick up both pots using the handles without having to use a potholder, but he could not pick up the pots with his bare hands. He concluded that the second pot was made of two different metals. The metal that made up the handle must not have *conducted* heat as efficiently or as rapidly as the metal in the body of the pot.

Robert decided to do his own investigation to see if other solids conducted heat with different speeds. He would use some common materials found in his kitchen: butter, a wooden spoon or a wooden stir stick, a metal spoon and a plastic spoon, and some hot (boiling) water.

**Safety Note:** If conducting this investigation, students should have previous instruction regarding safe use of hot liquids.

**Question:** Which solid conducts heat faster?

**Hypothesis:** The metal will conduct the heat fastest.

**Materials:**

Apron

Goggles

Beaker or bowl of hot (boiling) water

Butter

Wooden spoon (or a stir stick about same size as the spoons if a wooden spoon is not available)

Plastic spoon (same size as the metal spoon)

Metal spoon

**Procedure:**

1. Put the same amount of butter on the handle of each spoon. (or the wooden stir stick if it is used)
2. **The butter end does not go in the water.** Place the bowl of all three spoons into the hot water at the same time.
3. On what material does the butter melt the fastest? The slowest?
4. Record your observations. Use a diagram, or graph to show your findings.

**Analysis:**

1. Which *variables* would you have to *control* to make this a *fair test*?
2. Why did one type of material cause the butter to melt faster than the others?
3. Using what you have learned, conduct a second test using a different variety of similarly sized materials.

**Conclusion:**

Explain your findings, using your knowledge of *conduction* and *heat transfer*.