

ENERGY AND MINES

SECTION J: SAMPLE STUDENT LEARNING GUIDES

The following pages provide background information, strategies and a template for developing student learning guides. Also included at the end of this section are several sample student learning guides for Energy and Mines.

A student learning guide provides information and direction to help students attain the expectations defined in a specified CTS module. It is designed to be used by students under the direction of a teacher.

Many excellent student learning guides (SLGs) are available for use and/or are in the process of being developed. While Alberta Education provides a development template accompanied by some samples, most student learning guide development is being done by individuals and organizations across the province (e.g., school jurisdictions, specialist councils, post-secondary organizations). Refer to the *Career & Technology Studies Manual for Administrators, Counsellors and Teachers* (Appendix 11) for further information regarding student learning guide developers and sources.

Note: A student learning guide is not a self-contained learning package (e.g., Distance Learning Module), such as you might receive from the Alberta Distance Learning Centre (ADLC) or Distance Learning Options South (DLOS).

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BACKGROUND INFORMATION

A Student Learning Guide (SLG) is a presentation of information and direction that will help students attain the expectations defined in a specified CTS module. It is designed to be used by students under the direction of a teacher. A SLG is not a self-contained learning package such as you might receive from the Alberta Distance Learning Centre (ADLC) or Distance Learning Options South (DLOS).

Each SLG is based on curriculum and assessment standards as defined for a particular CTS module. Curriculum and assessment standards are defined in this document through:

- module and specific learner expectations (Sections D, E and F)
- assessment criteria and conditions (Sections D, E and F)
- assessment tools (Section G).

The SLG is written with the student in mind and makes sense to the student in the context of his or her CTS program. SLGs are designed to guide students through modules under the direction of the teacher. They can be used to guide:

- an entire class
- a small groups of students
- individual students.

In some instances, the Student Learning Guide may also be used as teacher lesson plans. When using SLGs as teacher lesson plans, it should be noted that they tend to be:

- learner-centred (versus teacher-directed)
- activity-based (versus lecture-based)
- resource-based (versus textbook-based).

Components of a Student Learning Guide

The student learning guide format, as developed by Alberta Education, typically has *seven* components as described below.

1. *Why Take This Module?*

This section provides a brief rationale for the work the student will do, and also establishes a context for learning (i.e., in relation to the strand, a life pursuit, a specific industry, etc.).

2. *What Do You Need To Know Before You Start?*

In this section, prerequisite knowledge, skills and attitudes considered necessary for success in the module are identified. Prerequisites may include other modules from within the strand or from related CTS strands, as well as generic knowledge and skills (e.g., safety competencies, the ability to measure/write/draw, prior knowledge of basic information relevant to the area of study).

3. *What Will You Know And Be Able To Do When You Finish?*

This information must parallel and reflect the curriculum and assessment standards as defined for the module. You may find it desirable to rewrite these standards in less formal language for student use.

4. *When Should Your Work Be Done?*

This section provides a timeline that will guide the student in planning their work. The timeline will need to reflect your program and be specific to the assignments you give your students. You may wish to include a time management chart, a list of all assignments to be completed, and instructions to the student regarding the use of a daily planner (i.e., agenda book) to organize their work.

5. *How Will Your Mark For This Module Be Determined?*

This section will interpret the assessment criteria and conditions, assessment standards, assessment tools and suggested emphasis as defined for the module within the context of the projects/tasks completed. Accepted grading practices will then be used to determine a percentage grade for the module—a mark not less than 50% for successful completion. (**Note:** A module is

“successfully completed” when the student can demonstrate ALL of the exit-level competencies or MLEs defined for the module.)

6. *Which Resources May You Use?*

Resources considered appropriate for completing the module and learning activities are identified in this section of the guide. The resources may be available through the Learning Resources Distributing Centre (LRDC) and/or through other agencies. Some SLGs may reference a single resource, while others may reference a range of resources. Resources may include those identified in the Learning Resource Guide (Section I) as well as other sources of information considered appropriate.

7. *Activities/Worksheets*

This section provides student-centred and activity-based projects and assignments that support the module learner expectations. When appropriately aligned with curriculum and assessment standards, successful completion of the projects and assignments will also indicate successful completion of the module.

Strategies for Developing Student Learning Guides

Prior to commencing the development of a student learning guide, teachers are advised to obtain:

- the relevant Guide to Standards and Implementation
- the student learning guide template.

Information communicated to the student in the SLG must parallel and reflect the curriculum and assessment standards as defined for the module. Therefore, critical elements of the Guide to Standards and Implementation that need to be addressed throughout the SLG include:

- module and specific learner expectations
- assessment criteria and conditions
- assessment standards
- assessment tools.

Additional ideas and activities will need to be incorporated into the student learning guide. These can be obtained by:

- reflecting on projects and assignments you have used in delivering programs in the past
- identifying human and physical resources available within the school and community
- networking and exchanging ideas (including SLGs) with other teachers
- reviewing the range of resources (e.g., print, media, software) identified in the Learning Resource Guide (Section I) for a particular module/strand.

Copyright law must also be adhered to when preparing a SLG. Further information and guidelines regarding copyright law can be obtained by referring to the:

- *Copyright Act*
- *Copyright* and the *Can Copy Agreement*.

A final task in developing a student learning guide involves validating the level of difficulty/ challenge/rigour established, and making adjustments as considered appropriate.

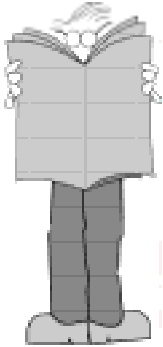
A template for developing student learning guides, also available on the Internet, is provided in this section (see “Student Learning Guide Template,” pages J.5–10). Several sample student learning guides are also provided in this section (see “Sample Student Learning Guides,” starting on page J.11).

CAREER & TECHNOLOGY STUDIES



SAMPLE STUDENT LEARNING GUIDE TEMPLATE

WHY TAKE THIS MODULE?



WHAT DO YOU NEED TO KNOW BEFORE YOU START?



WHAT

**WILL YOU KNOW AND
BE ABLE TO DO
WHEN YOU FINISH?**

-
-
-
-
-
-
-
-

WHEN

SHOULD YOUR WORK BE DONE?

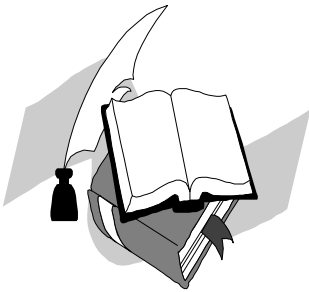


HOW WILL YOUR MARK FOR THIS MODULE BE DETERMINED?

	PERCENTAGE
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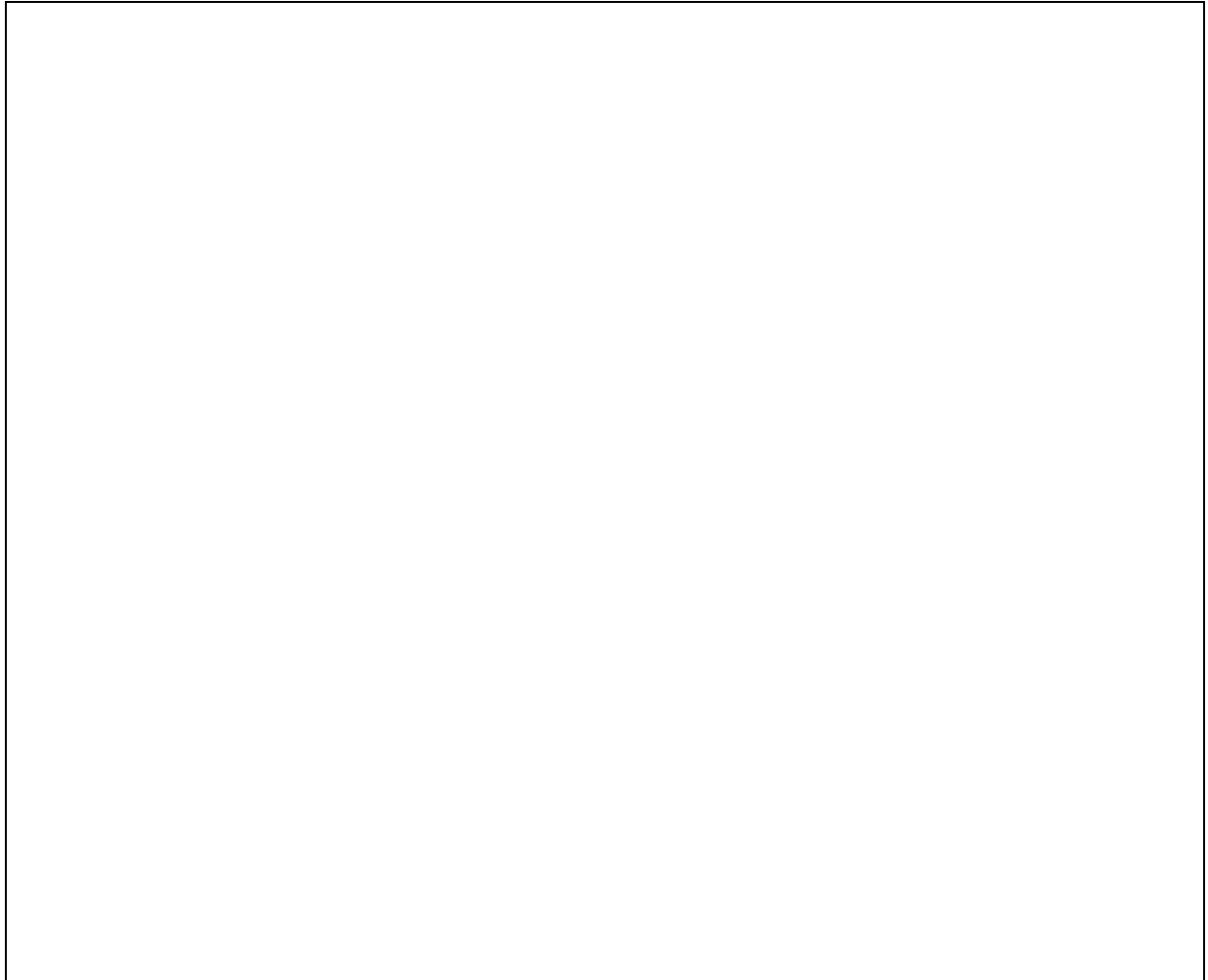


WHICH RESOURCES MAY YOU USE?



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ACTIVITIES/WORKSHEETS



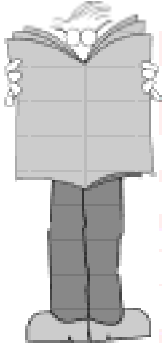
CAREER & TECHNOLOGY STUDIES

ENERGY AND MINES

SAMPLE STUDENT LEARNING GUIDE

ENM1050 Renewable Resources

WHY TAKE THIS MODULE?



- The most commonly used energy sources on earth are non-renewable resources, including coal, oil and natural gas. In Alberta, coal is used to produce almost 90% of our electricity. Natural gas is used for most of our heating, and crude oil is used to produce gasoline, diesel and many other important products.
- Our reserves of nonrenewable energy resources are decreasing. Furthermore, there is increasing concern regarding the environmental effects of burning fossil fuels to produce energy. A number of alternative energy sources are available in Alberta and Canada that have the potential to supplement conventional energy supply.
- This module will examine several renewable sources of energy and related technologies. You will discover benefits and obstacles associated with the use of each, with respect to technological and geological requirements, cost, environmental impact and forecasts regarding sustainability.

WHAT DO YOU NEED TO KNOW BEFORE YOU START?

There are no prerequisites identified for this module.

However, you should be able to:

- identify major non-renewable energy resources and describe the use of each in Alberta and Canada
- explain how the use of non-renewable resources may affect the atmosphere, land and soil, water and wildlife
- define and give examples of sustainable energy development.



WHAT WILL YOU KNOW AND BE ABLE TO DO WHEN YOU FINISH?

Upon completion of this module you will be able to:

- describe applications of renewable energy technology
- explain current and potential contributions of renewable energy to sustainable energy development
- identify career opportunities relevant to renewable energy development
- demonstrate basic competencies.

WHEN SHOULD YOUR WORK BE DONE?

Your teacher will give you a timeline for completing tasks and assignments within this module.

You may also wish to use a time-management planning chart to preplan the work that needs to be done in this module. Plan how you will use your class time as well as extra time needed to complete the assignments in this module.



ENM1050 Renewable Resources

HOW WILL YOUR MARK FOR THIS MODULE BE DETERMINED?

	PERCENTAGE
You must first demonstrate all of the competencies required for this module.	
When you have done this, your percentage mark for the module will be determined as follows:	
<ul style="list-style-type: none"> • Alberta Charts and Reports on Renewable Technologies 	20
<ul style="list-style-type: none"> • Renewable Energy and the Alberta Market 	20
<ul style="list-style-type: none"> • Renewable Energy Policies 	20
<ul style="list-style-type: none"> • Renewable Energy House 	35
<ul style="list-style-type: none"> • Time Management and Teamwork 	5



WHICH RESOURCES MAY YOU USE?



- *Somebody Should Do Something About This!*, Alberta Energy, 1992.
- *Energy: Sources/Applications? Alternatives*, Irwin Publishers, 1993.
- *Living With Technology*, Delmar Publishers, 1993.
- *Transportation, Energy and Power Technology*, Delmar Publishers, 1989.
- *Delmar Technology Series: Energy, Power, and Transportation Technology Activities*, Delmar Publishers, 1988.
- *Edmonton Beneath Our Feet: A Guide to the Geology of the Edmonton Region*, Edmonton Geological Society, 1993.
- *Facing the Future: Renewable Energy*, Fitzhenry and Whiteside, 1991.
- *Light Makes Electricity*, Marlin Motion Pictures, 1990.
- *Science Now! Energy*, Copp Clark Pitman, 1990.
- *SWAREI: Energy in Alberta - Take Another Look*, Public Affairs Bureau, 1993.

ENM1050 Renewable Resources

ACTIVITIES/WORKSHEETS

1. Form a group with up to four additional students. The group will be responsible for conducting research on five common forms of renewable energy (e.g., solar, wind, biomass, hydroelectric, geothermal). Each group will be responsible for creating a wall chart of Alberta, on which will be indicated the sites where renewable energy is currently being developed. For each topic the group will create a 250-word overview of the energy source, technologies used to harness the energy, and the status of the industry in Alberta. The wall chart, descriptions and any additional diagrams should be combined into a display that can be mounted in the classroom or elsewhere in the school.
2. Identify five Albertans that have experience with different forms/sources of renewable energy (e.g., residential contractors, architects, engineers, retailers of wood stoves, users of solar and wind energy technology). Create a series of interview questions for each person, asking them about their educational and professional experiences, factors that encouraged them to get involved with renewable energy technologies, and accomplishments/challenges in marketing these technologies. Ask each knowledgeable person to explain how the renewable technology is being marketed. Gather information about how the Alberta market compares to markets in other provinces and countries. Using information gained from the interviews, write a 300-word report on current markets for renewable energy technologies in Alberta. If possible, have a person knowledgeable about renewable energy in your community talk to the class about their experiences and/or work with alternative energy technologies.

NOTE: There are a number of active renewable energy organizations in Alberta, including the Solar Energy Society of Canada and the Small Power Producers of Alberta. Members of these groups would be excellent sources of information.

3. Contact an agency of the Alberta government (e.g., Alberta Energy, Alberta Environmental Protection, Energy Resources Conservation Board, Alberta Energy and Utilities Board) regarding information about energy policies in the province. Obtain answers to questions such as:
 - Why is coal used to produce about 90% of Alberta's electricity?
 - To what extent are solar, wind and biomass energy sources used to produce electricity in Alberta?
 - What are some benefits and obstacles to the use of alternative energy technologies in Alberta?

Prepare an oral and/or written report that summarizes questions asked and answers obtained regarding energy policies in Alberta.

4. Design and construct a model of a renewable energy house. Possible technologies include passive solar energy, active solar energy, photovoltaic electricity, solar water heating, ground source heat pumping, wind pumping, wind turbines and wood heating. The household should not require access to natural gas and electrical utilities. Energy efficient construction techniques should be addressed. The house design should be presented as a model and series of drawings that illustrate renewable energy technologies (see *Worksheet #1: Designing a Renewable Energy House*).

WORKSHEET 1

DESIGNING A RENEWABLE ENERGY HOUSE

INTRODUCTION

Many buildings in Alberta are being designed using renewable sources of energy. Some of these buildings are constructed in remote areas, far from power lines or natural gas pipelines, so these other sources of energy have to be used. At the present time renewable technologies such as photovoltaic cells and wind turbines are more expensive to use than grid electricity or natural gas. As a result, renewable energy houses are also usually very energy efficient, to use less energy and reduce the cost of living in the house.

As you work through this assignment you will be designing a highly energy efficient, renewable energy house. For each of the following categories, answer the questions to help you decide how to solve the problem in your house. When you are finished the questions, use the information to create two different products: a number of drawings illustrating the house and the technologies you are using, and a small model of the house. The drawings should include a floor plan, a drawing of the front and back of the house and detailed drawings of any special technologies that will be included.

USING RENEWABLE ENERGY

A typical house needs energy for the following jobs: heating the air, heating the water, electricity and fuel for the range. There are a number of ways that renewable energy can be used for each of these jobs. Compare and contrast the cost and benefits of each technology before selecting which you will use in your house. Be prepared to explain your decision.

1. Heating the Air: Most Albertans use a natural gas furnace to heat the air in their homes.
 - How about passive solar energy? How can you design your house to make better use of the sun's heat energy?
 - What about wood-burning stoves or fireplaces? Can a wood-burning stove or fireplace be used to heat an entire house? If so, how?
 - Would a ground source heat pump work in Alberta? How would this technology affect the design of your house?
 - Are there other ways to heat the air using renewable energy?
2. Heating Water: Most water heaters in Alberta use natural gas.
 - Could you use an active-solar heating system to heat your water? If so, how will that affect the design of your house?
 - Many Alberta settlers used water containers stored on or in wood stoves to heat water. Would this work with new models or wood stoves? How would this affect the design of your house?
 - Can you think of other ways that you could use renewable energy to heat water?

ENM1050 Renewable Resources

3. Electricity: Most Alberta homes are connected to the electrical grid. Electricity is needed in every modern house, so other ways must be found to generate electricity in homes that are not connected to the electrical grid.
 - What about using photovoltaic panels? Could PV panels produce enough electricity for an average Alberta house? How would using photovoltaic panels affect the design of your house?
 - How about using a wind turbine? Is there enough wind in your part of Alberta?
 - A small hydro generator is another option. What sort of water source do you need to use this technology?

4. Cooking: Two types of stoves are common in Alberta: natural gas and electricity. Electric stoves consume a large proportion of the electricity in a house, so other types of stoves may be required.
 - How about wood stoves? How efficient are these stoves for cooking and baking? Could a wood stove be used for space heating, water heating and cooking?
 - Ovens using the sunlight are also available. How do they compare with normal stoves?
 - Do you have any other ideas?

BUILDING ENERGY EFFICIENT HOMES

1. The Building Envelope: The building envelope is the barrier between the space inside the house and the outside elements or the environment. The envelope controls the flow of heat and moisture across this barrier. An inefficient barrier lets heat escape outside in cold weather, and heat to enter the house in hot weather. An energy-efficient building envelope greatly reduces the amount of energy required to heat and cool the house.
 - There should be a layer on the outside of the house that stops the wind from blowing air through the insulation and removing the heat, like a windbreaker over a sweater. What products are available to do this? Will your house have this layer?
 - The insulation is like a sweater, stopping the flow of heat. Generally, the more insulation the walls and ceiling of a house contain, the better. However, there is a point at which the cost of additional insulation no longer makes sense. How much insulation will be in your house? What type of insulation will you use? How will this affect the design of your house?
 - The air in Alberta is very dry, particularly in winter. A healthy house contains moister air than the outside. Wherever air leaks from a house, moisture leaks as well. Efficient homes have a layer called a vapour barrier on the inside of the insulation. What type of vapour barrier will you use? How is a vapour barrier installed to maximize its benefit?
 - A high percentage of the air leakage in a house happens around and through doors and windows. What type of doors will you use, wood or steel? What type of windows will you use to decrease the amount of heat lost through the glass? Where will you put them to maximize the natural light and the amount of passive solar energy that the house receives? How can you reduce the amount of solar energy that enters your house during the summer? What can you do when you install doors and windows to increase their efficiency?

2. Size and Orientation:
 - Larger houses require more energy than smaller houses. How can you design your house so that it will be comfortable to live in, yet be kept fairly small?
 - Which rooms should be on the south side of the house, to take the greatest advantage of natural lighting and passive solar energy?

ENM1050 Renewable Resources

3. Appliances and Lighting:

- Write a list of all the items in your home that use electricity. Which require the most energy? Since the electricity at your renewable house is limited and probably costly, you will have to reduce your electrical demand as much as possible. Which appliances will you have in your house? Are there any that you can do without? Can you replace some with a more efficient model? How will you design your lighting?

4. Landscaping:

- From which direction do the prevailing winds blow in Alberta? How could the house be positioned to decrease the effect of the wind? How could you use hills or trees to help break the wind?
- In the winter you want as much sun shining on your house as possible. In the summer, you want to block the sun. How can your landscaping do this?

DESIGNING YOUR HOUSE

Now that you have figured out how to produce all the energy needed in your home and how you are going to make it energy efficient, the last step is to decide some of the basic features of your house.

- Will your house have a basement? In most houses, the furnace, hot water heater and freezer are found in the basement. In many houses, the basement is just used for storage. Does your house need a basement? What are the advantages and disadvantages of a basement?
- How many storeys will your house have? Which is easier to heat—a large, spread-out house or a smaller, two-storey house? Which is more convenient?
- How many rooms will your house have? Obviously the number of rooms will help decide how big your house will be. How many people will live in your house? Following are lists of rooms that are needed or may be optional, as well as suggested minimum sizes.

Required Rooms

- kitchen (3 m × 3 m)
- eating area (3 m × 3 m)
- bedroom(s) (3 m × 3 m)
- bathroom (3 m × 2 m)
- living room (3 m × 3 m)
- utility room (2.5 m × 2.5 m)
- storage

Optional Rooms

- dining room (3 m × 3 m)
- family room (3 m × 3 m)
- study (3 m × 3 m)
- extra bedrooms
- extra bathrooms

- Don't forget hallways to connect the rooms, and stairs to connect any storeys. You will need a front and back door, and at least one window in each room.

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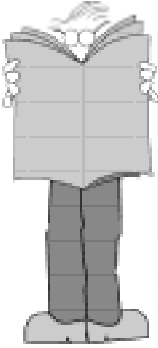
ENERGY AND MINES

SAMPLE STUDENT LEARNING GUIDE

ENM1100 Conservation Challenge

ENM1100 Conservation Challenge

WHY TAKE THIS MODULE?



- Energy is all around us. We see it in bright sunshine and when we turn on lights. We feel warm sun and cool wind. We listen to sound produced from electricity in CD players and TVs. We also use mining products every day, from parts in our alarm clock that wake us up, to materials in our pencils we use at school, to the parts in our TVs that we watch at night. Our way of life depends upon energy and mineral resources.
- However, most of our energy and mineral resources are non-renewable resources and are in limited supply. Extracting and using these resources can also affect the environment. In this module you will discover why conserving these resources is necessary. You will also discover a number of ways to conserve energy and mineral resources. By the end of this module you will have developed a plan for changing the way you do many things at home and at school in order to conserve energy and mineral resources.

WHAT DO YOU NEED TO KNOW BEFORE YOU START?

There are no prerequisites identified for this module.

However, you should be able to:

- list and describe common energy and mineral resources. Categorize each resource as renewable or nonrenewable.
- describe the role of non renewable resources like coal, oil and natural gas in producing energy for Albertans.
- explain how electricity is produced in Alberta.
- identify energy sources used by the transportation sectors, and explain how each type of energy is produced.
- identify minerals of economic importance produced in Alberta.
- describe consumer products that are developed from mineral resources.



ENM1100 Conservation Challenge

WHAT WILL YOU KNOW AND BE ABLE TO DO WHEN YOU FINISH?

Upon completion of this module you will be able to:

- describe ways in which energy or mineral development may affect the environment
- identify trends in the consumption of an energy or mineral resource, and explain the objectives of a conservation strategy
- propose personal and shared actions that foster conservation and responsible use of an energy or mineral resource
- demonstrate basic competencies.

WHEN SHOULD YOUR WORK BE DONE?

Your teacher will give you a timeline for completing tasks and assignments within this module.

You may also wish to use a time-management planning chart to preplan the work that needs to be done in this module. Plan how you will use your class time as well as extra time needed to complete the assignments in this module.



ENM1100 Conservation Challenge

HOW WILL YOUR MARK FOR THIS MODULE BE DETERMINED?

	PERCENTAGE
You must first demonstrate all of the competencies required for this module.	
When you have done this, your percentage mark for the module will be determined as follows:	
<ul style="list-style-type: none"> Journal Entries on What <u>YOU</u> are Doing to Conserve Resources 	25
<ul style="list-style-type: none"> Article File and Graphs 	15
<ul style="list-style-type: none"> Research on Environmental Impacts 	15
<ul style="list-style-type: none"> Conservation Career Interviews 	15
<ul style="list-style-type: none"> Conservation Campaign 	25
<ul style="list-style-type: none"> Time Management and Teamwork 	5



WHICH RESOURCES MAY YOU USE?



- *Somebody Should Do Something About This!*, Alberta Energy, 1992.
- *The Coal Kit*, Coal Association of Canada, 1991.
- *The Global Environment*, Copp Clark Pitman, 1991.
- *Our Petroleum Challenge: Into the 21st Century*, Petroleum Communication Foundation, 1993.
- *A Place for Wildlife, A Way is No Longer There*, ACCESS Network, 1991.
- *Boreal Forest Issues*, Friends of the Environment Education Society of Alberta (FEESA) and ACCESS Network, 1993.
- *Light Makes Electricity*, Marlin Motion Pictures, 1991.
- *Science Show: Forests*, Multi Media Group of Canada, 1990.
- *Science Show: Three Environmental Concerns*, Multi Media Group of Canada, 1991.
- *From the Mountains to the Sea: A Journey in Environmental Citizenship*, Environment Canada, 1992.
- *What We Can do For Our Environment: Hundreds of Things to Do Now*, Environment Canada, 1991.
- *Focus On Series*, Alberta Environmental Protection.

ENM1100 Conservation Challenge

ACTIVITIES/WORKSHEETS

1. Create a personal journal in which you keep a weekly record of your thoughts about conserving energy and mineral resources throughout the module. You should also record ideas you have about ways to conserve energy and mineral resources at home and school. Describe activities and routines you may engage in at home and school to conserve energy or mineral resources.
2. Keep a file of newspaper and magazine articles you find about saving energy or recycling, or about the impacts of energy and mineral development on the environment. Write a 100-word summary of each article. Post the articles and summaries on a bulletin board in your classroom or school. Create a new display each week of news articles and your written summaries.

Gather data about energy consumption patterns and trends within each of Alberta's residential, commercial, industrial and transportation sectors. Construct and display graphs that depict these consumption patterns.

3. Research one of the following topics:
 - the greenhouse effect
 - ozone depletion
 - acid deposition
 - smog
 - degradation of land and soil by oil spills
 - land disturbance by mines, pipelines and drilling sites.

Investigate how energy and mineral development influences this environmental phenomena, and steps taken by industry and government to monitor and manage resource development and the environment. Summarize and communicate the information that you gather by one of the following methods:

- a 500-word magazine article
 - a visual two- and/or three-dimensional display
 - a collaborative video presentation that simulates a television news story.
4. Identify five Albertans who are involved in different energy and mineral resource conservation industries (e.g., building contractor, engineer, architect, recycling worker, building supplies salesperson). Create a series of interview questions, and conduct an interview with each individual either in person or over the phone. Gather information regarding:
 - educational training
 - significance of resource conservation in each occupation
 - specific conservation strategies and techniques being used.

Create a 250-word report introducing two of the people interviewed to your teacher.

ENM1100 Conservation Challenge

5. Assume that you have been hired to market an energy-saving technology by a product manufacturer. Create a marketing campaign to increase awareness of and potential benefits resulting from the use of any three of the following technologies:

- compact fluorescent bulb
- water-saving shower head
- weatherstripping
- toilet water-saving device
- motion detector.

Each marketing campaign should include:

- a poster or pamphlet
- a simulated television commercial on videotape.

Present the posters, pamphlets and videotape to other persons in the school.