Grade 7

Cluster 4: Earth's Crust

Overview

In this cluster, students investigate Earth's geology, including rock and mineral formation, changes in the landscape over time, and human use of geological resources. Students describe processes involved in the location, extraction, processing, and recycling of geological resources found in Manitoba and Canada. Students recognize that soil is an important natural resource and they discuss the importance of soil conservation. Students identify environmental, social, and economic factors that should be considered in making informed decisions about land use. They examine theories explaining the Earth's geology, and recognize the role of technology in the development of new scientific theories. Specialized careers involving the science and technology of the Earth's crust are also explored.

PRESCRIBED LEARNING OUTCOMES
Students will...
7-4-01 Use appropriate vocabulary related to their investigations of the Earth's crust. Include: crust, mantle, outer core, inner core, weathering (physical, biological, and chemical), erosion, rock cycle, fossil fuel, geothermal energy, continental drift theory, theory of plate tectonics. GLO: C6, D5

SUGGESTIONS FOR INSTRUCTION

Teacher Notes

Prior Knowledge

Students have had previous experience related to this cluster in Grade 4, Cluster 4: Rocks, Minerals, and Erosion.

➢ Introduce, explain, use, and reinforce vocabulary throughout this cluster.

➢ **Vocabulary Hopscotch**

Provide students with a list of approximately 20 terms that are related to this cluster. Have students

- choose 10 of these terms
- print each term with every other letter missing and then write a definition for the term beside it
- exchange hopscotch papers, either with partners or randomly, and solve the vocabulary puzzles

Example:

_ e _ t _ e _ i _ g is the breaking down of rocks. (weathering)

SUGGESTIONS FOR ASSESSMENT

SUGGESTED LEARNING RESOURCES

PRESCRIBED LEARNING OUTCOMES	SUGGESTIONS FOR INSTRUCTION
Students will...	
7-4-02 Describe the Earth's structure. Include: crust, mantle, outer core, inner core. GLO: C6, D5	➢ **Diagram of a Layered Earth** Introduce students to the concept of a layered Earth. Have students use print and/or multimedia resources to • draw and label a diagram depicting the composite layers of the Earth, including representative sizes for each layer, with the crust being very thin (Refer to the "Include" portion of learning outcome 7-4-02.) • write a brief description of each layer
7-0-2a ↻ Access information using a variety of sources. *Examples: libraries, magazines, community resource people, outdoor experiences, videos, CD-ROMs, Internet…* GLO: C6 (ELA Grade 7, 3.2.2; TFS 2.2.1)	
7-4-03 Describe the geological processes involved in rock and mineral formation, and classify rocks by their method of formation. GLO: D3, D5, E3	➢ **Activating Prior Knowledge** Have students complete a Knowledge Chart (Matchullis and Mueller, 1994) describing what they know about rocks and minerals, including the types of rock, how they are formed, and how they change. (For a BLM of a Knowledge Chart, see *SYSTH*, Attachment 9.2, or *Success*, p. 6.95.) ➢ **Classifying Rock As Sedimentary, Igneous, or Metamorphic** Provide students with a copy of "Using a Rock Classification Key" (BLM 7-H) and have them use it to determine whether a rock type is *sedimentary, igneous*, or *metamorphic*. (Students may find some types of rock difficult to classify.) Through this learning activity students gain experience using known characteristics to determine rock type and using a classification key. Inform students that additional types of testing would need to be done to determine definitively whether a rock type is sedimentary, igneous, or metamorphic. ➢ **Taking a Closer Look at Igneous Rock** Provide students with the following information: *Igneous* rock is produced when magma (liquefied rock beneath the Earth's surface) or molten lava (liquefied rock on the Earth's surface) solidifies. When rock solidifies beneath the Earth's surface, it is called *intrusive*. When it solidifies above the Earth's surface, it is called *extrusive*. As the molten rock cools, it creates *crystals*. The size of the crystals depends on how fast the molten rock solidifies.
7-0-3c Create a written plan to answer a specific question. Include: apparatus, materials, safety considerations, steps to follow, and variables to control. GLO: C2 (ELA Grade 7, 3.1.4) **7-0-4a** Carry out procedures that comprise a fair test. Include: controlling variables, repeating experiments to increase accuracy and reliability. GLO: C2 **7-0-4c** ↻ Work cooperatively with team members to carry out a plan, and troubleshoot problems as they arise. GLO: C7 (ELA Grade 7, 5.2.1) **7-0-4e** Demonstrate work habits that ensure personal safety, the safety of others, and consideration for the environment. Include: keeping an uncluttered workspace; putting equipment away after use; handling glassware with care; wearing goggles when required; disposing of materials safely and responsibly. GLO: C1 **7-0-5a** ↻ Make observations that are relevant to a specific question. GLO: A1, A2, C2 **7-0-5c** Select and use tools to observe, measure, and construct. Include: microscopes, a variety of thermometers, graduated cylinders, glassware, balance. GLO: C2, C3, C5 **7-0-7a** Draw a conclusion that explains investigation results. Include: explaining the cause and effect relationship between the dependent and independent variables; identifying alternative explanations for observations; supporting or rejecting a prediction/hypothesis. GLO: A1, A2, C2 (ELA Grade 7, 3.3.4)	

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SUGGESTIONS FOR ASSESSMENT

SUGGESTED LEARNING RESOURCES

Nelson Science & Technology 7 (Section 4.1)

Sciencepower 7 (Section 11.4)

Addison Wesley Science & Technology 7 (Chapter 5, Section 1.1)

Teacher Notes

Background Information

Minerals are inorganic solids that occur naturally on the Earth. A mineral is usually made up of crystals, which can be identified by properties such as colour, hardness, and crystal form. Minerals look the same inside and out.

Minerals are the building blocks of rocks. *Rocks* are mixtures of minerals and vary in the number and amount of minerals present.

The three types of rock are formed in the following ways:

- *Igneous rock* is made from magma (liquefied rock beneath the Earth's surface) or molten lava (liquefied rock on the Earth's surface) that has solidified. (Examples of igneous rock: pumice, basalt, and granite.)
- *Sedimentary rock* is made of sediment (e.g., sand, mud, pebbles, silt, remains of plants and animals) that settles in layers on the ground and at the bottom of lakes and oceans. This deposition of sediment is called *sedimentation*. The weight of the layers eventually compresses them into rock, a process called *compression*. Plant or animal remains are often trapped in the layers and can result in fossil formation. (Examples of sedimentary rock: sandstone, limestone, and shale.)
- *Metamorphic rock* changes from its original form by heat and pressure below the Earth's surface. (Examples of metamorphic rock: marble, slate, and gneiss.)

Nelson Science & Technology 7 (Sections 4.13-4.14)

Sciencepower 7 (Section 10.2)

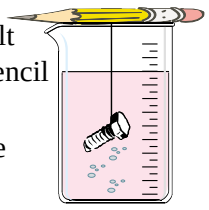
Addison Wesley Science & Technology 7 (Chapter 5, Sections 3.1-3.2)

PRESCRIBED LEARNING OUTCOMES	SUGGESTIONS FOR INSTRUCTION
Students will...	
7-4-03 *(continued)*	*(continued)*

Part A: Investigating the Formation of Crystals

Have students observe the growth of crystals by carrying out the following steps:

1. Place 60 mL of water in a beaker and heat it on a hotplate.
2. When the water begins to boil, add 180 mL of sugar and stir until the sugar dissolves and the solution looks clear. If the solution begins to bubble vigorously, remove it from the heat and let it settle in order to see whether it has cleared.
3. Pour the heated solution into a beaker, with a bolt attached to a piece of string suspended from a pencil lying across the top of the beaker (see diagram).
4. Leave the bolt in the solution overnight. Observe crystals the next day.



Many other methods are available to grow crystals. One alternative is to use a saturated salt solution such as Epsom salts. If this method is used, have the solution cool in a Petri dish instead of having the crystals form on the string.

Part B: Comparing Crystal Sizes

As a class, discuss what changes would have to be made to Part A of this investigation to demonstrate the effect of different cooling rates on the crystal size. Have students carry out a further investigation to compare the crystal size of the solution that cooled slowly and the one that cooled quickly (e.g., in the fridge, on ice, or in snow outdoors). Have students

Safety Precaution:
Avoid placing hot glassware directly on a very cold surface (such as snow or ice). After heating a solution, pour it into another container (e.g., plastic).

- record their observations (The mixture that cooled slowly has large crystal facets, and the one that cooled quickly has small crystal facets.)
- draw diagrams depicting the two samples of crystals
- write a conclusion stating the relationship between the cooling rate of a solution and the size of the crystals formed (The cooling rate affects the size of the crystals formed. A slower cooling rate creates large crystals, and a faster cooling rate creates small crystals.)

Part C: Determining Cooling Rates of Rock Samples

Give students samples of igneous rock that have varying sizes of crystal facets. Based on the outcome of the above investigations, have students determine the cooling rates (fast or slow) of each igneous rock.

SUGGESTIONS FOR ASSESSMENT

SUGGESTED LEARNING RESOURCES

Restricted Response

Using the Three-Point Approach (Simons, 1991), have students define and provide an example for each of the following terms: *mineral, rock, igneous rock, sedimentary rock,* and *metamorphic rock.* (For definitions and examples, see Teacher Notes for learning outcome 7-4-03.)

(For a BLM of the Three-Point Approach for Words and Concepts, see *SYSTH,* Attachment 10.2, or *Success,* p. 6.101.)

PRESCRIBED LEARNING OUTCOMES

Students will...

7-4-04 Investigate and describe the processes of weathering and erosion, and recognize that they cause changes in the landscape over time.

Include: physical, biological, and chemical weathering.

GLO: D3, D5, E3

7-0-4e Demonstrate work habits that ensure personal safety, the safety of others, and consideration for the environment. Include: keeping an uncluttered workspace; putting equipment away after use; handling glassware with care; wearing goggles when required; disposing of materials safely and responsibly. GLO: C1

7-0-5a ↻ Make observations that are relevant to a specific question. GLO: A1, A2, C2

7-0-7g ↻ Communicate methods, results, conclusions, and new knowledge in a variety of ways. *Examples: oral, written, multimedia presentations...* GLO: C6 (ELA Grade 7, 4.4.1)

7-0-7h Identify and evaluate potential applications of investigation results. GLO: C4

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SUGGESTIONS FOR INSTRUCTION

➢ Changes to the Landscape

Part A: Physical Weathering

Physical weathering involves factors such as water, ice, and/or wind. Have students investigate physical weathering by completing the following steps.

- *Water:* Have students cite, in their science notebooks, occurrences in nature where physical weathering involves water. As a class, develop a list of examples (e.g., waves crashing against a shore, rocks knocking against other rocks in the water, river water helping to break down riverbanks).
- *Ice:* To demonstrate how freezing water can assist in the breakdown of rocks, follow these steps:
  - — Fill a small glass jar with water. Cover it with a lid.
  - — Place the jar in a thick plastic bag and then into the freezer.
  - — After the water has frozen, pull the bag from the freezer, open the bag, and have students observe its contents.

  Have students describe, in their science notebooks, what happened to the water and the jar and relate this to water seeping into cracks in rocks and then freezing. (The water froze and expanded and broke the glass jar. In nature, water seeps into cracks in rocks and when it freezes it widens the cracks and eventually causes the rocks to break into smaller pieces.)
- *Wind:* Have students use the Think-Pair-Share strategy (McTighe and Lyman, 1992) to suggest ways in which wind helps break down rocks. (Wind blows materials that strike against rocks, causing them to wear down or break apart.)

Part B: Chemical Weathering

Have students conduct the following investigation to observe *chemical weathering* in action:

- Place coarse limestone gravel into a plastic container half filled with water.
- Place the same amount of gravel into a plastic container half filled with vinegar.
- Cover each container with a lid and shake the containers for 10 minutes.
- Record your observations.
- Let the containers stand overnight.
- Pour the contents of each container into separate dishes.

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SUGGESTIONS FOR ASSESSMENT

SUGGESTED LEARNING RESOURCES

Nelson Science & Technology 7 (Sections 4.6-4.7)

Sciencepower 7 (Section 10.2)

Addison Wesley Science & Technology 7 (Chapter 5, Sections 4.0-4.1)

PRESCRIBED LEARNING OUTCOMES	SUGGESTIONS FOR INSTRUCTION
Students will...	
7-4-04 *(continued)*	*(continued)* • Use a coin to attempt to scratch gravel from each container. • Record your observations in your science notebook. (At first, both the water and vinegar were clear. In the process of being shaken, both liquids became cloudy and the vinegar formed many bubbles. The gravel in both containers broke apart slightly. After a day, the gravel in the vinegar was easier to scratch with a coin and more sediment gathered. The vinegar seems to help soften the gravel and cause it to break down faster.) *Extension:* Have students research to find out how limestone caves are formed, how acid rain affects rocks and concrete structures, or how mosses and lichens slowly help wear down rocks with the secretion of acids. **Part C: Biological Weathering** Have students do research to identify ways in which animals and plants cause chemical or physical weathering. (Animals burrow, plant roots grow in rock cracks and separate the rock as the plant grows, the roots secrete an acid that softens the rock and causes it to wear down more quickly, lichens and mosses secrete acids and chemically weather the rock beneath them.) ➢ **Picture It** Have students create and label an illustration that shows several different examples of chemical, physical, and biological weathering. Remind students that some examples of weathering will have two labels (e.g., roots causing cracks in rocks are an example of both physical and biological weathering).

SUGGESTIONS FOR ASSESSMENT

SUGGESTED LEARNING RESOURCES

Restricted Response

Note: the following learning activity can be used as an Exit Slip. Provide students with the following:

True or False?

Indicate whether the following statements are true or false:

1. _____ Living things can cause chemical weathering.
2. _____ Waves crashing against a shoreline cause biological weathering.
3. _____ The production of bubbles in a vinegar and gravel mixture indicates that a chemical change is occurring.
4. _____ Living things cannot cause physical weathering.
5. _____ Water expands as it freezes.

Look for:

1. true
2. false
3. true
4. false
5. true

PRESCRIBED LEARNING OUTCOMES
Students will...
7-4-05 Explain how rocks on the Earth constantly undergo a slow process of change through the rock cycle. GLO: D5, E3
7-0-7f ⊂ Reflect on prior knowledge and experiences to construct new understanding and apply this new knowledge in other contexts. GLO: A2, C4 (ELA Grade 7, 1.2.1)

SUGGESTIONS FOR INSTRUCTION

➢ Rock Cycle: Word Splash

Have students use a Word Splash (Saphier and Haley, 1993) to obtain information about the rock cycle.

Divide students into groups of three and ask them to assign a recorder. Give each group the title of the article "The Rock Cycle" (BLM 7-I) and the corresponding "Word Splash: The Rock Cycle" (BLM 7-J). Before students read the article, ask groups to

- make and record thought/concept connections among the different words in their list
- identify the thought connections they believe to be true and the thought connections of which they are unsure

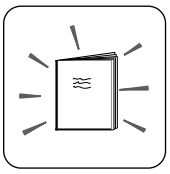
Once students have read the article, have each group analyze their word connection map, identifying differences and similarities between their map and the given article.

➢ Is It a Cycle?

Have students explain, using diagrams and/or written text, why the rock cycle is not really a cycle at all. (A cycle implies a change from one stage to the next, eventually getting to the stage where the process begins all over again. In the rock cycle, changes happen in a number of directions, and stages can be missed.)

SUGGESTIONS FOR ASSESSMENT

SUGGESTED LEARNING RESOURCES



Concept Mapping

(Learning outcomes 7-4-03 to 7-4-05)

Provide students with the following:

Concept Map of the Rock Cycle

Create a concept map that identifies the three types of rock and the forces that can cause one rock form to change to another.

Look for:

Refer to the Teacher Notes provided for learning outcome 7-4-03.

Concept Map Assessment			
Criteria	**Possible Points**	**Self-Assessment**	**Teacher Assessment**
The concept map • identifies three types of rock			
• makes main connections among the three types of rock and magma			
• describes the changes that occur			
• makes subsidiary connections among the types of rock			
Total			

Nelson Science & Technology 7 (Section 4.21)

Sciencepower 7 (Section 10.2)

Addison Wesley Science & Technology 7 (Chapter 5, Sections 3.1-3.3, 4.3-4.4)

Keepers of the Earth: Native Stories and Environmental Activities for Children (Teacher Reference)

PRESCRIBED LEARNING OUTCOMES

Students will...

7-4-06 Identify geological resources that are used by humans as sources of energy, and describe their method of formation.

Include: fossil fuels, geothermal energy.

GLO: D4, D5, E3

7-0-2a ⊂ Access information using a variety of sources. *Examples: libraries, magazines, community resource people, outdoor experiences, videos, CD-ROMs, Internet…* GLO: C6 (ELA Grade 7, 3.2.2; TFS 2.2.1)

7-0-2b Evaluate the usefulness, currency, and reliability of information, using predetermined criteria. GLO: C6, C8 (ELA Grade 7, 3.2.3; TFS 2.2.2)

7-0-2c Make notes using headings and subheadings or graphic organizers appropriate to a topic and reference sources. GLO: C6 (ELA Grade 7, 3.3.2)

7-0-7g ⊂ Communicate methods, results, conclusions, and new knowledge in a variety of ways. *Examples: oral, written, multimedia presentations...* GLO: C6 (ELA Grade 7, 4.4.1)

SUGGESTIONS FOR INSTRUCTION

➢ **Research Project: Fossil Fuels and Geothermal Energy**

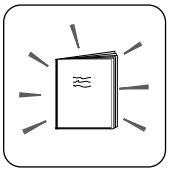
Have students use the SQ3R (Survey, Question, Read, Recite, Review) method (Robinson, 1961) to

- research how *fossil fuels* and *geothermal energy* are formed and how humans use these resources
- present findings to the class, using a multimedia presentation format (e.g., PowerPoint)

(For a discussion of the SQ3R learning strategy, see *5-8 ELA*, Strategies, pp. 179-180, and for the assessment strategy SQ3R Bookmark for Students, see *5-8 ELA*, Grade 8, p. 225.)

SUGGESTIONS FOR ASSESSMENT

SUGGESTED LEARNING RESOURCES



Research Project: Fossil Fuels and Geothermal Energy

Look for indications of the following in student work:

Knowledge Checklist for Research Project		
Fossil Fuels Project	**Yes**	**No**
• defines fossil fuels as fuels formed from long-dead organisms and found in or near sedimentary rock		
• provides a brief, succinct description of coal		
• describes the origin of coal		
• provides a brief, succinct description of crude petroleum		
• provides a brief, succinct description of natural gas		
• describes the origin of crude petroleum and natural gas		
• includes examples of each of the fossil fuels and examples of devices that use fossil fuels as an energy resource		
• includes a picture/diagram/visual on each page of the slide show or multimedia presentation to represent or support the text		
Geothermal Energy Project		
• defines geothermal power as using the heat energy from the Earth's core		
• identifies what magma is and describes how it heats groundwater to create steam		
• describes at least two ways in which geothermal energy is used		
• provides a map that identifies locations of suitable places where geothermal energy may be used		
• identifies environmental impacts of the use of geothermal energy		
• includes a picture/diagram/visual on each page of slide show or multimedia presentation to represent or support the text		

Sciencepower 7 (Sections 3.2, 11.2)

PRESCRIBED LEARNING OUTCOMES

Students will...

7-4-07 Identify geological resources that are present in Manitoba and Canada, and describe the processes involved in their location, extraction, processing, and recycling.

Include: fossil fuels, minerals.

GLO: A5, B5, D3, D5

7-4-08 Identify environmental impacts of geological resource extraction, and describe techniques used to address these.

GLO: B1, B5, C1, C3

7-0-2a ➲ Access information using a variety of sources. *Examples: libraries, magazines, community resource people, outdoor experiences, videos, CD-ROMs, Internet…* GLO: C6 (ELA Grade 7, 3.2.2; TFS 2.2.1)

7-0-2b Evaluate the usefulness, currency, and reliability of information, using predetermined criteria. GLO: C6, C8 (ELA Grade 7, 3.2.3; TFS 2.2.2)

7-0-2c Make notes using headings and subheadings or graphic organizers appropriate to a topic and reference sources. GLO: C6 (ELA Grade 7, 3.3.2)

SUGGESTIONS FOR INSTRUCTION

➢ **Geological Resources in Manitoba/Canada**

Have students work in pairs to complete the following research, with the intent of preparing a class reference book or bulletin board display:

- Choose a geological resource that is present in Manitoba or elsewhere in Canada.
- Research a variety of sources (e.g., by contacting mining associations, museums, and so on) to find the information or materials needed to complete the Research Project Components listed below. Scrutinize sources carefully for currency and possible bias.
- Submit five questions addressed in the research project.

Compile students' questions so that everyone has the opportunity to use the finished class book or bulletin board display to find answers to questions about geological resources.

Research Project Components

Students' research projects will include information on the

- geological resource and its use
- importance of the resource to the economy
- location of mines in Manitoba and/or Canada, including a map
- method(s)/process(es) used to
  - — locate the resource
  - — extract the resource, including techniques used to address environmental impacts
  - — process the resource
  - — recycle the resource

Possible sources of information:

- Association of Manitoba Museums <http://www.escape.ca/~amm/> (204-947-1782) can assist with the location of museums in Manitoba that provide information on resource extraction (e.g., museums in Flin Flon, Thompson, Lynn Lake, Wabowden).
- Manitoba Industry, Trade and Mines <http://www.gov.mb.ca/em> (204-945-6569)
- The Mining Association of Canada <http://www.mining.ca/> (613-233-9391) offers a free magazine, *What Metals and Minerals Mean to Canadians*. It includes information on topics such as prospecting and exploration, extraction of ore, processing of resources, and mining and the environment.

Suggestions for Assessment

Restricted/Extended Response

Some of the project questions that students submit as part of their research project on Geological Resources in Manitoba/Canada may be used on a Cluster 4 test.

Teacher Notes

Background Information

Manitoba has an abundance of mineral resources, ranking fourth among Canadian provinces in production. Metallic minerals are found in the Canadian Shield. The chief metals mined in Manitoba are nickel, copper, and zinc. The Thompson nickel belt is one of the richest in the world. Gold, silver, cobalt, and platinum are by-products of nickel and copper mining. The entire Canadian output of tantalum is mined in southeastern Manitoba. Zinc and copper mining have been conducted at Fin Flon, Lynn Lake, and Leaf Rapids.*

* Source: *Senior 3 Agriculture: A Full Course for Distance Education Delivery, Field Validation Version.* Winnipeg, MB: Manitoba Education and Training, 1999. p. 103.

Suggested Learning Resources

Nelson Science & Technology 7 (Sections 4.3-4.5)

Sciencepower 7 (Section 10.1, Unit 4: Issue to Analyze)

Addison Wesley Science & Technology 7 (Chapter 5, Sections 3.2, 6.3)

PRESCRIBED LEARNING OUTCOMES

Students will...

7-4-09 Recognize that soil is a natural resource, and explain how the characteristics of soil determine its use.

GLO: D5, E1

7-0-2a ➲ Access information using a variety of sources. *Examples: libraries, magazines, community resource people, outdoor experiences, videos, CD-ROMs, Internet…* GLO: C6 (ELA Grade 7, 3.2.2; TFS 2.2.1)

7-0-4c ➲ Work cooperatively with team members to carry out a plan, and troubleshoot problems as they arise. GLO: C7 (ELA Grade 7, 5.2.1)

SUGGESTIONS FOR INSTRUCTION

➢ What Is a Natural Resource?

Provide students with the following description:

A *natural resource* is something found in the natural environment that humans can use to satisfy a need.

Have students indicate which of the following would be considered a renewable resource and provide justification for their responses. (As part of their discussion, students will need to generate a working definition of a renewable resource.)

- nickel
- water
- soil
- gold
- trees

Students may complete the task in small groups and share their responses with the class.

➢ Soils in Manitoba

Have students use a strategy such as Highlighting (see *5-8 ELA*, Grade 7, p. 216) to gain information from the reading selection "Soils in Manitoba" (BLM 7-K). Following the reading, ask students to answer the following questions in their science notebooks:

1. Why are soils important to ecosystems? Where does soil come from?
2. How is particle size used to classify soils?
3. What two factors play major roles in soil formation?
4. What similarities are found among the three maps (Soil Zones of Manitoba, Climate Changes in Manitoba, and Natural Vegetation in Manitoba) provided in BLM 7-K?
5. In which soil zone, climate region, and natural vegetation region are you located?

➢ Garden Plan

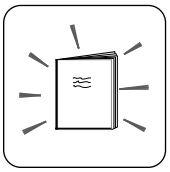
Have students identify

- characteristics of soil that are important for flower gardeners (e.g., drainage, acidity, loam)
- characteristics of local soil
- local planting zones

Gardening catalogues, local greenhouses/gardeners, and/or agricultural representatives are helpful sources of information.

Based on the information they collect, have students plan a flower garden containing a minimum of five different plants for a designated location (soil type, drainage, and amount of sun/shade would need to be determined), then sketch a plan of their garden and include a list of plants and their soil, light, and drainage requirements.

Suggestions for Assessment



Garden Plan

Provide students with the following tool for peer assessment of the garden plan:

Peer Assessment of Garden Plan					
Designer: _____					
Peer assessor: _____					
Rating Scale					
Criteria	**Poor** 1	2	**Good** 3	4	**Excellent** 5
The garden plan • is clear and aesthetically pleasing • includes a list of at least five different plants, with details regarding soil, light, and drainage requirements • features plants that are suited to the given soil type, lighting, and drainage					
Constructive comments:					

Teacher Notes

Background Information

Some agricultural methods of soil usage are like forms of "mining"—taking as much as possible out of the soil without replacing what is taken. The idea that soil is a renewable resource is part of the concept of sustainable agriculture.*

* Source: *Senior 3 Agriculture: A Full Course for Distance Education Delivery, Field Validation Version.* Winnipeg, MB: Manitoba Education and Training, 1999. p. 63.

Suggested Learning Resources

Nelson Science & Technology 7 (Sections 4.7-4.9)

Sciencepower 7 (Section 10.3)

Addison Wesley Science & Technology 7 (Chapter 5, Sections 5.3-5.4)

PRESCRIBED LEARNING OUTCOMES
Students will...
7-4-10 Describe methods used to control soil erosion, and recognize the importance of soil conservation. *Examples: economically important to the agri-food industry, important for controlling the flow of water, necessary for plant growth...* GLO: A5, B2, B5, E3
7-0-2a ⊂ Access information using a variety of sources. *Examples: libraries, magazines, community resource people, outdoor experiences, videos, CD-ROMs, Internet…* GLO: C6 (ELA Grade 7, 3.2.2; TFS 2.2.1) **7-0-7g** ⊂ Communicate methods, results, conclusions, and new knowledge in a variety of ways. *Examples: oral, written, multimedia presentations...* GLO: C6 (ELA Grade 7, 4.4.1)

SUGGESTIONS FOR INSTRUCTION

➢ Soil Conservation

Ask students to indicate whether they agree or disagree with the following statement, and to explain why:

Soil management is everyone's responsibility.

Provide students with a copy of "Soil Erosion" (BLM 7-L). After students have read the information provided in the reading selection, have them

- reconsider the above statement
- indicate whether they now agree or disagree with it
- explain their thinking

➢ Dirty Thirties

The Midwest of North America was known as a dust bowl in the 1930s. The summers were hot, dry, and windy. Strong winds eroded the fertile topsoil, causing the sky to turn dark and visibility to lessen. Ultimately, the loss of nutrients in the soil resulted in crop failure.

Have students read texts or view videos or CD-ROM clips that describe the "Dirty Thirties." Have them write a diary entry from the viewpoint of a farmer living during the 1930s, describing the conditions of that era and their impact on the lives of individuals and families.

Suggestions for Assessment

Suggested Learning Resources

Restricted Response

Provide students with the following questions:

Controlling Erosion

1. What are two ways in which *water erosion* can be controlled?
2. What are two ways in which *wind erosion* can be controlled?

Look for:

See "Soil Erosion" (BLM 7-L) for possible responses.

Nelson Science & Technology 7 (Sections 4.9-4.10)

Sciencepower 7 (Section 10.3)

Addison Wesley Science & Technology 7 (Chapter 5, Sections 5.3-5.4)

PRESCRIBED LEARNING OUTCOMES

Students will...

7-4-11 Identify environmental, social, and economic factors that should be considered in making informed decisions about land use.

GLO: B1, B5, D5

7-0-4c ⊂ Work cooperatively with team members to carry out a plan, and troubleshoot problems as they arise. GLO: C7 (ELA Grade 7, 5.2.1)

7-0-4d ⊂ Assume various roles to achieve group goals. GLO: C7 (ELA Grade 7, 5.2.2)

7-0-8g Discuss societal, environmental, and economic impacts of scientific and technological endeavours. Include: local and global impacts. GLO: A1, B1, B3, B5

7-0-9e Be sensitive and responsible in maintaining a balance between the needs of humans and a sustainable environment. GLO: B5

SUGGESTIONS FOR INSTRUCTION

➢ **Point of View on an Issue**

Provide students with the following scenario of a land-use issue (or a description of a local issue).

Land-Use Issue

A large city is running out of land in which to dump its garbage. The city is looking for possible places to build a landfill site. A large open-pit mine several hundred kilometres to the north has been closed down and is suggested as a possible dump site.

The community adjacent to the old mine is considering this proposal, taking into account a variety of related issues. The new state-of-the-art landfill project will provide needed jobs for the community, which is still feeling the effects of the closed mine. The community has recently focused on attracting tourists and new residents on the basis of a clean, quiet environment. Unless this proposed venture is successful, or another industry takes its place, the people who still live in the community will pack up and move elsewhere. Some scientists suspect that the community's drinking supply may be at risk of becoming contaminated because of aquifers located beneath the fissured rocks (rocks containing small cracks) that line the open-pit mine.

Part A: Letters to the Editor

Have students write letters to the editor regarding the above land-use issue, including substantiated reasons for their decision to back the proposal or to voice concerns about it. Ask students in the class to represent different interest groups, such as

- a city official in charge of garbage disposal
- a landfill company representative
- an unemployed person living in the community near the proposed landfill site
- a new community resident
- a long-term community resident
- a community official in charge of attracting tourists
- a geologist/scientist
- an official in a nearby city that extracts its drinking water from a river running through the area

Part B: Decision Making

Have teams of students represent the community council and use the letters to make and justify a decision related to the land-use issue. Have teams share their decisions and discuss any differences.

SUGGESTIONS FOR ASSESSMENT

Journal Reflection

Provide students with the following questions:

Decision-Making Reflection

1. Was it easy for the community council to come to a decision regarding the land-use issue? Why or why not?
2. Did you agree or disagree with the decision of the council? If you agreed, explain why. If you disagreed, how did your reasoning differ?
3. What further information would you like to obtain to help you feel confident about your decision?

SUGGESTED LEARNING RESOURCES

Nelson Science & Technology 7 (Sections 4.10-4.11)

Sciencepower 7 (Section 10.3)

Addison Wesley Science & Technology 7 (Chapter 5, Sections 5.3-5.4, 6.0-6.3)

PRESCRIBED LEARNING OUTCOMES

Students will...

7-4-12 Describe evidence used to support the continental drift theory, and explain why this theory was not generally accepted by scientists.

GLO: A1, A2, A4, D5

7-0-7b Critically evaluate conclusions, basing arguments on fact rather than opinion. GLO: C2, C4

7-0-9a Appreciate and respect that science has evolved from different views held by women and men from a variety of societies and cultural backgrounds. GLO: A4

SUGGESTIONS FOR INSTRUCTION

➢ Continental Drift Theory

Read the following mock news release to students:

> **New Theory Proposed (1912)**
>
> Scientist Alfred Wegener recently released a paper describing his theory that the continents were once part of one large continent called Pangea. He describes how the continents fit together like a giant puzzle. He believes that, over time, the continents moved apart in a process he calls *continental drift.* The scientific community does not accept Wegener's theory, as he is not able to explain how the continents could move or provide evidence showing they were once joined.

Have students answer the following questions in their science notebooks:

1. What are the major flaws with Wegener's continental drift theory? (He cannot explain how the continents could possibly move, nor can he provide evidence showing they were once joined.)
2. What evidence might a *geologist* look for to prove Wegener's theory? (Similar rocks found on the different continents.)
3. What evidence might a *biologist* look for to prove Wegener's theory? (Similar animals and/or fossils found on the different continents.)
4. Why is it difficult to get all scientists to support a theory? (Evidence to support a theory has to address every possible question.)

SUGGESTIONS FOR ASSESSMENT	SUGGESTED LEARNING RESOURCES
Refer to the assessment strategy suggested for learning outcome 7-4-14.	*Nelson Science & Technology 7* (Section 4.15) *Sciencepower 7* (Section 12.2)

PRESCRIBED LEARNING OUTCOMES
Students will...
7-4-13 Describe evidence used to support the theory of plate tectonics, the role technology has played in the development of this theory, and reasons why it is generally accepted by scientists. GLO: A1, A2, A5, D5
7-0-2a ⊂ Access information using a variety of sources. *Examples: libraries, magazines, community resource people, outdoor experiences, videos, CD-ROMs, Internet…* GLO: C6 (ELA Grade 7, 3.2.2; TFS 2.2.1) **7-0-4c** ⊂ Work cooperatively with team members to carry out a plan, and troubleshoot problems as they arise. GLO: C7 (ELA Grade 7, 5.2.1) **7-0-4d** ⊂ Assume various roles to achieve group goals. GLO: C7 (ELA Grade 7, 5.2.2) **7-0-7g** ⊂ Communicate methods, results, conclusions, and new knowledge in a variety of ways. *Examples: oral, written, multimedia presentations...* GLO: C6 (ELA Grade 7, 4.4.1) **7-0-8b** Describe examples of how scientific knowledge has evolved in light of new evidence, and the role of technology in this evolution. GLO: A2, A5, B1

SUGGESTIONS FOR INSTRUCTION

➢ **Plate Tectonics Theory: Role-Play Trial**

Have students role-play a court scene in which the *theory of plate tectonics* as an explanation of the Earth's structure is on trial. In preparation for this trial, have students

- research to gather evidence that proves the theory of plate tectonics, highlighting the role of technology in gathering evidence
- organize other students to come to the witness stand to provide evidence and answer questions that will substantiate the theory

Possible witnesses:

- a sonar operator on a research ship
- a seismograph expert who has recorded earthquakes occurring along the Mid-Atlantic Ridge
- a researcher who has used a magnetometer to measure the magnetism in rocks on the ocean floor
- an inventor of a submersible that collected rock samples and photographed geological activity at the ridges and trenches

SUGGESTIONS FOR ASSESSMENT

SUGGESTED LEARNING RESOURCES

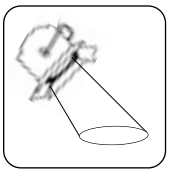


Plate Tectonics Theory: Role-Play Trial

Provide students with the following:

You Be the Judge

You were the judge of the trial just held. You must make point-form notes detailing the evidence for and against the acceptance of the *theory of plate tectonics*. Develop a verdict and substantiate it with evidence derived from the trial and the validity of the data.

Scoring Rubric	
Score	**Criteria**
4	Point-form notes detail all evidence given for and against the theory. The verdict is logical, is well substantiated with the evidence provided, and discusses the validity of the data.
3	Point-form notes detail all evidence given for and against the theory. The verdict is logical and substantiated with the evidence provided.
2	Point-form notes detail most evidence given for and against the theory. The verdict is logical and substantiated with the evidence provided.
1	Point-form notes are missing several points of evidence for and against the theory. A verdict is made but not fully substantiated.

Also refer to the assessment strategy suggested for learning outcome 7-4-14.

Nelson Science & Technology 7 (Sections 4.15, 4.18)

Sciencepower 7 (Section 12.3)

Addison Wesley Science & Technology 7 (Chapter 5, Section 1.2)

PRESCRIBED LEARNING OUTCOMES	SUGGESTIONS FOR INSTRUCTION
Students will...	
7-4-14 Explain geological processes and events using the theory of plate tectonics. Include: mountain formation, earthquakes, volcanoes. GLO: A1, A2, D5, E3	➢ **Modelling Folding and Faulting** Have pairs of students • use print or electronic resources to determine how the geological processes of *folding* and *faulting* of Earth's crust result in the formation of mountains • use modelling clay or foam sheets to create a multi-layered section representative of the Earth's crust • use their model to demonstrate to the class how folding and faulting occur and how mountains are formed ➢ **Analyzing Data** Have students analyze maps depicting locations of earthquakes and volcanoes and have them compare these to the locations of the geological plates. Ask students to use the theory of plate tectonics to explain these phenomena.
7-0-2a ⊂ Access information using a variety of sources. *Examples: libraries, magazines, community resource people, outdoor experiences, videos, CD-ROMs, Internet…* GLO: C6 (ELA Grade 7, 3.2.2; TFS 2.2.1) **7-0-7f** ⊂ Reflect on prior knowledge and experiences to construct new understanding and apply this new knowledge in other contexts. GLO: A2, C4 (ELA Grade 7, 1.2.1) **7-0-7g** ⊂ Communicate methods, results, conclusions, and new knowledge in a variety of ways. *Examples: oral, written, multimedia presentations...* GLO: C6 (ELA Grade 7, 4.4.1)	
7-4-15 Identify specialized careers involving the study of the Earth's crust or the utilization of geological resources, and give examples of technologies used in each. *Examples: geophysicist, seismologist, volcanologist, farmer...* GLO: A5, B4	➢ **Job/Career Advertisement** Have students create an advertisement for a job/career that involves the study of the Earth's crust or the utilization of the Earth's resources. The advertisement should include a description of the • job/career • education required • possible job locations • type of equipment or technology that the applicant may have to use to perform the job
7-0-7g ⊂ Communicate methods, results, conclusions, and new knowledge in a variety of ways. *Examples: oral, written, multimedia presentations...* GLO: C6 (ELA Grade 7, 4.4.1) **7-0-9b** Express interest in a broad scope of science and technology related fields and issues. GLO: B4	

SUGGESTIONS FOR ASSESSMENT

SUGGESTED LEARNING RESOURCES

Theory of Plate Tectonics

(Learning outcomes 7-4-12, 7-4-13, and 7-4-14)

Provide students with the following:

Predicting the Future

Predict whether or not the *theory of plate tectonics* will still hold true 100 years from now as the best explanation for geological phenomena that we observe. Justify your response.

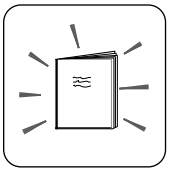
Look for:

- a clearly stated opinion
- an understanding that scientific knowledge is ever-evolving
- an understanding that technology can help us gather even more information to support (or refute) the theory of plate tectonics

Nelson Science & Technology 7 (Section 4.2)

Sciencepower 7 (Sections 11.1-11.2)

Addison Wesley Science & Technology 7 (Chapter 5, Sections 1.3-1.4, 2.0-2.4)



Job/Career Advertisement

When assessing students' Job/Career Advertisements, look for indications of the following:

Checklist for Job/Career Advertisement		
Criteria	**Yes**	**No**
The job/career advertisement • is presented in an appropriate format • uses appropriate language • includes a description of the — job/career — education required — job locations — technological skills required		

Nelson Science & Technology 7 (Section 4.18)

Sciencepower 7 (Sections 10.3, 12.3)

Addison Wesley Science & Technology 7 (Chapter 5, Unit 2: Careers & Profiles, Unit 3: Careers & Profiles)

Notes