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READING STRATEGIES

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

Grade 9 Science, Applied

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 9 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. Example: Teacher generated word wall words could be one colour, student suggestions could be another colour.
- 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 bingo.



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

Grade 9 Science, Applied

Notes

What teachers do	What students do
<p>Before</p> <ul style="list-style-type: none"> • Before class, preview the text for key vocabulary. • Prepare strips of card stock (approximately 4" x 10") for words. • Divide students into groups of 3. • Provide stick-on notes, markers, and masking tape or pins for each group of students. • 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. • Distribute Student Resource, <i>Skimming and Scanning to Preview Text</i>, and read and clarify the techniques with students. 	<ul style="list-style-type: none"> • With their group, find an appropriate space where they can talk face-to-face and write down the words. • Find the chapter or get a copy of the assigned text. • Follow along on the handout as the teacher reviews skimming and scanning.
<p>During</p> <ul style="list-style-type: none"> • Ask students to skim the text to get a general sense of what is in it and where it is located. • Engage students in some general discussion of the topic, making a few brief notes on the board about big ideas. • Direct the students to independently scan the text for unfamiliar words. • Ask students to create a personal list of 10 unfamiliar words. • Direct the students to small groups and ask the groups to compare personal lists and create a group master list. • Distribute eight pieces of card stock (approx. 4" x 10"), markers and pieces of masking tape to each group. 	<ul style="list-style-type: none"> • Skim the text, looking at illustrations and subtitles to get a general idea of the topic of the text. • 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. • Compare personal lists. Choose the words for a group master list. • 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.
<p>After</p> <ul style="list-style-type: none"> • 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. • Ask each group to look up the meaning of their words and then to explain the meaning to the rest of the class. 	<ul style="list-style-type: none"> • Use the glossary in the textbook dictionary(ies) to find the meaning of the words. • Present their words to the rest of the class. • Add the meaning of the words to the cards in smaller letters.



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.

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.

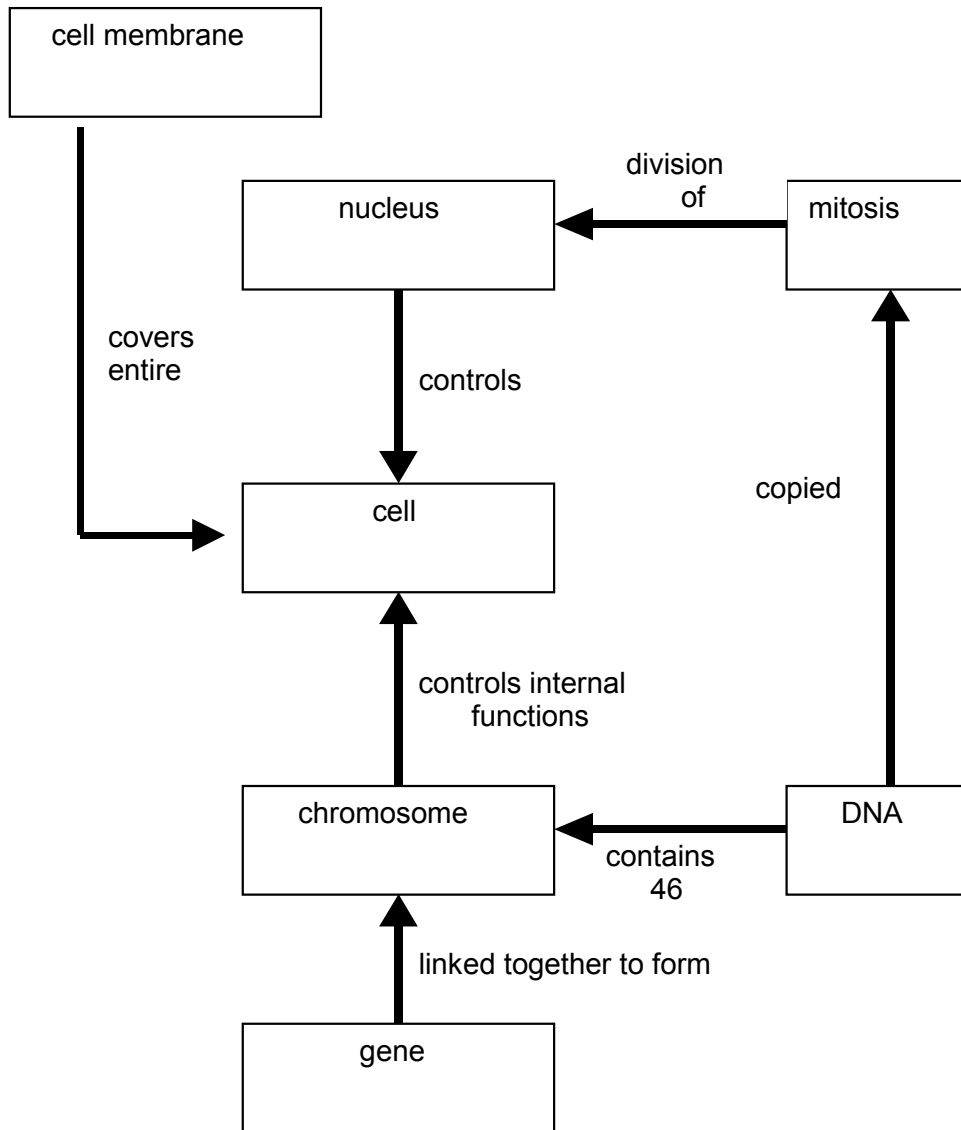


Word Connections Sample – Grade 9

Word Connections

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

Title: Cells – The Basic Unit of Life



1. Title the mind map.

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

nucleus
mitosis
cell
chromosome
gene
cell membrane
DNA
(deoxyribonucleic acid)

3. Put each word on the mind map.

nucleus

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

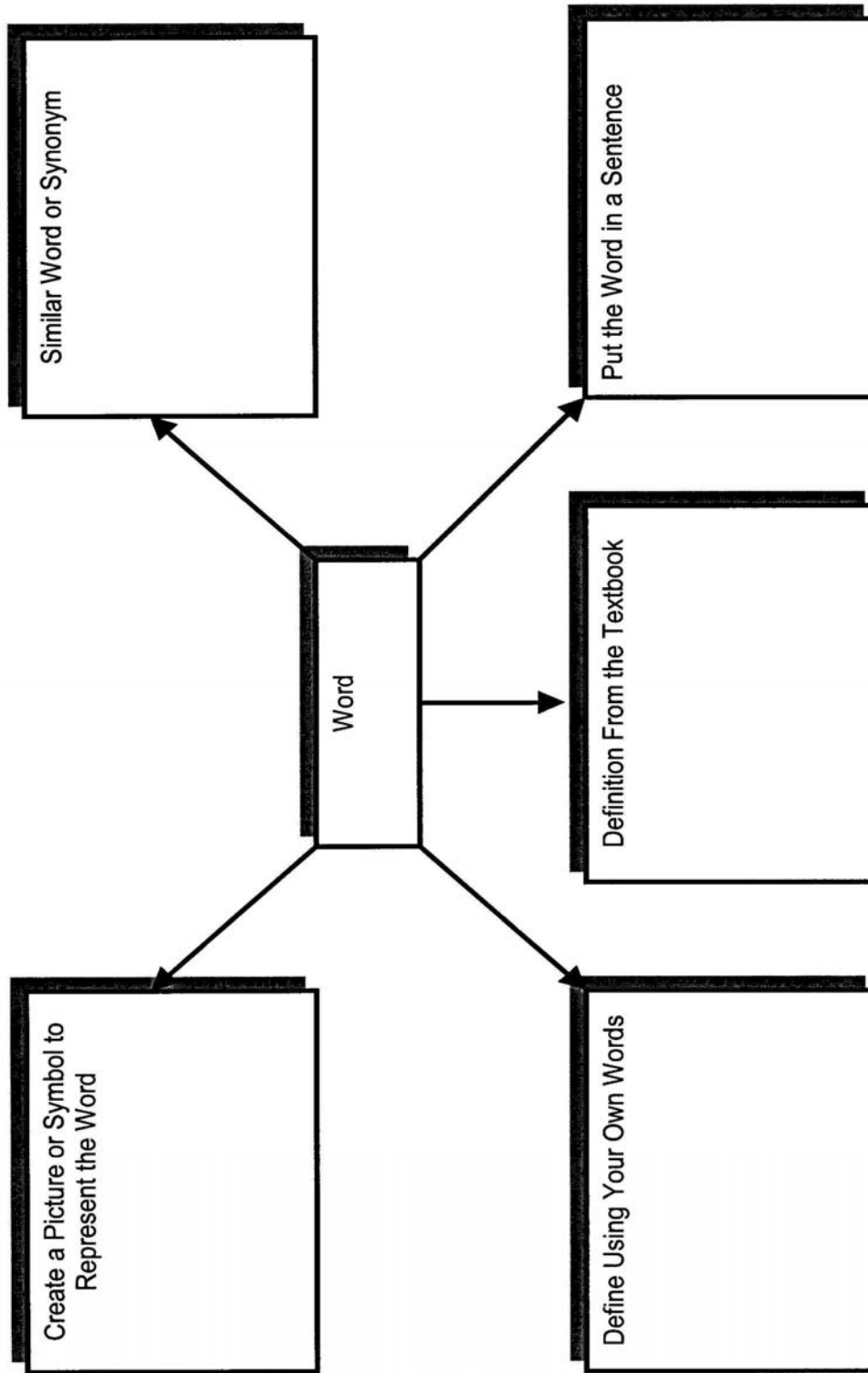
made up of





Student/Teacher Resource

Word Development Guide



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.



Teacher Resource

Word Wall for Science: Grade 9 Applied, Earth and Space

Earth and Space

asteroid	astronomical unit	astronomy
black hole	comet	constellation
fusion	galaxy	light year
luminous	meteor	meteorite
microgravity (free fall)	non-luminous	planet
revolution	rotation	satellite
star	supernova	

Word Cards with Definitions

asteroid - a small body composed primarily of rock that moves in outer space

luminous - a body that produces its own light (ie. The Sun is a luminous body)

supernova - an exploding star

Earth and Space (Grade 9 Applied) – Definitions

asteroid - a small body composed primarily of rock that moves in outer space

astronomical unit (AU) - a unit of measurement defined as being the distance from the Sun to the Earth; it is used to measure large distances in the Solar System

astronomy - the study of bodies in space and of the physical universe as a whole

black hole - a point in space in which the force due to gravity is so great that even a beam of light can't escape

constellation - a pattern imposed by humans upon a collection of stars, these patterns often resemble humans or animals

comet - a body made primarily of ice and dust; when it orbits the Sun it exhibits a long tail caused by the heating effect of the Sun

fusion - the process whereby the nuclei of atoms join together; a great deal of energy is released in this process (ie. this is how stars radiate energy)

galaxy - a large collection of gas, dust, planets, and stars held together by mutual gravitational attraction

light year - the distance that light will travel in a year (9.46×10^{12} km)

meteor - a small body composed primarily of rock that enters the Earth's atmosphere; this body causes a bright streak of light in the sky as result of friction with air

meteorite - what remains of small body of rock (meteor) originally from outer space after it hits the Earth's surface

microgravity (free fall) - a process in which it looks as if there is no gravity acting on an object; in reality, all objects are falling at the same rate

luminous - a body that produces its own light (ie. the Sun is a luminous body)

non-luminous - a body that can only be seen by reflected light; it does not produce its own light (ie. the Earth is a non-luminous body)

planet - a large body orbiting around a star; this body does not produce its own light

revolution - the motion of a body as it orbits another more massive body (ie. the moon revolves around the Earth, but the Earth revolves around the Sun)

rotation - the turning or motion of a body around a central axis going through the body (ie. the Earth rotates about an axis going roughly from the North Pole to the South Pole)

satellite - any body that orbits around another body (ie. the moon is a satellite of the Earth)

star - a large body in space that produces its own light



supernova - an exploding star

Teacher Resource

Word Wall for Science: Grade 9 Applied, Biology

Reproduction

asexual reproduction

cell division

cell membrane

cloning

chromosome

DNA

embryo

fertilization

fetus

gene

genetic engineering

hermaphrodites

mitosis

nucleus

propagation

sexual reproduction

Word Cards with Definitions

asexual reproduction - involves one parent producing genetically identical offspring

gene - is made of DNA and is linked together to form a chromosome, each gene is responsible for one specific function within a cell

nucleus - the control centre of all functions inside the cell

Biology (Grade 9 Applied) - Definitions

asexual reproduction – involves one parent producing genetically identical offspring

cell division – process in which the genetic information is copied and passed on to each new cell

cell membrane - the cell structure in plants and animal cells that covers the entire cell, and controls the movement of materials in and out of the cell - the gatekeeper

chromosomes – thread-like structures, found in the nucleus, that control the internal functions of a cell

cloning - the process of creating an identical offspring from a single cell or tissue

DNA – (deoxyribonucleic acid) is the chemical unit of genetic information, which is organized into packages called genes

embryo – a fertilized egg that has become more than a 100 cells in size through many cell divisions

fertilization – when the chromosomes in a sperm cell combines with the chromosomes an egg cell (producing a zygote)

fetus – (translates into young one) a point in the growth and development when an embryo no longer looks like a of a clump of cells but begins to look like its parents

gene – is made of DNA and is linked together to form a chromosome, each gene is responsible for one specific function within the cell

genetic engineering – a technology used to transfer genetic information from a cell in one organism to a cell in another organism

hermaphrodite - an organism that creates both male and female sex cells

mitosis – a process of copying and dividing the genetic material before the cell splits into 2 new cells

nucleus – the control centre of all functions inside the cell

propagation – to create more organisms from existing organisms (asexual or sexual reproduction)

sexual reproduction – involves 2 parents producing genetically different offspring

Word Wall for Science: Grade 9 Applied, Chemistry**Exploring Matter**

atom characteristic property chemical symbol

chemical formula chemical change compound

electron element families of elements

metal molecule neutron

nucleus periodic table physical change

proton pure substance relative mass

subscript number

Word Cards with Definitions

electron - a negative part of the atom that spins in layers around the centre

neutron - part of the centre of an atom without any charge

proton - part of the centre of an atom having a positive charge

Chemistry (Grade 9 Applied) - Definitions

atom – the smallest piece of matter with no charge, found in elements

characteristic property – a property by which one substance can be distinguished from another

chemical symbol - 1 or 2 letters used to represent names of elements

chemical formula – symbols and (subscript) numbers combined to represent the parts of a compound

chemical change – a process in which new substances with new properties are formed

compound – pure substance made of one kind of molecule

electron – a negative part of the atom that spins in layers around the centre

element – a pure substance that is made of only one kind of atom

families of elements- groups linked with similar chemical properties in the periodic table

metal – substances that share the same physical properties, such as conducting heat

molecule – a structure with 2 or more atoms combined

neutron – part of the centre of an atom without any charge

nucleus – the central part of an atom having a positive charge

periodic table – a chart of all the elements as they relate chemically to each other

physical change – is a change in the state or form of a substance

proton – part of the centre of an atom having a positive charge

pure substance – matter that contains only one kind of atom or molecule

relative mass – how much matter is in one atom of a pure substance compared to the mass in another atom of a different pure substance

subscript number – the number of atoms for each element found in a chemical formula



Word Wall for Science: Grade 9 Applied, Physics

Electricity

ampere (A)	cell	charge
circuit	conductor	current (I)
efficiency	electron	electricity
energy	fuse	grounding
insulator	joule (J)	load
ohm (Σ)	parallel circuit	potential difference (V)
resistance (R)	series circuit	volt (V)

Word Cards with Definitions

ampere (A) - the unit used for measuring electric current

joule (J) - the unit used for measuring energy

series - a circuit arrangement in which electrons all have to follow the same path

Physics (Grade 9 Applied) - Definitions

ampere (A) - the unit used for measuring electric current

cell - a device that changes one form of energy (i.e, solar, electrochemical) into electrical energy

charge - a measure of the electrical condition of an object in which it either has a surplus of electrons (a negative charge), or a shortage of electrons (a positive charge)

circuit - a complete path that allows electrons to flow

conductor - a material that allows charge (electrons) to easily flow through it

current (I) - a measure of the rate of flow of charge (electrons) in a conductor

efficiency - the degree to which electrical energy is converted to useful energy by the electrical device

electron - a negatively charged particle that orbits the nucleus of the atom

electricity - it is produced when electrons flow

energy - a measure of how much work can be done; it is measured in joules (J)

fuse - a safety device that will melt a lower current than that which will melt the wiring in a circuit

grounding - this refers to the flow of electrons either into or out of an object so that the final electrical condition of the object is neutral

insulator - a material that does not allow the passage of electrons

joule (J) - the unit used for measuring energy

load - it is that part of an electrical circuit on which the electricity performs work and the electrical energy is converted into another form of energy

ohm (Ω) - the unit measuring resistance

parallel circuit- a circuit arrangement in which the electrons have more than one pathway available to them

potential difference (V) - a measure of the work per unit charge between two points in a circuit

resistance (R) - a measure of how difficult it is for electrons to flow in a circuit; defined as potential difference (V) over current (I)

series circuit- a circuit arrangement in which electrons all have to follow the same path

volt (V) - a unit of potential difference

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.

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.

Reading Different Text Forms: Reading Informational Texts

Grade 9 Science, Applied (Space)

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 and diagrams 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 what we know about Mars using the technology of the time.
- Many informational texts use visual elements (such as typeface, size of type, and diagrams) 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 Information Texts*.
- See Teacher Resource, *Questions to Guide Reading: Exploring Mars*.
- See Student Resource, *Anticipation Guide: Exploring Mars*.
- See Student Resource, *Exploring Mars*.

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 **Anticipation Guide** in *Think Literacy: Cross-Curricular Approaches, Grades 7 – 12*.
- See **Think/Pair/Share** in *Think Literacy: Cross-Curricular Approaches, Grades 7 – 12*.



Reading Different Text Forms: Reading Informational Texts

Grade 9 Science, Applied (Space)

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, *Exploring Mars*). 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 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 diagram 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.



Questions to Guide Reading: Exploring Mars

What teachers do	What students do
<p>Before</p> <ul style="list-style-type: none"> • Why are we going to read this particular section? • How do we know what the big idea or main topic is? • What are some of the ideas to be covered in this topic and how do you know? • What do you already know about this topic? Students complete the Student Resource, <i>Anticipation Guide: Exploring Mars</i>. 	<ul style="list-style-type: none"> • We want to know about how technology has helped us to understand more about space. We are looking at one very recent example-Mars. • The main heading is at the top in bold in a box with a sentence to explain in italics. It is about exploring Mars, based on what we have learned over the years. • There are subheadings in bigger, bolder print above new paragraphs. The smaller topics are what we thought about Mars a long time ago, what we know now and what we hope to discover by exploration. • Students respond based on their prior knowledge or predictions/inferences using photographs, captions and headings to complete the Student Resource <i>Anticipation Guide: Exploring Mars</i>.
<p>During</p> <ul style="list-style-type: none"> • Read the Student/Teacher Resource, <i>Exploring Mars</i>. Using the sub-headings as an outline, write 2 or 3 important points from each section. 	<ul style="list-style-type: none"> • Students use dot jot notes (point form) to write the important information.
<p>After</p> <ul style="list-style-type: none"> • Use the Think/Pair/Share strategy to check your responses on the Anticipation Guide. • What do you think? 	<ul style="list-style-type: none"> • Students work in pairs to check their understanding. • Students respond to the question at the end of the text and discuss.



ANTICIPATION GUIDE: Exploring Mars

Define Reading

Part I - On the line before each statement, put a check mark next to any which you consider to be a correct fact.

Part II - Write 2 questions that you would like to learn about Mars, based on what you already know about this planet.

___ 1. It was once thought that shapes and colour variations on the surface of Mars were proof of a past civilization.

___ 2. Mars appears to be red in colour because of its thick atmosphere.

___ 3. The Spirit and Opportunity are the first 2 robots to explore Mars.

___ 4. Mars and Earth, in their orbits around the sun, get close together every 5 years.

___ 5. There is now evidence that ancient oceans once existed on this planet.

Part II - On the lines below, write your own 2 questions:

After Reading

Part III - After reading the text, compare your thinking about all 5 statements with information contained in the text. Now **correct** the statements that are wrong, on the line provided under each sentence.

Student/Teacher Resource

EXPLORING MARS

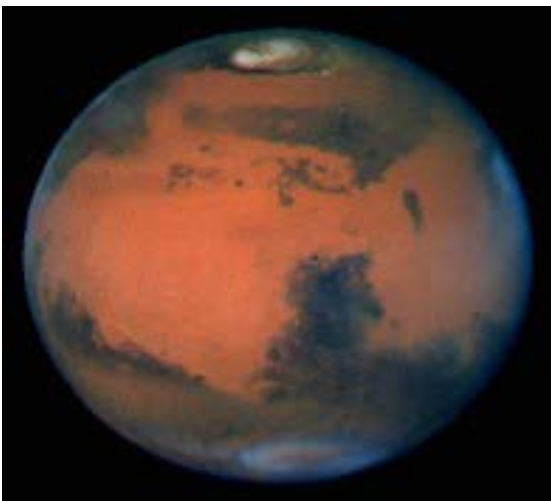
What we know and what we hope to discover about this planet!

Soon after the invention of the telescope, astronomers noticed that Mars was the only planet that looked something like Earth. Just over 100 years ago, it was believed that canals were visible on the surface of Mars. This meant that there must have been, at one time, a Martian civilization managing their water supply to the deserts. Scientists also thought that the dark zones were vegetation.

This wasn't disproved completely until 1972 when the U.S. Mariner 9 spacecraft sent back images to Earth that showed no canals and no plant life. We look forward to learning more about this mysterious red planet as cutting edge technology allows us to actually see what is on the surface.

Features from afar

Mars is red because of the iron oxide (rust like) minerals that cover the surface of the planet as dusty sand. It has deserts, volcanoes, canyons, dark coloured regions, rocky plains and two ice caps. Both ice caps change size with different seasons and the deserts change patterns, as hurricane-like winds blow across the surface. It does have a thin atmosphere containing some clouds. Mars passes close to Earth every 26 months and it is during this time that we can see these features with a good telescope.



Mars is half the size of Earth and has two tiny moons.
Courtesy <http://marsprogram.jpl.nasa.gov/>

Features from the surface

In 1996 the spaceships Viking 1 and 2 sent the first pictures of Mars from the surface of the planet. In 1997, the Pathfinder spacecraft and the robotic rover called Sojourner, sent detailed images of the landscape and sampled soil and rocks. Today, we have 2 robotic rovers, Spirit and Opportunity, which landed on opposite sides of the planet. Both robots can move 100m a day and carry the scientific equipment to view, analyze and communicate back to Earth.



*Notice that there are 6 wheels and a solar panel.
What does this tell you about the machine?*
Courtesy <http://marsprogram.jpl.nasa.gov/>

What might we learn this time?

The equipment used by the rovers, Spirit and Opportunity, can determine the age and chemistry of the rocks. The mission is to discover if there were large bodies of water on this planet in the past. If so, can any evidence of life, like fossils, be discovered by the robots in either location? Both robots are programmed to work for a few months on Mars. Future robots will travel the planet for a year or more. Looking further ahead, some robots may go to Mars to collect samples to be returned to Earth!

What do you think?

Should we, as a global community, continue to spend money on this type of space exploration?

Reading Different Text Forms: Reading Graphical Texts (Graphs)

Grade 9 Science, Applied (Chemistry)

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 Resource, *Tips for Reading Graphical Text*.
- See Student/Teacher Resource *Flame Test*.
- See Teacher Resource *Questions to Guide Reading: Flame Test*.

Further Support

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

Reading Different Text Forms: Reading Graphical Texts (Graphs)

Grade 9 Science, Applied (Chemistry)

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

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.

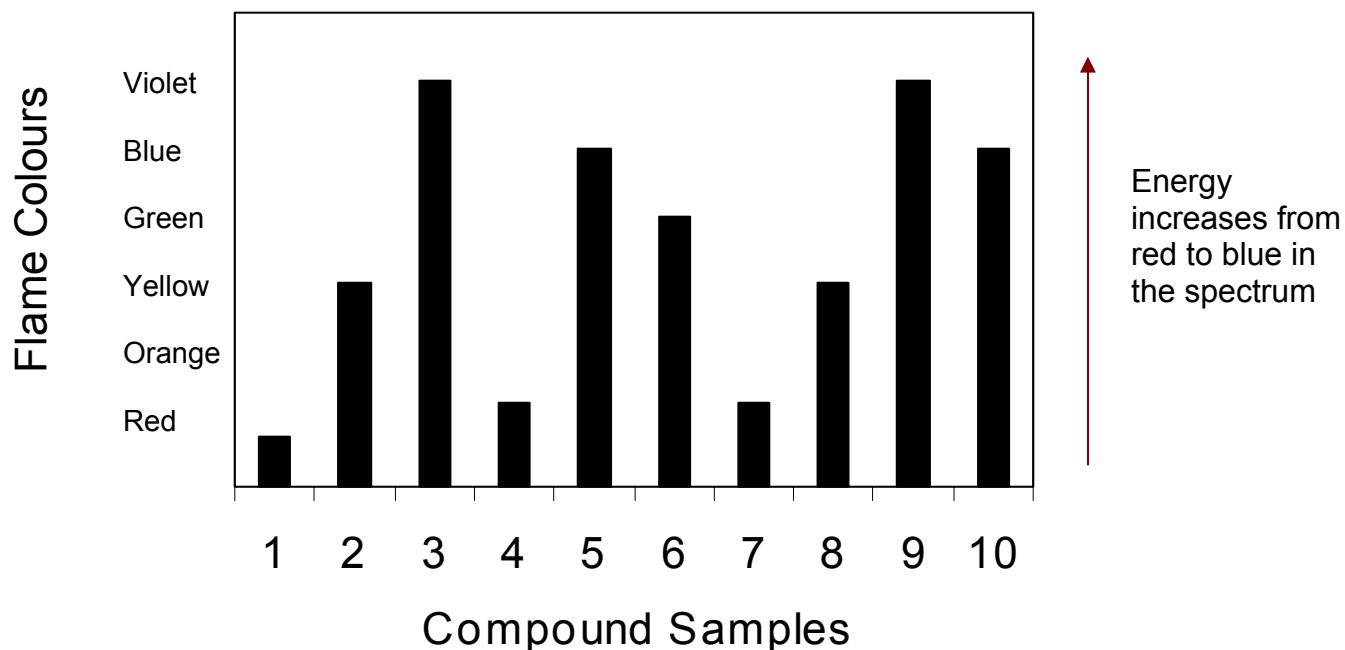


Teacher Resource

Questions to Guide Reading: Flame Tests

Questions to ask	Possible answers
<p>Before</p> <ul style="list-style-type: none"> • How is this page organized? • Predict what this page may be about and how it would tie in with what we have been doing in class. • What type of graphic is this and why did the author choose to use it? 	<ul style="list-style-type: none"> • There is a graph, a box that could be a key or legend, and a section with words under the bold title. • Answers may vary. • It is a bar graph and it is used as a visual comparison of information.
<p>During</p> <ul style="list-style-type: none"> • What are the names of each axis? How are they related? • What information is given in the key (the box)? • Give the numbers with corresponding names of the bars that are similar and those that are different. • Read slowly the text section “About Flame Tests”. Paraphrase the information the section gives you. 	<ul style="list-style-type: none"> • The y-axis list the colours (on the left), and indicate the energy increases from red to blue (on the right). The x-axis has the 10 samples, by numbers, that were tested. • The names of the compounds. • Students list the similar and different bars compounds based on bar length. • Students put the information in their own words and check understanding.
<p>After</p> <ul style="list-style-type: none"> • How does the graph help you understand the relationship between some elements? • Think/Pair/Share the patterns you see. In your own words write an explanation of these patterns. • Is there another way this information on the graph could be presented? • Where could this knowledge be used? 	<ul style="list-style-type: none"> • It presents similar patterns in the compounds that contain the same metal, which you apply to answer the question about the unknown sample # 10. • Students record the patterns they see referring to the key to make inferences. • It could be in the form of a T-chart such as observations in an experiment. • It can be used in making fireworks.

FLAME TESTS



1 Lithium Chloride	6 Copper (II) Sulphate
2 Sodium Chloride	7 Strontium Nitrate
3 Potassium Chloride	8 Sodium Hydrogen Carbonate
4 Strontium Chloride	9 Potassium Carbonate
5 Copper (II) Chloride	10 Unknown

About Flame Tests

When samples of metallic compounds are heated, the flame will change colour. The reason is the electrons in the metal atoms gain energy and jump to a higher energy level. Later when the electrons return to the original energy level, the extra *energy is converted to light*. The colour is a measure of the amount of energy (in the visible light spectrum) that was gained and then lost by the metal in the compound sample.

What would you predict is the metal in the unknown compound – sample # 10?

Reading Different Text Forms: Reading Graphical Texts (Schematic Diagram)**Grade 9 Science, Applied (Electricity)**

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 Resource, *Tips for Reading Graphical Texts*.
- See Student Resource/Teacher Resource, *Can you analyze this circuit?*
- See Teacher Resource, *Questions to Guide Reading: Can you analyze this circuit?* These questions can be adapted for use with a variety of diagrams, 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 diagrams. Some suggested prompts are provided in the Teacher Resource, *Questions to Guide Reading: Can you analyze this circuit?*

Further Support

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

Reading Different Text Forms: Reading Graphical Texts (Schematic Diagram)

Grade 9 Science, Applied (Electricity)

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 Resource/Teacher Resource, *Can you analyze this circuit?*). 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

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.

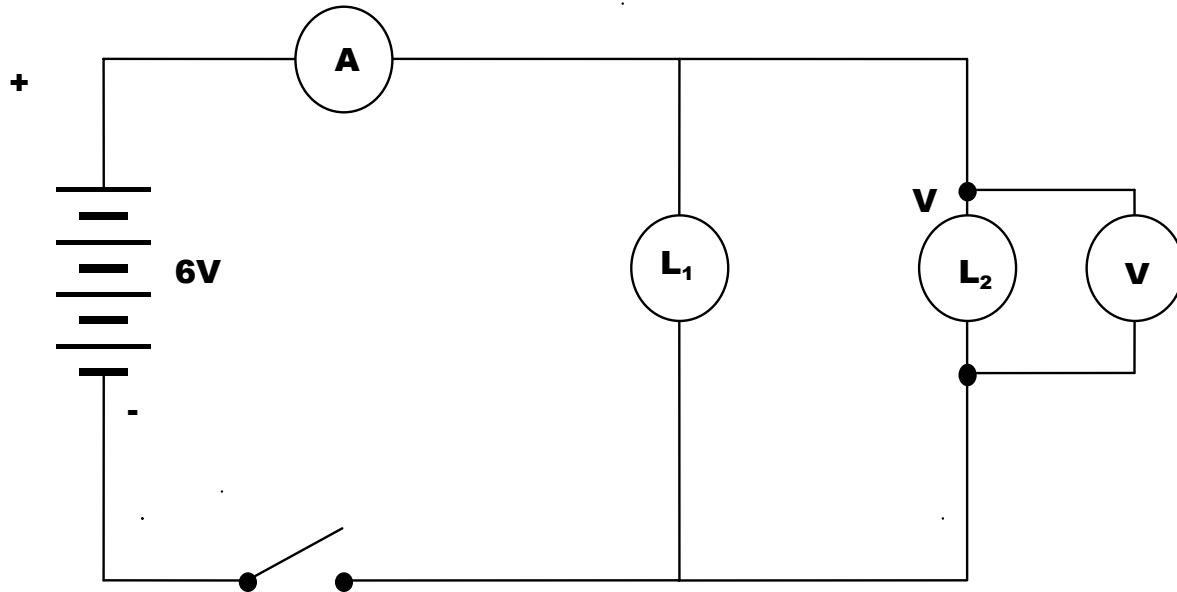


Teacher Resource

Questions to Guide Reading: Can you analyze this circuit?

What teachers do	What students do
<p>Before</p> <ul style="list-style-type: none"> • Scan the diagram and quickly decide what it means. • What other clues are there to tell you what the graphic will be about? • What type of graphic is this? • What is the purpose of this type of graphic? 	<ul style="list-style-type: none"> • We have a general idea of a simple circuit with a switch that has a power source, meters and lights. • There are symbols, numbers and a caption/question to consider. • This is a schematic diagram. • The purpose is to display all of the features in a given circuit for analysis/comparison.
<p>During</p> <ul style="list-style-type: none"> • Examine and identify all of the symbols. What do they mean? How do they relate to another? • Where do you start to analyze the circuit? How do you know? • Where is the end of the circuit? How do you know? • Is there a specific direction to be followed? How do you know? Add arrows to the diagrams to indicate the flow of electrons. • How does this diagram help you to understand the question being asked? • What information does the caption/question give you? 	<ul style="list-style-type: none"> • Students draw on prior knowledge to answer the questions about the circuit, which in essence is reviewing how to “read” a circuit. • It allows you to see all of the components when considering where the third light bulb will be added to the circuit. • Students should realize that this creates a series circuit inside a parallel circuit once they have placed the new bulb next to bulb #1.
<p>After</p> <ul style="list-style-type: none"> • How would the altered circuit, in the question, look different? • What relationships do you see? How does this visual help you understand? • Do you now have all the information you need to solve this question? What information is missing? Do you have any questions? 	<ul style="list-style-type: none"> • Students add the extra light bulb #3 to the given diagram. • This requires a comparison between the given (which is parallel) and the altered (a series within a parallel) circuits. Visually you can see the difference.

Can you analyze this circuit?



Would the brightness of the light bulbs (#1 + #2) change if you added another light bulb (#3) next to the first one, on the same wire, in this circuit? Explain your thinking.

Reading Different Text Forms: Reading Graphical Texts (Flow Chart)

Grade 9 Science, Applied (Reproduction)

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:
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- Many of the strategies for reading informational and literacy texts can also be used effectively to read graphical texts.
- See Student/Teacher Resource, *Reproduction*.
- See Teacher Resource, *Questions to Guide Reading: Reproduction*.

Further Support

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

Reading Different Text Forms: Reading Graphical Texts (Flow Chart)

Grade 9 Science, Applied (Reproduction)

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, *Reading Different Text Forms: Reproduction*). 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.
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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?
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 - 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.

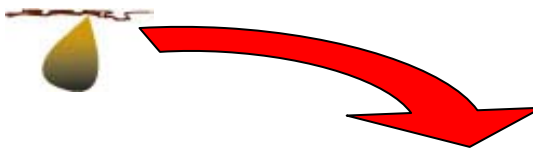


Teacher Resource

Questions to Guide Reading: *Reproduction*

Questions to ask	Possible answers
<p>Before</p> <ul style="list-style-type: none"> • What clues are there to help you make inferences as to what the graphic will be about? • What type of graphic is this? • What is the purpose of this type of graphic? • What information is needed to help someone tell what this graphic is about? 	<ul style="list-style-type: none"> • Bold print gives you the parts of a flower and arrows give you direction. It is the changes that a flower undergoes as it grows. • This is a flow chart. • It is a visual aid to show the order of events. In this case it is the life cycle of a flower. • A title is needed, <i>The Life Cycle of a Plant</i>.
<p>During</p> <ul style="list-style-type: none"> • Where is the beginning of the cycle? The end? Is there a specific direction to be followed? Give reasons. • Start at the beginning and Think/Pair/Share the headings, captions and images. Paraphrase the information they give about the cycle of a plant. • What information or insight do the captions give you? 	<ul style="list-style-type: none"> • Students' responses should indicate an understanding of how to read a cycle graphic. • Answers should be based on each step in the process. • They explain what the pictures cannot tell you and they help your understanding.
<p>After</p> <ul style="list-style-type: none"> • Write a brief summary, in your own words, about the life cycle of a plant. • How does this flow chart help you to understand the life cycle of a plant? • Where else have you seen the use of a flow chart? Record responses on a chart paper. 	<ul style="list-style-type: none"> • Students may organize the information in a way that is best for them e.g., list. • Answers may vary. • Examples could be the water cycle, carbon dioxide cycle, etc.

Reproduction



SEED

Seeds are easily stored, compact, and are usually dark brown (protective colouring). They survive in extraordinary circumstances



GERMINATION

With water, the right temperature and the right location (e.g. soil) the seed begins to make a new plant.



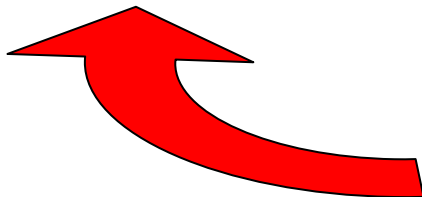
LEAVES

Leaves unfold to absorb sunlight to produce food for growth.



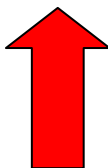
ROOTS & STEMS

Roots push down to anchor the new plants while they take up minerals and water from the soil and stems grow more leaves.



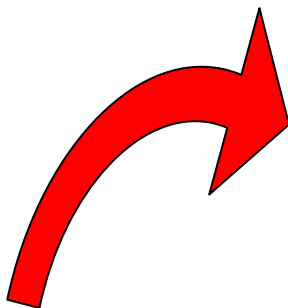
FLOWERS

Most plants produce flowers containing eggs that need to be fertilized.



POLLINATION

Flowers are pollinated by insects, animals or the wind. Pollen contains the sperm cell that fertilizes the egg cell and a seed is created.



Reading Different Text Forms: Following Instructions

Grade 9 Science, Applied (Chemistry)

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, *Investigating the Properties of Change*.
- See Teacher Resource, *Questions to Guide Reading: Investigating the Properties of Change*.

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 9 Science, Applied (Chemistry)

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, *Investigating the Properties of Change*) 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



Questions to Guide Reading: Investigating the Properties of Change

What teachers do	What students do
<p>Before</p> <ul style="list-style-type: none"> 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. What additional requirements does a scientific set of instructions include? Provide students with a copy of the instructions and model how to preview the instructions. Clues can be found by looking at the focus of the Analysis questions. 	<ul style="list-style-type: none"> The list should include a title, a numbered or bulleted series of steps in sequence, clear organization and sub-headings. Scientific instructions should include a question, hypothesis, materials, procedure, observations and a conclusion. Identify the title, read the introduction, check out the italicized or bold words for meaning, and note the sequence.
<p>During</p> <ul style="list-style-type: none"> Read the instructions aloud with the students noting the signal words—place, fill, add, repeat, and mark. Using think/pair/share strategy, students paraphrase to identify the task to be completed and what they are expected to do. (The experiment will take 3 days to collect and record data for this chemical change.) 	<ul style="list-style-type: none"> Students note the signals, highlight or underline, and clarify what they tell the reader to do. Students use their own words to clarify the instructions in the experiment. Students may create a diagram to assist in visualizing the steps.
<p>After</p> <ul style="list-style-type: none"> What parts of the instructions are not clear? Use a flow chart to outline the required steps. Conduct the investigation, and compare results with another group. What problems did you run into as you tried to follow the instructions? What strategies did you use to solve the problems? 	<ul style="list-style-type: none"> Answers may vary. Students complete the organizer. Think/Pair/Share format (as a group) for the investigation and results. Answers may vary.

INVESTIGATING THE PROPERTIES OF CHANGE

In this experiment, which will take 3 days to complete, you will make observations to use in deciding if a chemical or physical change has taken place.

Purpose

The purpose of this experiment is to investigate some properties of change. After reading the instructions formulate a *hypothesis* that states what you believe will happen.

Materials

1 graduated cylinder
1 tall thin jar with a narrow neck (gas bottle)
steel wool – moistened with water
shallow pan filled with water
permanent ink marking pen

Procedure

1. Take a clump of wet steel wool and push it into the bottom of the jar. Use a big enough piece so that it will stay wedged in place when the jar is put upside down.
2. Fill the jar to the very top with water and then pour this water into a graduated cylinder. Make sure the steel wool stays at the bottom of the jar.
3. Record the volume of water (mL) as this number represents the volume of air the jar can hold with the steel wool in place.
4. Invert the jar of air and steel wool into the pan of water. It will remain upside down in the water for the next 3 days. Tomorrow is day #1.
5. **Design an observation table** to record the data. Each day you will observe the appearance of the steel wool and with the marking pen, draw a line on the jar to indicate the level of the water.
6. In order to measure the amount of water that moved into the jar, after your last observation on day #3, you will need to take the jar out of the pan and fill it up to the final level line you have drawn. Measure the volume (mL) of water with the graduated cylinder. This represents how much air has *disappeared* over 3 days.

Analysis and Conclusion

- (1) Is this an example of a physical or chemical change? State the evidence to prove it.
- (2) Steel wool has the element iron in it. Where have you seen this kind of change happen in every day life?
- (3) Explain why the water moved up and into the jar. Why didn't all of the air disappear? (HINT – what gases are in air?)

Challenge

Write the word equation for this change. What 2 elements are found in the product?