

CONTENTS: Grade 9-10 Science

Writing Strategies

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Generating Ideas: Setting the Context

SCIENCE Grades 9-10

It is the expectation of the science curriculum that students develop critical thinking skills in formulating questions about science-related issues, integrating information from various sources, and communicating the results of their research using a variety of oral, written, and graphic formats.

Good writers anticipate the information and ideas that readers may want or need to know about the subject. Imagining and considering the possible questions that the intended audience may have about the topic help to generate content for the writing, suggest a writing form, and provide a direction for research.

Purpose

- Identify the audience and purpose for the writing.
- Identify important ideas and information to include in the writing.
- Generate possible topics and subtopics for a writing task.

Payoff

Students will:

- clarify the writing task (purpose, audience, form).
- consider the audience and the purpose for the writing.
- generate questions and use them to focus the writing.

Tips and Resources

- Review *Introduction to Writing Strategies* in *Think Literacy: Cross-Curricular Approaches, Grades 7-12* on page 97 and the *Think/Pair/Share* strategy in *Think Literacy: Cross-Curricular Approaches, Grades 7-12* on pages 152, 153 and in this Resource on Page 2 of the [Oral Communications Strategies](#) section.
- Review **R.A.F.T.S.** (role of writer, audience, format, topic, strong verb) strategy in *Think Literacy: Cross-Curricular Approaches, English Grades 7-9* on pages 35-37. (http://www.elan.on.ca/ThinkLiteracy/IntroTL_summer202004.htm). **R.A.F.T.S.** is a pre-writing organizer that supports students in understanding their role as writers, the audiences they will address, the varied formats for writing, and the expected content.
- **Purpose** refers to the reason for the writing and the results that writers expect from the writing. Some writing is intended to communicate information to the reader. The purpose of these writing forms include: *to inform, to explain, to review, to outline, and to describe*. Other writing forms convince the reader of a particular viewpoint. The purpose of these forms include: *to request, to persuade, to assess, to recommend, to propose, to forecast, and to entertain*. The purpose for the writing will affect the selection of content, language, and form.
- **Audience** refers to the intended readers of the writing. Defining the audience is important because it will affect the content (what is said), and the form and features (how it is said). The intended audience may vary in age, background knowledge, experience and interest.
- See the following resources:
 - Student/Teacher Resource, *Generating and Refining the Questions*.
 - Student Resource, *Checklist for Refining the Questions*.
 - Student Resource, *Writing an Outline*.
 - Student Resource, *Organizing Ideas Template*.

Further Support

- When students are working in pairs, have each partner generate questions for the other's topic.
- To generate ideas, ask questions about the topic from the point of view of the intended audience. Provide support for asking rich questions.
- Review the 5Ws + H questions (who, what, when, where, why, how).



Generating Ideas: Setting the Context

SCIENCE Grades 9-10

Notes

What teachers do	What students do
<p>Before</p> <ul style="list-style-type: none"> • Prepare an assessment task that describes the purpose and audience for the piece of writing (e.g., to inform community members about the environmental concerns related to the ways in which metals, such as copper or uranium, are mined and processed; write a letter to the mayor regarding the impact of converting an open field into a supermarket with a large parking lot; describe to grade 6 students the sun and its effects on the Earth and its atmosphere). • Model for students the process of imagining the readers in their class and the possible questions they would ask about the topic, and record these questions under the topic heading. For example, on the topic of the sun: <ul style="list-style-type: none"> - What is the composition of the sun? - Where does the sun’s energy come from? - How is solar energy transmitted to Earth? - Why is the sun considered to be the most important star? <p>Ask students to contribute questions that they think the audience need/want answered.</p>	<ul style="list-style-type: none"> • Recall what they already know about the topic. • Imagine the questions they would ask as readers of a piece of writing on this topic. • Make connections to other students’ questions, noting similarities and differences. • Imagine that they are the readers and generate possible questions.
<p>During</p> <ul style="list-style-type: none"> • Ask students to review their selected topics for the assigned assessment task and identify the audience and the purpose. • Have students (in pairs, small groups, or individually) create possible questions that the readers may have about the topic. • Have students share and compare the questions for similar topics. Students may wish to add to or refine their list of questions. 	<ul style="list-style-type: none"> • Use their prior knowledge of their topic and imagine what their reader might want to know. • Contribute to the discussion. • Work in pairs to record questions. • Report on questions that the pairs or groups generated.
<p>After</p> <ul style="list-style-type: none"> • Model for students how to organize the questions into a possible outline for their writing, and use the questions to focus their first draft writing or research. • Ask students to use their questions to create a writing outline. • Ask students to use their writing outline to begin writing about their topic. 	<ul style="list-style-type: none"> • Listen to the teacher’s thinking process for organizing the questions. • Work individually; use the writing outline to respond to the questions to get started on the writing assignment.



Generating and Refining the Questions

NAME OF WRITER	
TASK	Write a report to be presented to your classmates on how acid rain is affecting the fish population of Ontario's small lakes over the years.
TOPIC	Acid Rain
AUDIENCE	Grade 10 Science students

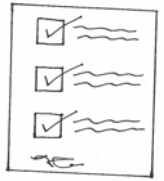
Possible Questions	Meeting the Reader's Needs (adding to the Questions)
(Examples of possible questions generated by the writer) What is acid rain? How is acid rain formed? What causes acid rain? How does acid rain change the conditions in small lakes in Ontario? How does acid rain affect fish? How does acid rain affect fish populations?	(Examples of possible questions the reader would ask) What air pollutants contribute to acid rain? How do the pollutants that cause acid rain get into the air? Who is responsible for producing the pollutants? Why does acid rain affect fish? What is the effect of acid rain on Ontario lakes? What can be done to reduce the pollutants in the atmosphere that produce acid rain?

REFINED LIST OF QUESTIONS RELEVANT TO THE TASK

--



Student Resource



Checklist for Refining the Questions

SCIENCE

NAME OF WRITER	
TASK	
TOPIC	
AUDIENCE	

CRITERIA FOR INITIAL QUESTIONS	Self assessment		Peer assessment Rating Scale				Peer assessment SUGGESTIONS
	YES	NO	1	2	3	4	
The questions are relevant to the topic.							
The questions are appropriate for the intended audience.							
The questions address all the 5Ws+H.							
The wording of the questions is clear.							
CRITERIA FOR REFINED QUESTIONS							
The refined questions are relevant to the task.							
The important questions are listed.							
Other helpful comments:							
Peer Editor Signature:							



Writing an Outline



1. State the specific topic to be researched.

2. Identify the focus of the task (i.e., the purpose and the audience).

Compile a report on _____ to be presented
to _____.

3. Choose and organize the questions by their relevancy to the task.

-
-
-
-
-

4. Conduct a preliminary research on the topic guided by the chosen questions and key phrases from the task, e.g., “effects of acid rain on Ontario lakes.”

5. Summarize the findings in chart form.

6. Organize the information from the chart in a logical order to address the task/focus (see Student Resource, *Template for Organizing Ideas*).

7. If necessary, rethink and redirect the research information to maintain the focus.

8. Add additional details and supporting evidence necessary to complete the task.

9. Begin writing the first draft.



Student Resource

Organizing Ideas Template

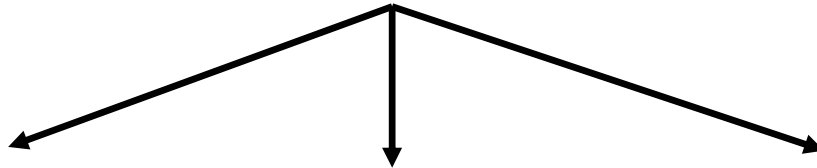


TOPIC/FOCUS:



KEY IDEAS:

-
-
-
-



IDEA #1 (1ST Sub-Topic)	IDEA #2 (2ND Sub-Topic)	IDEA #3 (3RD Sub-Topic)

CONCLUSION:

Generating Ideas: Adding Content (Pass It On!)

SCIENCE Grades 9-10

This strategy provides feedback to students before they start their first draft. Students exchange their initial brainstorming ideas and notes for a writing task. They read each other's notes and ask questions designed to help the authors draw out more details for their first draft. This peer input is particularly important in science to ensure that all the details required to support the writing task are present.

Purpose

- Identify ideas and information that may have been overlooked.
- Reconsider and revise initial thoughts before writing the first draft.
- Teach students how to question others and themselves.

Payoff

Students will:

- ask who, what, where, when and how (5Ws+H) while writing and editing.
- add and support ideas, with the help of others and then on their own.

Tips and Resources

- *Pass it On!* is a good follow-up to *Generating Ideas: Setting the Context (What Do My Readers Want to Know?)* For less complex writing tasks, it may be possible to save time by combining both tasks in the same period.
- *Rapid Writing* is an effective writing strategy for generating ideas that may also be useful prior to conducting a *Pass it On!* session. Your students may already be familiar with *Rapid Writing* from other subject-specific literacy exercises. See *Think Literacy Cross Curricular Approaches, Grades 7-12* pp. 98-100.
- The *Pass it On!* strategy is particularly useful if students are conducting research on related topics or compiling their research into one large project (e.g., alternative ways of generating electricity).
- Remind students to keep track of the sources of their information.
- See Teacher Resource, *Adding Content – Annotated Student Sample* and Student Resource, *Instructions for Adding Content (Pass it On!)* p. 11.

Further Support

- Teachers should model the process of asking questions about a writing sample.
- Compile sample student *Pass It On!* activities. These serve as useful exemplars. It would also be useful to keep samples of the final writing tasks to show how the *Pass It On!* ideas were incorporated.
- It may be useful for students to compile a glossary of terms or create a **Word Wall** while brainstorming and researching ideas. New terms that come up during the peer exchange can then be added. The word wall helps students to learn new science terms and use them in the correct context. See *Think Literacy Cross Curricular Approaches Grades 7-12 Subject –Specific Examples Science & Technology, Grades 7-8 Science, Grade 9 Applied, Extending Vocabulary (Creating a Word Wall)* pp. 109-124.



Generating Ideas: Adding Content (Pass It On!)

SCIENCE Grades 9-10

Notes

What teachers do	What students do
<p>Before</p> <ul style="list-style-type: none"> • Assign a topic based on course content. • Distribute the Student Resource, <i>Instructions for Adding Content (Pass it On!)</i>, p. 11. • Review who, what, where, when, why and how (5Ws+H), using the handout. • Remind students about the purpose of this activity - to ask questions (based on what's already there) that they would like the writer to answer. • Create groups of 4-6 students. 	<ul style="list-style-type: none"> • Individually brainstorm or make notes for the topic. • Reread the instructions with the teacher.
<p>During</p> <ul style="list-style-type: none"> • Time the students; have them pass their work to the person to their left and add questions to the work that is handed to them. In 3 to 5 minutes, depending on the length of the work, call "time" and have the students pass their work to the left again. • Have students continue until the work has been returned to the original author. • (Optional) Ask students to begin answering the questions they see on the papers in front of them, once the work has been passed to at least two others in the group. 	<ul style="list-style-type: none"> • Within their groups, pass work to their left and quickly skim the work handed to them. • As they read, ask questions based on the 5Ws and H. • Work silently. • Write comments in the margins of the notes or on stick-on notes. • (Optional) Start answering some of the questions others have written on the work, once they have questioned the work of at least two of the people in the group - even if it is not theirs.
<p>After</p> <ul style="list-style-type: none"> • Use the edited work and the answers to the questions as the basis for a written assignment. 	<ul style="list-style-type: none"> • Try to answer as many questions as possible when they get their own work back. • Use the questions and answers as the basis for responding to the written assignment.



Adding Content- Annotated Student Sample

SCIENCE Grades 9-10

Peer Suggestions

Student Sample

Peer Suggestions

The Pro's and Con's of Genetically Modified Crops

Introduction

- what are GM crops?
- how are they made?

Explain how making GM crops is different from selective breeding

What are some examples? Are any grown in Canada?

Pro's of GM crops

- healthier, crops that pests don't like to eat
- less pesticides are used on these crops
- increased crop yields

What do you mean by increased crop yield?

Con's of GM Crops

- GM crops are unnatural
- the effects on GM crops on the environment haven't been totally tested

What do you mean by unnatural?

Yield means the amount of crop grown on a certain amount of land

I think "unnatural" means that they can't breed naturally

Conclusion

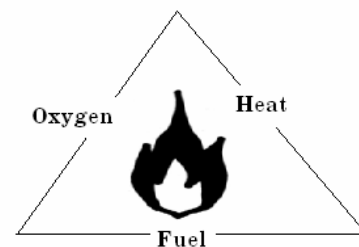


Student Resource

Instructions for Adding Content (Pass It On!)

SCIENCE Grades 9-10

Three essential ingredients contribute to keep a fire burning: fuel, heat and oxygen. Increasing one or more of these ingredients makes the fire even larger. Similarly, your brainstorming has produced the initial ideas or ingredients for a writing task. In order for your writing task to grow like the fire, you need the input of more ideas. The source of these ideas will be the members of your *Pass It On!* group.



Here's how it works.

1. Form groups of 4-6 students, as directed by your teacher.
2. Pass your work to the person on your left. Skim through the work that *you* have received from the person on your right. Work quickly so you can complete your work in the time limit given by your teacher. Don't worry if you don't finish. The next person in the group will probably deal with the parts you missed.
3. As you read, silently ask yourself questions based on the 5W's and How. Some of your questions might be:
 - What does this mean?
 - What is this all about?
 - What are some other possibilities?
 - When did this occur?
 - Who was involved?
 - Why did this happen?
 - Where did this occur?
 - How did this affect _____?
4. Do not talk until you have passed around all of the work. If you can't read or understand something, don't ask the person. Just write down a question or comment, such as "I don't understand this" or "I can't read this".
5. Write in the margin or at the top of the page, or in the lines – just don't write on top of someone else's writing! Otherwise, write your comments on the stick-on notes provided by your teacher.
6. Once you have questioned the work of at least two of the people in our group, your teacher may ask you to start answering some of the questions others have written on the work- even if the work is not yours.
7. When you finally get your own work back, try to answer as many of the questions as you can. This additional information will hopefully improve your writing.

Developing and Organizing Ideas: **Webbing, Mapping and More**

SCIENCE Grades 9-10

Effective writers use different strategies to sort and piece together information they have gathered through research in order to make connections, identify relationships and determine possible directions and forms that their writing will take. This strategy gives students the opportunity to reorganize, regroup, sort, categorize, classify, and cluster their information prior to writing the first draft .

Purpose

- Identify relationships and make connections among concepts and information.
- Select concepts and information to be used for reports.

Payoff

Students will:

- model critical and creative thinking strategies.
- learn a variety of strategies that can be used throughout the writing process.
- reread notes, gathered information, and writing for a specific writing task.
- organize ideas and information to focus the writing task.
- demonstrate their understanding of key concepts and how these concepts are interconnected.

Tips and Resources

- Strategies for webbing and mapping include:
 - *Clustering* - looking for similarities among ideas, information or things, and grouping them according to characteristics (e.g., group these elements according to similarities in their chemical properties).
 - *Comparing* – identifying similarities among ideas, information or things (e.g., compare the biodiversity between a natural and an artificial ecosystem).
 - *Contrasting* – identifying differences among ideas, information or things (e.g., distinguish between conductors and non-conductors).
 - *Generalizing* – describing the overall picture based on the ideas and information presented (e.g., what is the impact of the introduction of fertilizers on the ecosystem)?
 - *Sorting* - arranging or separating into types, kinds, sizes, (e.g., classify the following organisms according to their mode of reproduction).
 - *Trend-spotting* – identifying things that generally look or behave the same (e.g., compare the reactivity of the alkali metals with water).
- Coloured stick-on notes are useful to help organize related ideas. Related ideas can be written on stick-on notes of the same colour.
- Student generated mind maps provide formative assessment of student understanding of a concept.
- Review some common graphic organizers. See Student/Teacher Resource, *Types of Graphic Organizers* p. 14.

Further Support

- Provide students with sample graphic organizers that guide them in sorting and organizing their information and notes e.g., clusters (webs), sequence (flow charts), comparison (Venn diagrams).
- SMART Ideas ® is concept mapping software that is Ministry licensed and is available for students and teachers to use. It provides a variety of graphics and templates that facilitates the production of professional-quality concept maps. The software should be available through your school's computer resource coordinator.



**Developing and Organizing Ideas:
Webbing, Mapping and More**

SCIENCE Grades 9-10

What teachers do	What students do
<p>Before</p> <ul style="list-style-type: none"> Review the purpose and use of graphic organizers (see Student/Teacher Resource, <i>Types of Graphic Organizers</i>). Select a sample of a writing task (e.g., a research report on the impact of human activity on the carbon cycle – see sample). Post a series of stick-on notes, each containing a key idea for a specific topic. Model for students how to make connections among the ideas (e.g., moving the stick-on notes around and then linking related ideas with arrows). Identify and review the advantages of different types of graphic organizers. 	<ul style="list-style-type: none"> Recall past use of graphic organizers. Bring their research notes on a specific writing task to class. Note the concept connections that the teacher makes for the sample topic.
<p>During</p> <ul style="list-style-type: none"> Provide students with coloured stick-on notes or paper strips to record key ideas. Students with weak organizational skills will benefit from using coloured stick-on notes, with each colour having a different purpose. Work with students to create a mind map on a familiar topic. Ask questions to clarify the connections. For example: <ul style="list-style-type: none"> Is this important? Why? What does this mean? Is there another way to show the connection between these two ideas? Invite different groups to share their mind maps with the class. Point out differences in logic/structure. Stress that maps can be quite different and still show idea relationships. 	<ul style="list-style-type: none"> Record the key ideas for the familiar topic on stick-on notes or strips of paper. In small groups, manipulate the “key idea” strips until they reach an agreement about how the key ideas are connected. Share their mind maps with the class. Note similarities and differences about their maps with those of other students.
<p>After</p> <ul style="list-style-type: none"> Have students refer to their notes for the writing task. Ask students to create a mind map for their next writing assignment. Some students may prefer to create their map using cut-and-paste strips of paper. Question the connections they use. Use students’ responses as formative assessment of their understanding. Ask students to reread and check their mind maps for validity. Then, use the mind maps to create an outline of their writing task. 	<ul style="list-style-type: none"> Reread notes and identify important information and ideas. Use the question prompts to rephrase notes, identify key ideas and establish connections between them. Create a mind map for their topic. Check the validity of their map by justifying the links between ideas to a peer or the teacher.

Notes

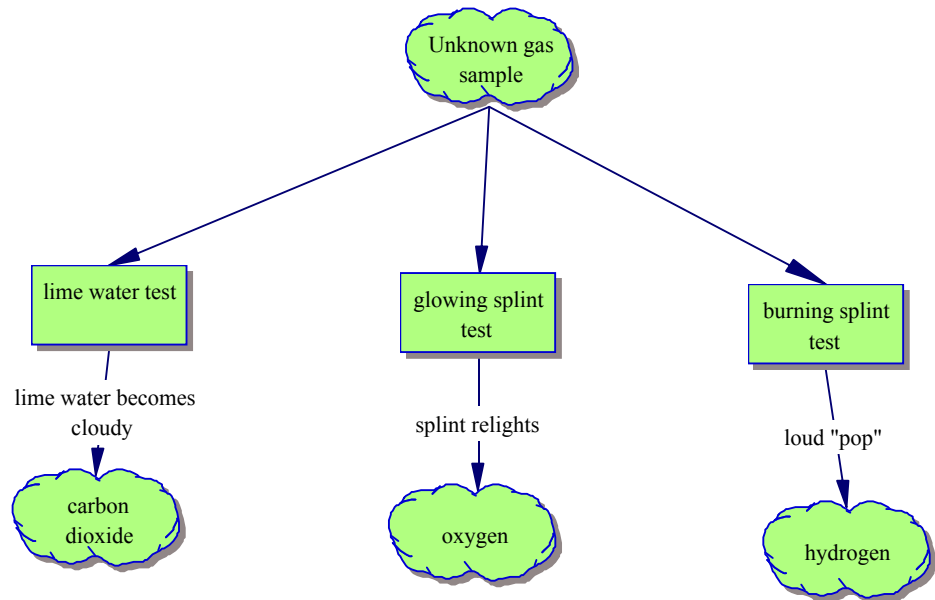


Types of Graphic Organizers

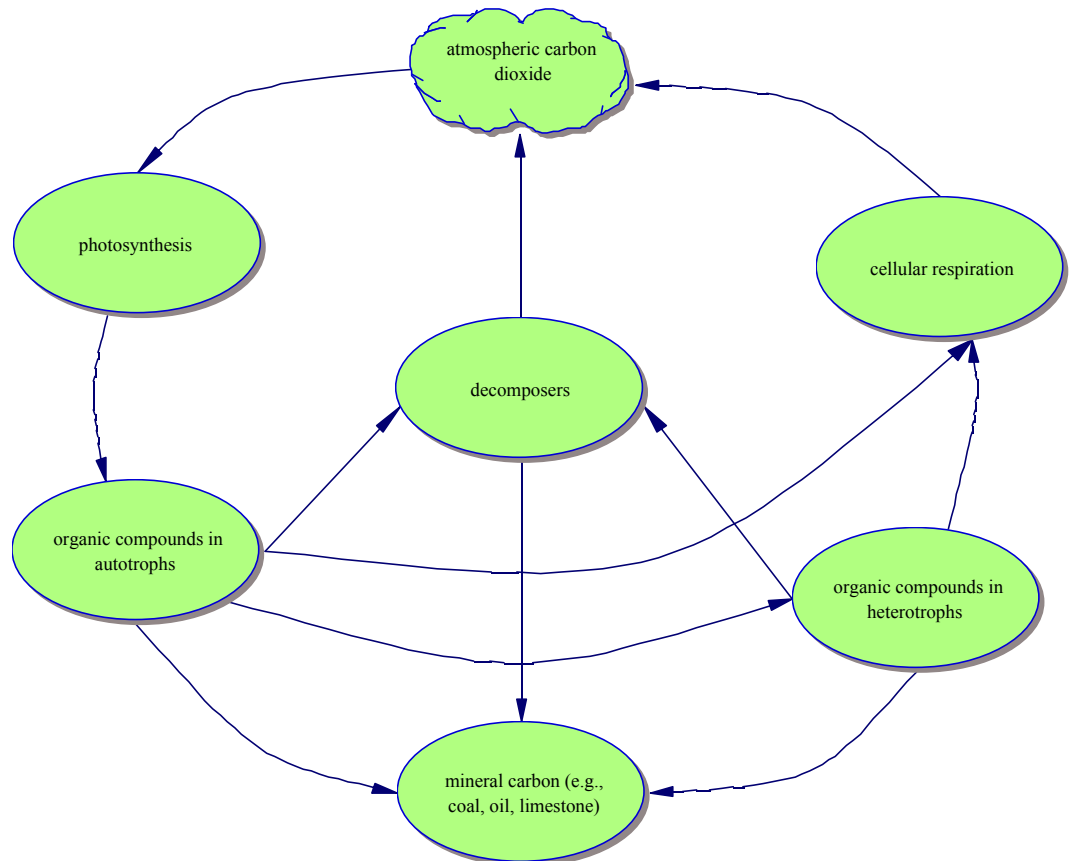
SCIENCE Grades 9-10

This page illustrates a few examples of graphic organizers that are particularly useful in science.

a) **Flow charts** show the linear relationship between concepts.



b) **Cycles** show the cyclical relationships between concepts.

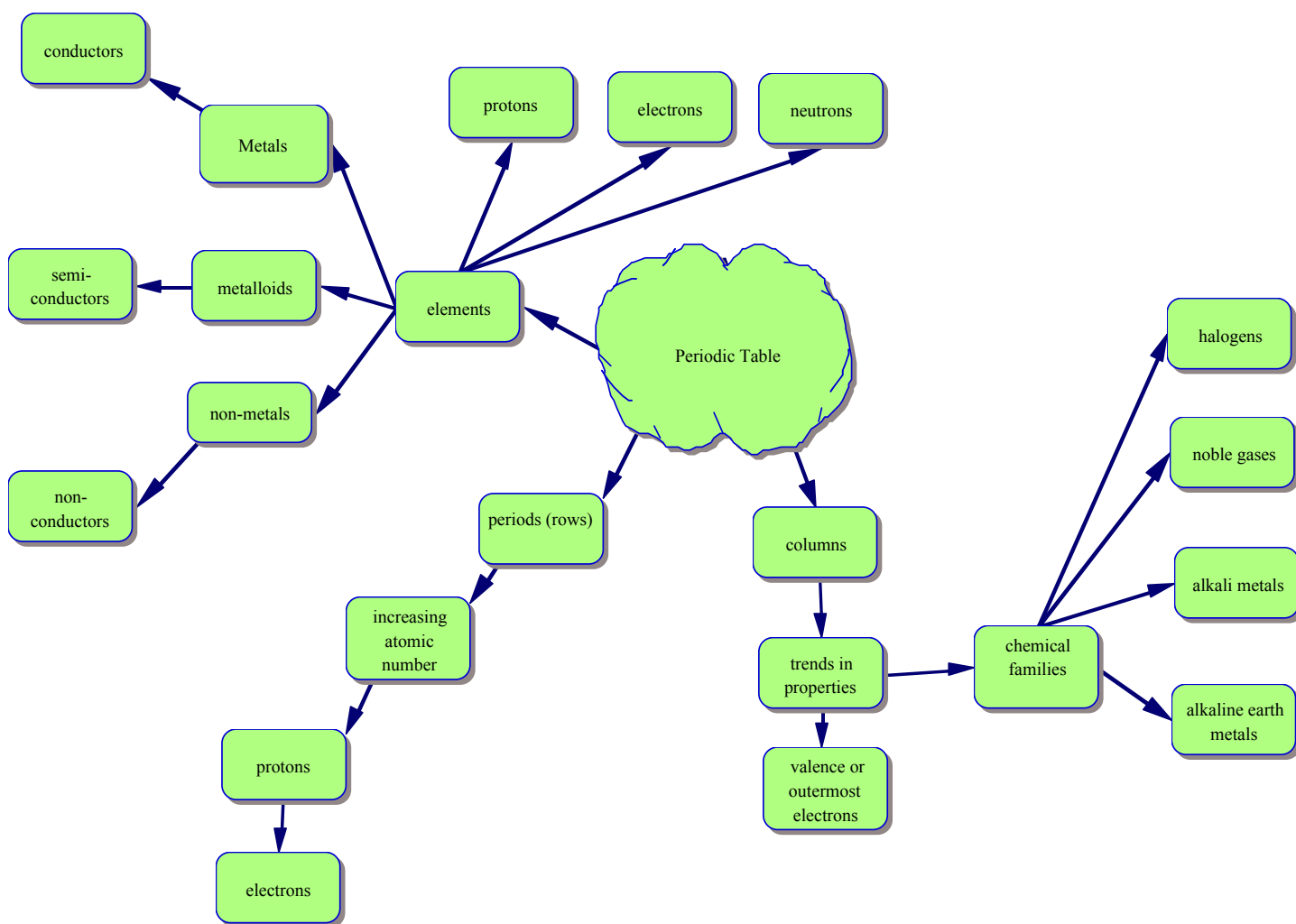




c) **Comparison/Contrast charts** are useful to show similarities and differences.

Attributes	Sexual Reproduction	Asexual Reproduction
1. Comparison of offspring to parent(s)	offspring different than parents	offspring identical to parents
2. Mixing of genetic material	mixing of genetic material	no mixing of genetic material
3. Types	e.g., fertilization, conjugation	e.g., budding, binary fission, vegetative propagation, regeneration

d) **Clustering** generates ideas/connections around a central word or theme. As students cluster, they record the terms associated with the topic, often increasing the word bank they have available for writing, and helping them make connections between concepts.



Developing and Organizing Ideas: Supporting the Main Idea

SCIENCE Grades 9-10

In this strategy, students learn how to select the better of two possible main ideas to use as a topic sentence in an information paragraph, and then learn how to choose details to support it.

Purpose

- Distinguish main ideas and supporting details for a paragraph.
- Write a well organized paragraph.

Payoff

Students will:

- improve reading comprehension by spotting main ideas and supporting details.
- demonstrate a clear understanding of the topic chosen.
- write a well-organized paragraph with supporting details.

Tips and Resources

- Write the sentences into a paragraph, starting with the most general and writing the remaining sentences in order of importance (most to least or least to most).
- In science this strategy is used to explain a concept (e.g., Acid Rain); to describe a significant contribution (e.g., Describe an example of Canadian contributions to the field of Meteorology); and to outline a process (e.g., the stages of mitosis, the formation of the Solar System).
- “Main Idea” is a broad statement that includes a topic that can be expanded. It usually begins a paragraph, e.g., *Solar energy is the ultimate energy source for most processes that occur in the Solar System.*
- See the following resources:
 - Student Resource, *Finding and Supporting the Main Idea*, p. 18.
 - Student/Teacher Resource, *Finding and Supporting the Main Idea – Sample Exercise*, p. 19.
 - Student/Teacher Resource, *Finding and Supporting the Main Idea – Answer Key*, p. 20.
- This strategy can help students to understand how to do the task on information paragraphs in the Ontario Secondary School Literacy Test.
- In the science curriculum an information paragraph can be used to meet many of the communication and making connection expectations through assessment tasks such as:
 - explanations
 - descriptions
 - summaries
 - newspaper articles
 - job advertisements
 - radio commercials

Further Support

Alternative methods:

- Complete the activity on paper.
- Work either individually or in pairs.
- Read groups of sentences.
- Look for the best-supported general statement.
- Cross off statements that do not fit the general statement selected.



Developing and Organizing Ideas: Supporting the Main Idea

SCIENCE Grades 9-10

What teachers do	What students do
<ul style="list-style-type: none"> • Use the sample <i>Finding and Supporting the Main Idea</i> to create similar sets using the specific expectations for your course. • Enlarge each set of statements and cut up into their separate statements. • Place each set of statements into a separate envelope. • Divide the class into groups of three or four and give each group one set of statements. • Model the strategy on the board or overhead using the set that was given to the students. • Teach how to find the main ideas in the statements (see Tips and Resources). • Hand out a second set of envelopes to each group for them to complete independently. • Alternatively, have the students complete this activity directly on paper, without cutting up the groups of statements. 	<ul style="list-style-type: none"> • Read through the set of statements with the teacher. • Annotate statements while the teacher models.
<p>During</p> <ul style="list-style-type: none"> • Circulate through the class. • Ask students how they know which statement is the best-supported generalization. • Point out that if students have more sentences crossed out than they have left to work with, they have probably selected the wrong generalization. 	<ul style="list-style-type: none"> • Work individually or in pairs or small groups. • Read the group of statements. • Look for the best-supported general statement. (If there is more than one main idea choose the one that has the most supporting statements.) • Place statements to the side if they do not fit the selected main idea. • Place the selected main idea or generalization at the top. • Place the supporting statements directly under each generalization.
<p>After</p> <ul style="list-style-type: none"> • Review and discuss the second set of sentences. If needed, have students move to another set of sentences. • When work is complete, review the work with the students and discuss answers. • Model how to use the sentences to write a paragraph – using the paragraph template. • Demonstrate how to write a concluding sentence. The basic style is to reword the first sentence/generalization. • Alternatively, assign topic and have students write a generalization and supporting details (e.g., describe the stages of the life of a particular type of star). • Have students read “The Earth and Its Layers” in <i>Think Literacy: Cross-Curricular Approaches, Science & Technology, Grades 7-8 Science, Grade 9 Applied</i> on page 26 and summarize the information in one coherent paragraph. 	<ul style="list-style-type: none"> • Review the statements with the teacher. • Write sentences in a paragraph. • Alternatively, write their own generalization and supporting details in answer to a teacher-assigned topic (e.g., outline the stages of mitosis, describe the stages of the life of a particular type of star, describe the evolution of models of the atom). • Read the assigned text “The Earth and Its Layers” and write an information paragraph.

Notes



Finding and Supporting the Main Idea

SCIENCE Grades 9-10

1. Look at the scrambled statements in paragraph one.
2. Identify two main ideas in paragraph one.
 -
 -
3. Choose which main idea is best supported by the other statements given – this will be the main idea for the paragraph.
 -
4. Cross off or remove the statements that do not belong in the paragraph (i.e., the statements that do not support the main idea).
5. Order the statements in the paragraph. There may be more than one way to order supporting details.
 -
 -
 -
 -
 -
6. Share and compare your ideas with others. (OPTIONAL)
7. Write the final paragraph.



Repeat the process for paragraphs two and three.



Student/Teacher Resource

Finding and Supporting the Main Idea

SCIENCE Grades 9-10

Sample Exercise**Paragraph one:**

Time capsules describe everyday life.

Make a list of items you would like to include in the capsule.

Time capsules tell us how people lived in past generations.

Time capsules tell us what was important to past generations.

People put objects from their everyday life into time capsules.

Garbage bags, videos, pictures, and diaries are some of the items that could be included in the capsule.

Decide how to make your capsule interesting.

The time capsule should be a weatherproof container.

**Paragraph two:**

Saliva is the fluid that helps us digest broken-down food.

The sticky mucous in our mouth is called saliva.

Saliva plays an important role in food digestion.

Saliva dissolves food pieces.

We can taste food because saliva allows the food to penetrate cells in our mouths.

Dry your tongue and place sugar on it.

You cannot taste the sugar until the sugar dissolves.

Food tastes good.

Paragraph three:

Always check the Internet.

Technology has improved our lives in many ways.

Computers help make it easier to communicate.

New forms of technology make new sources of fuel less expensive.

Modern technology has used science to develop new forms of transportation.

Less expensive fuel and new transportation forms make the world seem smaller.

People have more technological know-how than ever before.



Finding and Supporting the Main Idea- Answer Key

Legend:

→**main idea**

√**statement belongs in the paragraph**

×**statement should be crossed out or removed; does not belong.**

Paragraph one:

- Time capsules tell us what was important to past generations.
- √People put objects from their everyday life into time capsules.
- √Garbage bags, videos, pictures, and diaries are some of the items that could be included in the capsule.
- √Time capsules describe everyday life.
- ×Make a list of items you would like to include in the capsule.
- ×Time capsules tell us how people lived in past generations.
- ×Decide how to make your capsule interesting.
- ×The time capsule should be a weatherproof container.



Paragraph two:

- Saliva plays an important role in food digestion.
- √Saliva is the fluid that helps us digest broken-down food.
- √Saliva dissolves food pieces.
- √We can taste food because saliva allows the food to penetrate cells in our mouths.
- ×Dry your tongue and place sugar on it.
- ×You cannot taste the sugar until the sugar dissolves.
- ×Food tastes good.
- ×The sticky mucous in our mouth is called saliva.

Paragraph three:

- Technology has improved our lives in many ways.
- √Computers help make it easier to communicate.
- √New forms of technology make new sources of fuel less expensive.
- √Modern technology has used science to develop new forms of transportation.
- √Less expensive fuel and new transportation forms make the world seem smaller.
- ×People have more technological know-how than ever before.
- ×Always check the Internet.



Revising and Editing: **Peer Editing**

SCIENCE Grades 9-10

Peer editing gives students an opportunity to engage in meaningful conversations to assess whether a piece of writing constructed in a specific form for an audience has achieved its purpose. By reading each other's work, asking questions about it, and identifying areas of concern, students learn a great deal about how to put informational and/or graphical texts together for purposeful communication.

Purpose

- Provide an opportunity for students to examine, in a methodical fashion, their own and others' writing with a more knowledgeable, critical eye for meaning and clarity.
- Develop a clear and concise writing style – essential for accurately explaining scientific concepts.

Payoff

Students will:

- have an audience for their writing, other than the teacher.
- develop skills in editing and proofreading.
- receive peer input about possible errors and areas of concern, in a “low-risk” process.
- have positive, small-group discussions.
- be able to describe scientific concepts in a clear, concise and accurate manner.

Tips and Resources

- Peer editors should not be expected to correct all of the writer's errors, since the writer is responsible for the piece's clarity and content accuracy. Rather, the teacher and other students should indicate to the writer areas of concern for clarification or modification. The teacher should follow up with individual support or mini-lessons on topics on writing skills or subject content.
- Peer editing is a skill that must be built and practised over time. Build on what has already be done in English class. Begin with a single focus (such as writing an interesting and effective introduction in a lab or research report), then add elements *one at a time*, such as:
 - organization of ideas in appropriate paragraphing or format;
 - detail and support for hypothesis or topic statements;
 - appropriate scientific and technical vocabulary.
- This strategy may be used more intensively when time permits or when the writing assignment is particularly significant (e.g., a formal write-up of an investigation or a major report). In these cases, student work may be edited by more than one group, so that each student receives feedback from a large number of peers.
- This strategy can also be used in pairs or in small groups of three or four students. However, each student should have the opportunity to get feedback from a minimum of two other students.
- **Proofreading** is a revising and editing strategy that can be done without partners. See *Think Literacy: Cross-Curricular Approaches Grades 7-12, pp.136-139*.

Further Support

- Consider balancing each group with students who have varying skills and knowledge to bring to the peer-editing process. More capable peer editors will act as models for the students who haven't yet consolidated the concepts or skills.
- Explain to students that you have designed the triads or groups to include a person knowledgeable in the topic content, a person with good language skills, and one or more persons who would provide a very honest audience for the writing.
- Consider turning some of the questions into prompts (e.g., The best part of this piece of writing is...: I'd like more information about...; I was confused by...).



Revising and Editing: Peer Editing

SCIENCE Grades 9-10

What teachers do	What students do
<p>Before Ask students to bring a completed draft of a writing assignment to class.</p> <ul style="list-style-type: none"> ▪ Divide students into groups of three or four. ▪ Distribute a peer-editing checklist (see Student Resource, <i>Sample Peer-Editing Checklist</i> specific to the task). ▪ Choose a focus for revising and editing. Discuss the characteristics of the chosen element of writing. Model questions that students might ask. 	<ul style="list-style-type: none"> • Bring a completed draft of the required writing to class.
<p>During</p> <ul style="list-style-type: none"> • Give directions for the peer-editing process: <ul style="list-style-type: none"> - One group exchanges writing pieces with another group. - Group members read the writing pieces, focusing only on the element(s) of writing to be edited, and making notes about reactions, questions, and concerns. - One group member passes a finished edited piece. • Remind students that they are not responsible for correcting all of the writer's errors, but that they can underline areas of concern, or circle words that should be checked for spelling or usage. • Monitor and support the group processes. 	<ul style="list-style-type: none"> • Exchange their pieces of writing with another group. • Individually read and annotate all 3 or 4 pieces from the other group (circling, underlining, and writing questions or comments) as the pieces pass from person to person. • Remember that the writer owns the writing; therefore, the reader does not have the primary responsibility for correcting all the writer's errors. • <i>As a group</i>, discuss each piece and complete a peer-editing checklist, arriving at a consensus (through discussion) about judgements, suggestions, and comments. • Sign or initial the peer-editing checklists when the group is done, and return the writing pieces to the original owners.
<p>After</p> <ul style="list-style-type: none"> • Give each student time to look at the peer-editing checklist that accompanies the writing pieces. • Debrief the activity with the class, asking questions such as: <ul style="list-style-type: none"> - What were the strengths you noticed in the best pieces of writing in various areas (e.g., in the introduction, supporting details or examples or conclusion)? - What were some typical errors? - What types of things will your peer have to do to improve the work? • (Optional) Provide time for each student to engage in a brief conference with a student who peer-edited his/her piece of writing, to get more complete feedback and a deeper understanding of the comments and suggestions. • (Optional) Assign another draft, or a completed final draft, of the same assignment. 	<ul style="list-style-type: none"> • Read the peer-editing checklists that they receive with their work. • Take part in the class debriefing discussion. • Confer with one other student to provide more complete feedback and comments or suggestions. • Complete a subsequent draft, if assigned.

Notes



Sample Peer-Editing Checklist

Inquiry Procedure

Name :		Grade :		Date :
Assignment :				
	What to look for :	Yes	No	Suggestions / Concerns
1	The purpose of the writing is stated clearly.			
2	The introduction indicates the relevance of the topic.			
3	The information is organized in a coherent, logical sequence with appropriate headings.			
4	The hypothesis/design is stated clearly with a prediction and a rationale to support the idea.			
5	The list of materials and equipment used is complete.			
6	The procedural steps to do the investigation/design are described clearly and in proper order.			
7	Both qualitative and quantitative data are presented.			
8	Measurement units are correctly represented.			
9	Diagrams, tables, charts and/or graphs are used effectively and are properly labelled.*			
10	Data are analyzed logically and ideas are expressed clearly in coherent sentences.			
11	The words and terms used are appropriate and clear.			
12	Conventions on writing chemical symbols, formulas, taxonomic classifications and SI units are followed.**			
13	There are only a few minor errors in grammar, punctuation, or spelling.**			
Other helpful comments :				
Signed _____				

* See Student Resource: *Sample Peer-Editing Checklist Graphical Text*

** See Student Resource: *Sample Peer-Editing Checklist Proofreading*.



Revising and Editing: Peer Editing

SCIENCE Grades 9-10

Sample Peer-Editing Checklist

Informational Text – Report

Name :		Grade :		Date :
Assignment :				
	What to look for :	Yes	No	Suggestions / Concerns
1	The purpose of the writing is stated clearly.			
2	The opening sentence or paragraph hooks the reader and introduces the relevance of the topic.			
3	The information is organized in a meaningful sequence with sub-topics and appropriate headings.			
4	The main idea is stated clearly.			
5	The key idea in each sub-topic is supported by example(s).			
6	The concluding paragraph summarizes the key ideas.			
7	The researched information is current and accurate.			
8	Appropriate graphical text (e.g., diagrams, illustrations, photos, charts, tables) are used and labelled properly.*			
9	The words and terms used are appropriate and clear.			
10	The sentences flow, moving logically from one to another.			
11	The sentences vary in length and structure.			
12	The language is appropriate for the audience.			
13	Conventions on writing chemical symbols, formulas, taxonomic classifications and SI units are followed.**			
14	There are only a few minor errors in grammar, punctuation, or spelling.**			
Other helpful comments :				
Signed _____				

* See Student Resource: *Sample Peer-Editing Checklist Graphical Text*.

** See Student Resource: *Sample Peer-Editing Checklist Proofreading*.

Writing for a Purpose: Using Templates

SCIENCE Grades 9-10

The Science curriculum expectations require that students be able to communicate accurately, clearly, concisely, and with a sense of purpose and audience. The use of writing frameworks such as templates is a useful strategy to help students achieve these goals. A template is a skeletal structure for a writing form that helps students arrange their thoughts and researched information.

Purpose

- Provide students with a template upon which to scaffold their understanding of a form of writing and then organize information before attempting a first draft.

Payoff

Students will:

- learn the expectations and components of a particular writing form.
- organize their writing and ensure that it meets the requirements of the writing task.
- feel more confident about creating the final product because they have a clear “picture” of what the product should look like.

Tips and Resources

- A good way of helping students understand the structure of a writing task is for them to deconstruct or “take apart” an existing exemplar. Prior to writing an information report, for example, provide students with an exemplar report and an information report template. Have students use the template to identify important elements of the report (e.g., main focus, sub-headings). This can be done either individually or in small groups. Deconstructing a piece of writing before writing their own version gives students an exemplar from which to work when they begin their own writing. *Pop Rocks* (in the grade 10 reading section) can be used to deconstruct a typical set of investigation instructions.
- For explanations and templates for common science writing tasks, see the following resources:
 - Teacher Resource, *Writing Instructions*, p. 28;
 - Template for *Writing Instructions*, p. 29;
 - Instructions for a *Scientific Investigation Checklist*, p. 30;
 - *Writing a Science Information Report*, p. 31.

Further Support

- Use a fun activity to introduce instructional writing. For example, provide students with 12 Lego® pieces and have them write instructions to construct a specific structure. Then have them trade instructions to see if someone else can follow the instructions successfully. A fun outdoor activity involves providing students with a compass and having them write instructions to get from one spot on the school grounds to another. Limit the directions used to only N, S, E, and W if your students are not familiar with the use of a compass. Use paces as a measure of distance.
- The template for a writing task can be revised to make the accommodations necessary for students with special needs. For example:
 - use information reports whose sub-topics are identified by subheadings;
 - reduce the number of paragraphs and supporting details required for an information report;
 - select lab activities that involve fewer steps;
 - provide students with a set of instructions for a lab that are out of order. The student can cut and paste these instructions into the correct sequence;
 - provide students with a diagram of the lab activity for which they will develop a procedure.



Writing for a Purpose: Using Templates

SCIENCE Grades 9-10

Notes

What teachers do	What students do
<p>Before</p> <ul style="list-style-type: none"> • Prepare a template appropriate for the writing task that students are to complete. • Find an appropriate exemplar of the writing task that students can deconstruct (see samples of templates that accompany this strategy). • Model the deconstruction strategy using the first paragraph of the exemplar. Using the information report as an example: <ul style="list-style-type: none"> - Identify the type of writing sample being deconstructed (e.g., procedure, information report); - Ask aloud, “What happens in the first paragraph of the example?” - Answer: The first paragraph of the report introduces the topic of the report. It may also provide a map or a summary of what is to follow; - Ask aloud, “What is the first sub-topic of the example? What key points are made to support the first sub-topic? What writing structure does the author use to change to the next sub-topic?” (e.g., sub-heading, transitional sentence). • Ask students to work in small groups to deconstruct the rest of the example. • Engage students in a whole class discussion and record each sub-topic and the key points used to support it. 	<ul style="list-style-type: none"> • Read the sample, using the teacher’s oral deconstruction of the first paragraph as a guide. • Work in small groups to deconstruct the rest of the exemplar, one paragraph at a time. • Contribute to the whole-class discussion.
<p>During</p> <ul style="list-style-type: none"> • Distribute the template that will be used to develop the writing task. • Direct students to use the template to organize the information they have prepared/researched for the writing task. • Monitor students’ work as they begin completing the template. 	<ul style="list-style-type: none"> • Begin completing the template by adding (in the appropriate places) the information they have researched or prepared (e.g., the sequence of steps in an experimental procedure, background information for an information report).
<p>After</p> <ul style="list-style-type: none"> • Assign a completion date for the template. • Use peer and teacher assessment in a subsequent class, before students begin completing their instructions, information, report, etc. 	<ul style="list-style-type: none"> • Students ask each other questions and provide specific feedback about other students’ writing.



Writing Instructions

SCIENCE Grades 9-10

What are Instructions?

Instructions inform the reader about how to do something. A well-written set of instructions should allow the reader to successfully translate the instructions into action and complete the desired task. Effective instructions should also allow multiple readers (assuming similar competencies) to reach the same outcome. Given the significance of planning and conducting investigations in the science curriculum, it is important that students write instructions effectively. For the purposes of this resource, the term “procedure” shall be used to refer specifically to the procedure of a laboratory experiment.

In science, writing instructions as a writing form is most commonly used to communicate to the readers:

- the steps involved in planning and conducting a scientific investigation.
- how to perform a specific skill or task (e.g., lighting a gas burner, making a wet mount).

In a set of instructions, you can do the following:

- Begin by identifying the topic and the relevance or importance of the skill that is being explained. For example, writing instructions on how to neutralize left-over acids from an experiment is an important part of the clean-up procedures.
- Proceed by identifying the intent or goal of the instructions. What will be accomplished if the reader successfully follows these instructions?
- Make a prediction or create a hypothesis about what will happen if the instructions are followed.
- Write a step-by-step procedure in time sequence. Provide as many details as required for the intended readers to successfully complete the task.
- Let your readers know how to determine their results (e.g., Once the final connections are made, the light of the conductivity apparatus should come on.) Note: this final step may not be appropriate for some scientific investigations.

How to write a set of instructions?

1. Use a template like the Student Resource, *Template for Writing Instructions*. This template should be modified, when necessary, for specific tasks.
2. Investigate the equipment and materials available in your classroom or home. Make sure that the instructions you write are specific for these resources.
3. Think of who your audience might be. The age, experience and skill level of your audience will determine your choice of tone, language and degree of detail to be included. For example, providing a detailed procedure for how to light a gas burner may not be necessary if your audience already is experienced in using gas burners.
4. Write procedural steps using active verbs (e.g., **Pour** 20 mL, **Light** the gas burner, **Add** the acid sample to the test tube).
5. Build in a test so that the reader will know whether they have successfully completed the instructions. The test should ask the reader to know whether they successfully achieved the goal of the set of instructions (e.g., if the lights are connected successfully in parallel, they should all glow with the same brightness.) Constructing an observation chart (and/or data chart) can sometimes be an effective test for the design of the inquiry. An effective observation chart can only be made once the student has a thorough understanding of the purpose and procedure the inquiry.



Student Resource

Template for Writing Instructions

SCIENCE Grades 9-10

Topic: _____

<p>Introduction:</p> <ul style="list-style-type: none"> • Topic/Issue • Relevance/importance/real-world connections • Background information/vocabulary
<p>Aim/Goal (be brief- one sentence)</p> <p>“What is the scientific question that can be answered by following the set of instructions?”</p>
<p>Hypothesis:</p> <p>A suggested answer or reason why one variable affects another in a certain way (Science 9, Nelson Canada, 1999), e.g., “Increasing soil pH will lead to reduced pine growth because pine trees grow best in acidic soil.” Note: not all investigations require a hypothesis. Consult with your teacher when in doubt.</p>
<p>Materials/ Equipment:</p> <ul style="list-style-type: none"> • What do you need to perform this task? • Are these things readily available? • Are there suitable substitutes for materials/equipment not readily available?
<p>Procedure:</p> <ul style="list-style-type: none"> • What steps must you follow? • What is the appropriate order for these steps? Use active verbs (e.g., Pour 20 mL, Stir the contents of the beaker until...) • What safety precautions should you follow? • Where will you record your observation and data?
<p>Testing:</p> <p>What outcome shows that the instructions were successfully followed? Will the reader achieve the goal? (e.g., If you follow these steps, the flame of the gas burner should come on.)</p>

**Instructions for a Scientific Investigation Checklist****SCIENCE Grades 9-10**

Name :		Grade :		Date :	
Assignment :					
	What to look for :	Yes	No	Suggestions / Concerns	
1	All the required headings present.				
2	The introduction indicates the relevance of the topic.				
3	The goal is clear.				
4	The hypothesis states the effect that one variable has on another and why.				
5	All the materials and equipment needed in the procedure are listed in the materials list.				
6	All the required safety precautions are given.				
7	The procedural steps are clear, concise, and in logical order.				
8	The procedure provides enough detail to allow the reader to successfully complete the inquiry.				
9	All quantities given are in appropriate units. (SI units please!)				
10	One variable is changed while the others remain constant for a controlled experiment.				
11	Conventions on writing chemical symbols, formulas, and SI units are followed.				
12	There are only a few minor errors in grammar, punctuation, or spelling.				
Other helpful comments :					
Signed _____					



Student Resource

Writing a Science Information Report

What is an Information Report?

A report is a form of writing that provides information. There are different types of reports, and they can be organized in different ways depending on the purpose and audience. A report is usually based on **researched facts** or on **accurate details** of a situation or event, not just on the writer's interpretation of the facts. In science for example, students could be asked to write a report on the effects of second-hand cigarette smoke on the unborn fetus.

How do you write a report?

1. Research information using a variety of valid sources. Valid information can be found in encyclopaedias, current science textbooks, magazines, scientific journals, valid Internet sites and videos, etc.
2. Take notes of the key ideas from the sources. Record which information comes from which source so that credit can be given to each source.
3. Use an organizer such as a flow chart, a web, or sub-topic boxes to sort and classify the researched information into different sub-topics (Refer to the *Information Report Template* on page 35).
4. When writing the report, consider the audience and use Standard English. The information must be in the student's own words or be appropriately referenced.
5. The introduction should outline the purpose of the report and the main ideas to be developed throughout the report. Ensure that the introductory sentence is appropriate for the intended audience.
6. Develop each sub-topic with an appropriate topic sentence that shows how the sub-topic links to the topic.
7. Make sure that the sub-topic paragraphs have a logical order and that they flow smoothly. Use sub-headings to guide the reader through the report.
8. When writing a concluding paragraph, be sure to connect back to the introduction. Summarize and consolidate the main points developed in the body paragraphs of the report.
9. Proofread to ensure that all key ideas are communicated clearly.
10. Give credit to the sources by acknowledging them. List the sources alphabetically using MLA, APA, or school format, as specified by the teacher.



Information Report Sample

Introduction:

Introduce topic and classify it or put it into a category (e.g., “Acid rain has a detrimental effect on the fish population in small Ontario lakes”).

In two or three sentences, give the reader a “map” of what you plan to do with the topic. Essentially you are naming your sub-topics (e.g., define acid rain, identify the effects of acid rain on the fish population in small Ontario lakes).



First sub-topic: (Defining Acid Rain)

Define the topic and give some general information about it (e.g., define what acid rain is, how it is formed, and identify the causes of acid rain. Make several key points with supporting details from your research).

Second sub-topic: (Appropriate Heading)

Example: “Identify one major effect of acid rain on fish population.”

Make key points with supporting details from the research.

Third sub-topic: (Appropriate Heading)

Example: “Identify other effects of acid rain on fish population.”

Make key points with supporting details from your research.

Conclusion:

Re-state some of the key points (e.g., causes of acid rain, specific effects of acid rain on the fish population in small Ontario lakes).

In addition one could make some recommendations as to what can be done to reduce acid rain in order to increase the fish population in Ontario lakes.

Write an emphatic concluding sentence (e.g., “As a result of the accumulated evidence, it is clear the acid rain has caused the decline of fish population in many small lakes in Ontario”).



Information Report Template

Introduction



First sub-topic: (Appropriate Heading)

Key points with supporting details from your research:



Second sub-topic: (Appropriate Heading)

Key points with supporting details from your research:



Third sub-topic: (Appropriate Heading)

Key points with supporting details from your research:



Conclusion: Re-state some of the key points.

Write an emphatic concluding sentence.



SUGGESTED TOPICS FOR WRITING ASSESSMENT TASKS

GRADE 9

Canadian Contributions to Space Exploration

Household Wiring Components

Alternative Sources of Energy

Reproductive Technologies

Cancer

Extracting Nickel from its Ore

Mining Gold



GRADE 10

Impact of Climate Change

Acid Rain

Alternatives to Motor-Vehicle Transportation

Canadian Contributions to the Science and Technology of Motion

Clean up of Contaminated Cities

Canadian Contributions to the Field of Meteorology

Methods of Chemical Disposal



Writing an Explanation

What is an explanation?

An explanation is a form of writing that explains how things are or reasons for phenomena. Explanations often provide information in a cause-and-effect format.



How do you write an explanation?

Writing a clear and concise explanation can be quite a complicated skill. Think about all the times you try to explain something orally and you reach for a pen and paper to draw a diagram. Students experience the same frustration when they try to explain something using written form. They often need support finding the precise vocabulary they need to make their writing clear.

To begin writing an explanation you prepare a plan. Notes, diagrams and webs will help to organize the information. In your plan, consider the following elements:

- definition of what is being explained;
- description of the component parts, if applicable;
- explanation of the operation in a cause-and effect sequence;
- description of the application;
- interesting comments, special features or evaluation.



Getting Ready to Write: **Writing an Explanation**

SCIENCE Grades 9-10

Template for Writing an Explanation

Name:	Date:
Topic:	
Introduction: <ul style="list-style-type: none">• What is the topic? Why is it interesting to us?	
Definition: <ul style="list-style-type: none">• What is it?	
How it works: <ul style="list-style-type: none">• Causes and Effects (when _____ then _____)	
Applications: <ul style="list-style-type: none">• Where do we see this at work in the world outside the school?• Variations?	
Comments/Evaluation of topic/issue/problem: <ul style="list-style-type: none">• Anything further you need to add?• What is your opinion on the topic? (if applicable)	