

Teacher Package

Science and Technology Exemplar Task Grade 7

Teacher Package

Title: The Galapagos Islands: Oil Spill Near the Coast

Time Requirements: 320 minutes (over several class periods)

Introductory activities

- Pre-task 1: 60 minutes
- Pre-task 2: 40 minutes
- Pre-task 3: 60 minutes

Exemplar task

- Part 1: 40 minutes
- Part 2: 40 minutes
- Part 3: 40 minutes
- Part 4: 40 minutes

Description of the Task

Students will research and examine environmental issues related to an oil spill near the coast of the Galapagos Islands. They will present their findings in graphic and written formats for submission to a youth science magazine.

Students will complete the worksheets provided in this package and submit selected worksheets for assessment.

Scenario and Instructions for Students

Students should be presented with the following scenario and set of instructions:

Your science class regularly receives the science magazine Youth Science, which is aimed at teenagers and young adults. In the most recent issue, there is an article about an oil spill near the coast of the Galapagos Islands. In the article, an oil industry expert makes the following statement:

The recent oil spill off the coast of the Galapagos Islands will not cause any significant long-term damage to the environment because the components of the ecosystem will be able to cope with any changes caused by the spill.

Since your class has just finished studying ecosystems, your teacher has asked you to use information recently learned in class, as well as information gathered through your own research, to prepare a submission to Youth Science magazine in response to the expert's statement.

Your response is to include:

1. *a graphic organizer in the form of a web that will inform readers about the abiotic and biotic components of the Galapagos Islands as well as show how they interact;*
2. *a flow chart depicting the potential short-term and long-term effects of the spill on the components of the ecosystem;*
3. *a letter to the editor of Youth Science magazine, supported with scientific facts, expressing your agreement or disagreement with the expert's statement, and suggesting ways of reducing the risk of such a spill in the future.*

Curriculum Expectations Addressed in the Task

Note that the codes that follow the expectations relate to the Ministry of Education's *Curriculum Unit Planner* (CD-ROM).

Students will:

1. demonstrate an understanding of the interactions of plants, animals, fungi, and micro-organisms in an ecosystem (7s1);
2. investigate the interactions in an ecosystem, and identify factors that affect the balance among the components of an ecosystem (e.g., forest fires, parasites) (7s2);
3. demonstrate an understanding of the effects of human activities and technological innovations, as well as the effects of changes that take place naturally, on the sustainability of ecosystems (7s3);
4. identify living (biotic) and non-living (abiotic) elements in an ecosystem (7s4);
5. interpret food webs that show the transfer of energy among several food chains, and evaluate the effects of the elimination or weakening of any part of the food web (7s9);
6. investigate ways in which natural communities within ecosystems can change, and explain how such changes can affect animal and plant populations (e.g., changes affecting their life span, their gestation periods, or their ability to compete successfully) (7s11);
7. use appropriate vocabulary, including correct science and technology terminology, to communicate ideas, procedures, and results (e.g., use scientific terms such as *biosphere*, *biome*, *ecosystem*, *species*) (7s15);
8. communicate the procedures and results of investigations for specific purposes and to specific audiences, using media works, oral presentations, written notes and descriptions, charts, graphs, and drawings (e.g., design a multimedia presentation explaining the interrelationships of biotic and abiotic elements in a specific ecosystem) (7s17);

9. investigate the impact of the use of technology on the environment (7s18);
10. identify and explain economic, environmental, and social factors that should be considered in the management and preservation of habitats (e.g., the need for recycling; the need for people to have employment) (7s24).

“Big Ideas”

Based on the above expectations, the following “big ideas” for this task have been identified:

- Ecosystems are composed of abiotic and biotic components that interact dynamically with one another.
- Natural and human-induced changes affect the health of an ecosystem.

Teacher Instructions

Prior Knowledge and Skills Required

Before attempting the task, students should have had experience with the following:

- investigating the interactions of components within an ecosystem
- using research materials to create point-form notes
- developing and using graphic organizers such as mind maps, webs, chains, and flow charts
- developing and creating a supported opinion piece (e.g., in the form of a paragraph or letter)

The Rubric

The rubric* provided with this exemplar task is to be used to assess students' work. The rubric is based on the achievement levels outlined on page 13 of *The Ontario Curriculum, Grades 1-8: Science and Technology, 1998*.

Introduce the task-specific rubric to students at least one day before administering the task. Copy the rubric for students or create a transparency to use with the class. You may find it useful to rephrase the rubric for students to help them in their work.

Review the elements of the rubric with students to ensure that they understand the criteria and the descriptions for achievement at each level. Allow ample class time for a thorough reading and discussion of the assessment criteria outlined in the rubric. You may also find it beneficial to create assessment criteria collaboratively with your students.

Accommodations

Accommodations that are normally provided in the regular classroom for students with special needs should be provided in the administration of the exemplar task.

Classroom Set-up

A method of storing and sharing collected pictures and associated reference material will be needed (e.g., a table display, bulletin board, wall display).

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Materials Needed

- writing instruments
- chart paper
- markers
- pencil crayons
- a variety of resource materials including pictures and other visuals related to the Galapagos Islands and to oil spills (e.g., books, list of websites, magazines)
- access to the library and the Internet

Safety Considerations

There are no additional safety considerations beyond normal classroom safety practices required for these tasks.

Task Instructions

Introductory Activities

The pre-tasks are designed to review and reinforce the skills that students will require for the exemplar task. Although the exemplar task is to be completed in its entirety at school, some research for the pre-tasks is to be completed at home.

Pre-task 1: Introducing the Scenario

This activity provides students with experiences paralleling those required in the exemplar task.

1. Present the following scenario to your class:

A tanker truck is transporting a toxic chemical along Highway 60 through Algonquin Park. The truck is involved in an accident and spills its load of toxic chemicals beside the road. You are to decide whether or not this would be harmful to the ecosystem in the short or long term.

2. Ask students to brainstorm a list of abiotic and biotic components found in the Algonquin Park forest ecosystem. Record these components on the board or on chart paper.
3. Review with students different types of graphic organizers such as webs, pyramids, and flow charts and discuss how they can be used to represent relationships visually. Then use a web to illustrate the interrelationships among the listed components, emphasizing features such as words, arrows, small pictures, symbols, and colour that can be used to show connections within the web (see Appendix 1).
4. Discuss with students some of the possible short-term and long-term environmental, social, and economic consequences of this spill. Model the use of a flow chart to show the possible sequence of events (see Appendix 2).
5. Review the features of a supported opinion letter (see Appendix 3). Encourage students to support their opinions about the consequences of the spill with as many reasonable and factual scientific ideas as possible. Students are expected to use specific information from their webs and flow charts to develop their arguments and support their opinions.

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*The rubric is reproduced on page 14 of this document.

6. Explain to students that they will be going through this same process in a more formalized way in the exemplar task about the effects of an oil spill off the coast of the Galapagos Islands.
7. Give each student a copy of the student scenario. Go over the components of the task (a graphic organizer such as a web or flow chart, and a letter to the editor).
8. Copy the rubric for students or create a transparency to use with the class. Explain the features of the rubric. Allow time for students to ask questions for clarification.
9. Do not allow students to keep a copy of the student scenario or the rubric at this time. They will be provided with these when completing the exemplar task.

Pre-task 2: Conducting the Research

The research conducted by students for Pre-tasks 2 and 3 will be used for the exemplar task.

1. Divide the class into two groups. Have one group research the abiotic and biotic components of the Galapagos Islands, while the other group researches the transportation of oil by water and the effects that oil has on the environment when it is spilled into an ocean. Tell students that they will be responsible for reporting back to the whole class. Ask each student to bring some information (including pictures, if possible) about his or her topic to class for use the next day.
2. Have students carry out research in the library and/or in the computer lab. Spend some time with each of the two groups to focus the research and make sure that each student is making point-form notes on his or her topic. Try to collect as many pictures about the topic as possible.
3. Tell students that they are expected to continue with their research at school or at home, using the resources they have collected. They may collect their own notes on both topics if they wish, but they are responsible for reporting to the class only on their assigned topic. Tell them that they may bring only their point-form notes to class.
4. Since students will not be evaluated on their research skills during the exemplar task, it is recommended that you also collect as much supporting data for the topics as possible to assist students.

Pre-task 3: Collating and Displaying Research Results

1. Have students sit in groups of three or four with others who have researched the same topic. Ask them to share their data, recording it in large print on chart paper so that it can be easily read by other students in the room. (20 minutes)
2. Have the students post their chart paper around the room. Go over the information with the class to explain and expand on the concepts related to the Galapagos Islands (20 minutes). Then review the information posted by students dealing with oil and oil spills (20 minutes). Teachers should add to or clarify the information presented at this time.
3. Remind students that, when they begin the exemplar task next day, they will be using these charts, their personal point-form notes, and the collection of pictures acquired to assist them in this process.

Exemplar Task

The completed student worksheets “Web Organizer – Abiotic and Biotic Interactions”, “Flow Chart Organizer – Short- & Long-Term Effects”, and “Supported Opinion – Letter to the Editor” (see Appendices 4, 5, and 7) are to be submitted for marking.

Part 1: Web Organizer – Abiotic and Biotic Interactions

1. Distribute a copy of the Student Package and the assessment rubric to each student. Refer students to the scenario and the web organizer (see Appendix 4).
2. Remind students of the type of thinking they did during the introductory activity on the toxic chemical spill in Algonquin Park. Review with them the expectations for web organizers.
3. Clearly state the time parameters (40 minutes) for completing the task outlined on the worksheet “Web Organizer – Abiotic and Biotic Interactions”. Ensure that students work individually and that they use only the point-form notes on the chart paper or from their own research.

Part 2: Flow Chart Organizer – Short- & Long-Term Effects

1. Refer students to the flow chart organizer (see Appendix 5).
2. Review the components of effective flow charts, emphasizing the possibility of multiple branches within the flow of events. (Show students the diagram in Appendix 2.)
3. Clearly state the time parameters (40 minutes) for completing the task outlined on the flow chart worksheet reproduced in Appendix 5. Ensure that students work individually and that they use only the point-form notes on the chart paper or from their own research.

Part 3: Planning the Supported Opinion – Letter to the Editor

Note: This section has been included to help guide students in the organization of their ideas. It will not be part of the evaluation of the exemplar task.

1. Review the components for a supported opinion such as a letter to the editor (see Appendix 3). Refer also to the introductory activity on the toxic chemical spill in Algonquin Park.
2. Have students use the “Supported Opinion – Letter to the Editor” planning sheet (see Appendix 6) to help them plan their letters. Students are expected to use information from their graphic organizers and the data related to the task posted within the classroom to support their ideas for their letters.

Part 4: Writing the Supported Opinion – Letter to the Editor

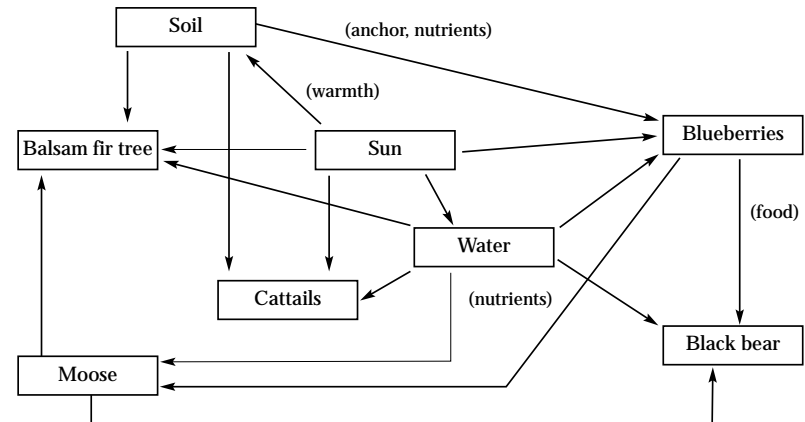
1. Refer students to the worksheet “Supported Opinion – Letter to the Editor” (see Appendix 7).
2. Review the instructions with students, emphasizing the requirements of the letter.
3. Remind students to use their letter to the editor planning sheets (see Appendix 6) to help create their letters.
4. Clearly state the time parameters (40 minutes) for completing the task outlined on the worksheet, and ensure that students work individually.

Appendix 1

Teacher Guidelines: Web Organizer

- Ensure that students are aware that directional arrows may indicate the dependence of one item on another and the flow of materials in an ecosystem: for example, food chains/webs, energy pyramids, abiotic cycles (water cycle, carbon cycle).
- Emphasize the importance of including some of the connections between abiotic and biotic components within an ecosystem: for example, water → insects; soil → plants.
- Remind students that producers are the initial source of energy in any ecosystem. For example, in the case of the Algonquin Park ecosystem, the primary producers are the trees.
- Inform students that words are as appropriate to use as pictures with their webs.
- Recommend that colour be used to highlight visually the different types of connections and interactions in students’ webs (e.g., purple for food relationships, green for shelter).
- Encourage students to keep their webs clearly organized and easy to read.
- Encourage students to provide descriptions on their arrows that clarify the reasons for their connections.
- Remind students to refer to the resources available in the classroom whenever they are needed.

A Sample Representation of the Algonquin Web



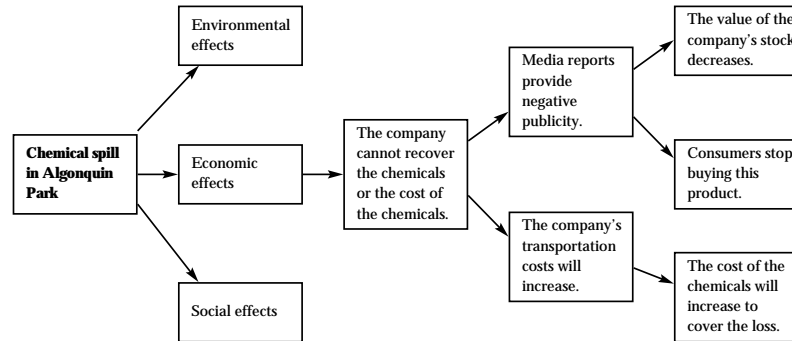
Appendix 2

Teacher Guidelines: Flow Chart Organizer

- Explain to students that flow charts and webs are commonly used to show cause-and-effect relationships or sequences of events.
- Encourage students to include multiple branching in their flow charts to indicate various consequences of an event or action. (See the flow chart below.)
- Stress that the vocabulary included in the flow chart should be specific (e.g., *cattails*) rather than general (e.g., *plants*).

Effects of the Algonquin Chemical Spill

(Only a few economic examples are noted.)



Appendix 3

Teacher Guidelines: Planning Sheet for a Letter to the Editor

Paragraph 1: Opinion and introduction (agree or disagree)

- Disagree with the statement.
- There are many changes that will affect the ecosystem.

Paragraph 2: Scientific facts and supporting arguments

- *Fact:* The soil along the roadside will absorb the chemicals and will become contaminated.
- *Argument:* This may cause a decrease in local plant populations, such as the cattails and grasses, as they depend on the soil.
- *Fact:* The chemicals will pollute the water in the ditches.
- *Argument:* This may affect the green frogs, as they rely on this water for their basic needs, such as food, drink, and habitat.

Paragraph 3: Suggested actions to reduce the chance that such spills will occur again

- Plan alternative routes around environmentally sensitive areas for trucks transporting toxic chemicals to limit the opportunity for a spill to occur in these areas.
- Decrease the speed limit for transportation through parkland to decrease the number or severity of accidents occurring within the area.

Paragraph 4: Summary of your viewpoint

- It is felt that the local ecosystem in the Algonquin Park area has been compromised by this spill.

Appendix 4

Web Organizer – Abiotic and Biotic Interactions

Use the space provided below or the back of this page to create a web organizer:

- which shows the specific abiotic and biotic components of the Galapagos Islands' ecosystems;
- which clearly shows the relationships between the abiotic and biotic components;
- which is organized in a way that is easy to understand; and
- which includes labels that explain the connections between components.

Note: You may use words, arrows, small pictures, symbols, and colour to clarify the relationships.

Appendix 5

Flow Chart Organizer – Short- & Long-Term Effects

Add to the template provided below to build a flow chart organizer of the environmental, social, and economic consequences of the oil spill:

- which shows the short- and long-term effects;
- which shows a reasonable sequence of events for each consequence; and
- which lists as many ideas as possible for each heading.

Note: You may use words, arrows, small pictures, symbols, and colour to clarify the relationships.

