



a tool
for developing
ecological
literacy
through
rich
performance
tasks

2007

ecoSCHOOLS

Being ecologically literate entails a new way of seeing
the world and a new way of thinking,
known as systems thinking, or systemic thinking.

It means thinking in terms of relationships,
connectedness and context.

Fritjof Capra in *Ecological Literacy: Mapping the Terrain*, 2002, 28.



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Table of Contents

◆	Introduction	7
◆	What is Ecological Literacy?	8
◆	The Value of Rich Performance Tasks	10
◆	Four Steps in Developing a GRASP Rich Performance Task	11
	Step 1. Brainstorming	11
◆	Goal	11
◆	Scenario	13
◆	Role	20
◆	Audience	24
◆	Product/performance	25
	Step 2. Presenting the Task to Make it Special	26
	Step 3. Developing Lessons	28
	Step 4. Assessment and Evaluation	29
◆	Claiming Points toward EcoSchools Certification	30



◆ Appendix 1: Black Line Masters	
◆ BLM G.1 Reflective Learning Log	33
◆ BLM S1. Operating a Bakery Depends on the Sun and the Earth	34
◆ BLM R.1 Understanding your Role	35
◆ BLM R.2 Energy Choices in Ontario	36
◆ Appendix 2: Examples of Rich Performance Tasks	
◆ Grade 2 Example (Science – Language Focus)	37
◆ Grade 4-5 Example (Social Studies – Science Focus)	38
◆ Grade 7 Example: Interactions within Ecosystems and Heat (Science – Math – Art Focus)	39
◆ Grade 10 Example: Academic Science	40
◆ Grade 12 Example: College Chemistry	41
◆ Appendix 3: Curriculum Connections for GRASP Elementary Examples	42
◆ Resources	43
◆ Notes	44



Ecological literacy...
implies a broad understanding of how people and societies
relate to each other and to natural systems,
and how they might do so sustainably.

It presumes both an awareness of
the interrelatedness of life and
knowledge of how the world works
as a system.

– David Orr, *Ecological Literacy: Education and the Transition to a Postmodern World*, 92.



Introduction

This resource has been written to help teachers develop the ecological literacy of their students. While there is no one way to promote ecological literacy, the “rich performance task” made popular by Wiggins and McTighe in their ground-breaking *Understanding by Design* (1998) has been chosen here because it brings together so many elements of good curriculum design and effective teaching and learning strategies.

Ecological literacy is not easy to define. It is more than “being able to read Nature's book” which is at first glance what the term might suggest. We have included definitions from David Orr and Fritjof Capra, major academic scholars in this field, which are worth pondering. However, we have chosen to define ecological literacy in terms of three components that we think teachers and students can relate to: Sense of Place, Ecosystems Thinking and Human Activity. Exploring any one of these as part of what you teach will help develop students' ecological literacy — understanding the human-nature interconnections, their benefits and their consequences.

Information about how to apply for points toward EcoSchools certification appears at the conclusion of this resource.

We can't solve problems by using
the same kind of thinking we used
when we created them.

Albert Einstein



What is Ecological Literacy?

Our planet is a single ecosystem that includes us. So ecological literacy involves understanding that the Earth is a single ecological system which is profoundly affected by our human activity. As in all systems, a disruption in one part of a system has an impact somewhere else in the system. Over time, local actions of people and economies everywhere can have global consequences. We're all in this together.

Ecological literacy is about seeing beneath and above what we humans are creating — beneath to reveal the impacts that lie out of sight and out of mind, and above to go beyond politics, sports, wars and trade agreements. It means more than just understanding our relation to, impact on and dependence on the Earth's natural systems. It means rethinking the details of our lives.

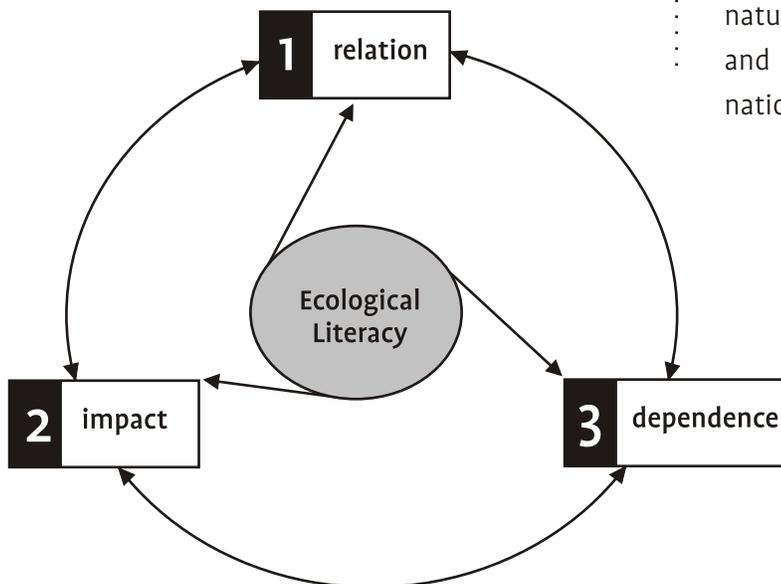
Three components of ecological literacy

Paying attention to our relation to, dependence on and impact on the planet can be expressed as three interconnected components. Each comes with a question.

◆ RELATION

Sense of Place — How will students gain an appreciation for and knowledge of the land?

Let's help our students develop a sense of their connection to "here." Look for opportunities to explore the school grounds and the school's neighbourhoods, their landscapes, and their ecology, history and geography. Through the grades, help them expand their knowledge to larger natural systems such as biomes and watersheds, and larger human systems at city, provincial, national and global levels.



◆ IMPACT

Human Activity — How will students learn to connect their actions to local and global impacts?

Human well-being is dependent on the health of nature's ecosystems — its land, water and air. Let us seize opportunities to help students become more aware of the quantity of natural resources we use. Because Nature's ecosystems produce no waste, they provide a model for refashioning our built human environment to reduce our impact. Biomimicry and ecological design are terms designers used to describe the concept of imitating nature's design (1)*. Relying on intimate knowledge of place and local resources, attention is paid to renewable forms of energy and reduction of waste as much as possible. Together, let's develop the knowledge, attitude and skills that can lead to new designs and new ways of meeting our needs to reduce our negative impact and restore the health of ecosystems.

◆ DEPENDENCE

Ecosystems Thinking — How will students learn about the interacting systems that sustain us?

Narrowly defined, ecological literacy is understanding the Earth in terms of ecology as a scientific discipline. When studying ecology, students learn that communities of living things are dependent on each other and on the non-living parts of the environment. Dr. Art Sussman has shown that even without a formal background in ecological studies, we can do a good job of helping our students understand almost all environmental issues if we help them uncover the cycling of matter, the flow of energy and the existence of life webs (2)*. By tracing back our human goods and services to their origins, students will learn how our daily lives depend utterly on healthy natural systems.

Any one, or any combination, of these three components is an entry point for teaching ecological literacy. Pursued very far, each leads to the other.

* Notes appear at the end of this resource.



The Value of Rich Performance Tasks

This resource provides the tools to help teachers create engaging tasks to develop students' ecological literacy. They cast learning in realistic **scenarios** that involve **role-play** and **awareness of audience**, and culminate in a persuasive **presentation or product**. The scenario sets the stage for critical thinking and problem-solving, with the **goal** usually being to reduce negative human impact on the environment.

A rich performance task has the potential to integrate clusters of expectations gracefully from several disciplines so that teaching and learning have a purpose that students can readily understand.

Planning rich performance tasks takes time, but teachers who have done this work say that they are a powerful and meaningful way to frame expectations for students. They also report that such tasks later simplify the planning of lessons. These lessons, drawing on more than one discipline, can contribute to the students' ability to understand human-nature interconnections, their benefits and their consequences.

A well-developed strategy for creating rich performance tasks is found in Wiggins and McTighe's *Understanding by Design* (1998). Five critical elements create a performance task that connects students' learning to the multidimensional world beyond the classroom. They are:



Goal

the goal of the task



Role

the role of the student



Audience

the audience for the student's work



Scenario

the scenario which gives meaning to their work



Product

the product/performance to be evaluated.

Woven together, these elements have proven to be powerful tools that help focus curriculum planning and teaching. The benefits of a meaningful classroom program for student learning — where everyone can point to “why” we’re doing what we’re doing — are immense.

The acronym GRASP serves as a useful memory aid for these five elements. Tools to develop each of these elements are discussed in more detail to demonstrate how our teaching can increase students' ecological literacy by design. Examples of rich performance tasks from several grades appear in Appendix 2.



Four Steps in Developing GRASP Performance Tasks

STEP 1. Brainstorming

A rich performance task grows and evolves like a tree — each year it will change and respond to the environment of your classroom and your students. The first step, the brainstorming stage, is akin to a seed taking root. The function of GRASP is parallel to that of a root — to anchor the rich performance task and serve as a conduit to draw upon available resources.

For each of the five elements of **GRASP** — **G**oal, **R**ole, **A**udience, **S**cenario and **P**roduct (or **P**erformance) — brainstorming tools are provided below to clarify your thinking and stimulate your creativity as you develop your own tasks.

After setting the goal, it may be more profitable to decide on the scenario in which student learning will be embedded, since the scenario chosen often includes the roles and sets the context for learning. For this reason, the sections are not presented following the order of letters of the acronym GRASP.



GOAL: Will the task help students improve their ecological literacy by uncovering the dependence and/or impact of humans and human systems on the natural environment?

List the cluster of curriculum expectations that will be addressed under the goal. This list is the compass to keep your direction sure as you develop the scenario. As students pursue the task, they may need to be reminded that whatever they are doing, part of their job is to see the task in terms of humans' interaction with the natural environment. With some tasks the goal will be to recommend one or more ways to reduce the impact of that interaction. With others, the goal may be to uncover the dependence of human systems on the environment or simply our relation to it.



Describe the goal

A powerful verb goes a long way toward setting the tone for an exciting project! Powerful verbs can awaken students' desire to achieve at higher levels, particularly if the rich performance task is authentic, that is, a task with real roles and real audiences.

Here are some verbs to consider:

advertise	consult	entertain	organize	reprimand
apologize	convince	evaluate	persuade	research
argue	criticize	expose	plan	sell
brag	decide	justify	plead	test
build	defend	implicate	promise	uncover
clarify	design	instruct	proclaim	use

Imagine students working towards these sample goals:

- ◆ To sell wind energy to homeowners...
- ◆ To sue the Government of Canada...
- ◆ To organize an assembly for Earth Day...
- ◆ To apologize to the next generation for...
- ◆ To persuade the staff and students to...





SCENARIO: How can a scenario be used to improve students' ecological literacy?

A scenario is basically any situation in which human activity takes place. This means that whatever scenario is chosen, there is some interaction between human systems and natural systems. A scenario need not point to an obvious environmental issue – it can be some human activity whose connections to nature have been obscured in some way. Almost any scenario can be probed to reveal our *dependence* on nature. Some scenarios lend themselves to better understanding our *relation* to nature – our sense of place. Others point clearly to the *impacts* of human activity. When choosing a scenario think about these three questions:

1. *How can the scenario help us understand our relation to nature?*
2. *How can the scenario reveal our impact on nature?*
3. *How can the scenario reveal our dependence on nature?*

Often one question will be more apt for a particular scenario than the others. Don't expect to answer all three questions equally with every rich performance task.



◆ RELATION

The student's *relation* to nature is hard to measure, or indeed to “teach.” Put simply, we can build a basis for ecological literacy by allowing students to have direct experience of nature. That unmediated relation to the natural world can happen in any number of ways — a walk in a ravine, a day at an outdoor education school, planting and maintaining a school garden. It means getting outside with your students, and giving that experience enough structure so that they can focus on and observe what is around them. Students' feelings about their relation to nature can find expression through writing and the arts — drama, dance, music, visual arts.

◆ IMPACT

Unearthing human-nature interconnections can also come from asking how the activity in this scenario has an *impact* on nature. Scenarios that highlight the human impact dimension of ecological literacy challenge students to use their problem-solving skills. Such scenarios would likely have a story with potential for alternative actions. Questions that arise are:

- ◆ *Is there any way that my role can use less energy, or advance the use of renewable, lower-impact energy (solar, wind, water) sources in this scenario?*
- ◆ *In my role, can I do anything to have a smaller impact on the Earth's resources (air, water, soil, metals, fuels), either directly or indirectly?*

◆ DEPENDENCE

You may choose a scenario to help students vividly see how the role they assume depends on nature. This is not as self-evident as it may sound once you ask students to point out what the specific links are. This will stimulate students' **ecosystems thinking**. This mode of thinking is about breaking down the very big concept of nature into **energy flows**, **matter cycles** and **life webs**. Once that triad is established, students can ask:

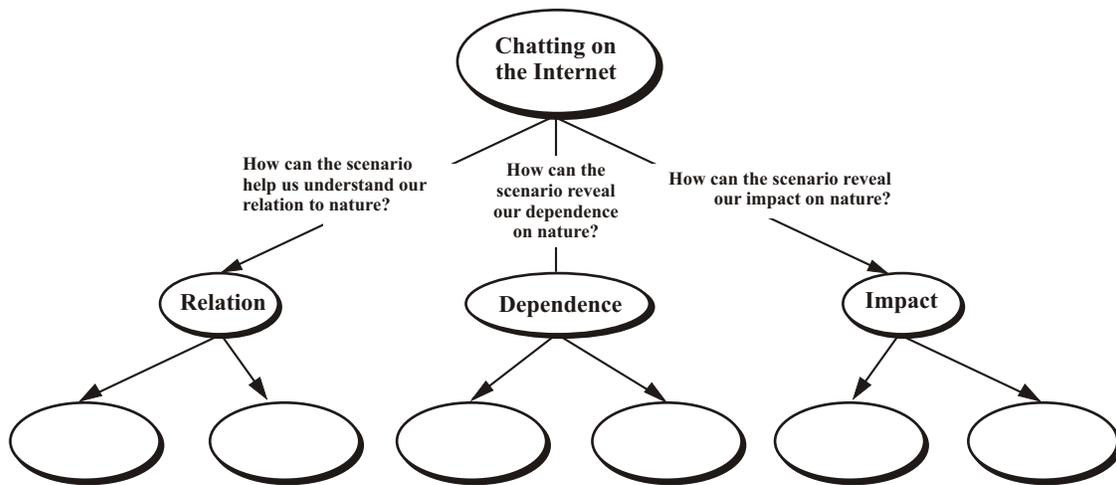
- ◆ *In this scenario, how do I use energy?*
- ◆ *How do I use matter?*
- ◆ *How does my activity in this scenario draw on the “goods and services” of nature?*

These questions will reveal that “dependence on nature” and “human impact on nature” are very closely related.



Sample scenario 1: Chatting on the Internet

Try, for example, a scenario that has become ubiquitous in North America: using the Internet. Within that simple scenario, ask students to assume the role of friends using the Internet to chat. It is easiest to probe how chatting on the Internet is dependent on energy and matter. Computers and modems require electricity to work. The hardware itself is made of a variety of materials – plastic, glass, metals, and semi-conductors. And so the virtual world depends concretely on the extraction of fossil fuels for energy and materials, as well as mining the Earth for copper and other metals required in the construction of the computer hardware.



In order to move the conversation from a discussion of our *dependence* on nature's resources to our *impact* on nature we simply need to ask:

- ◆ *What is the impact of using the Earth's energy and matter on the ecosystems that they are drawn from?*
- ◆ *Can we reduce the impact of this activity on nature?*

This is where ecosystems thinking is required. If we begin to learn how the activity of chatting on the Internet connects to energy flows, and how poorly we have attended to matter cycles when it comes to the disposal of electronic waste, then we can put on our problem-solving hats and strategize ways of minimizing our negative impacts.



Ecosystems in the natural world are sustainable communities of plants, animals and microorganisms.

Within these ecological communities there is no waste — one species' waste becomes another species' food.

Thus matter cycles continually through the web of life.

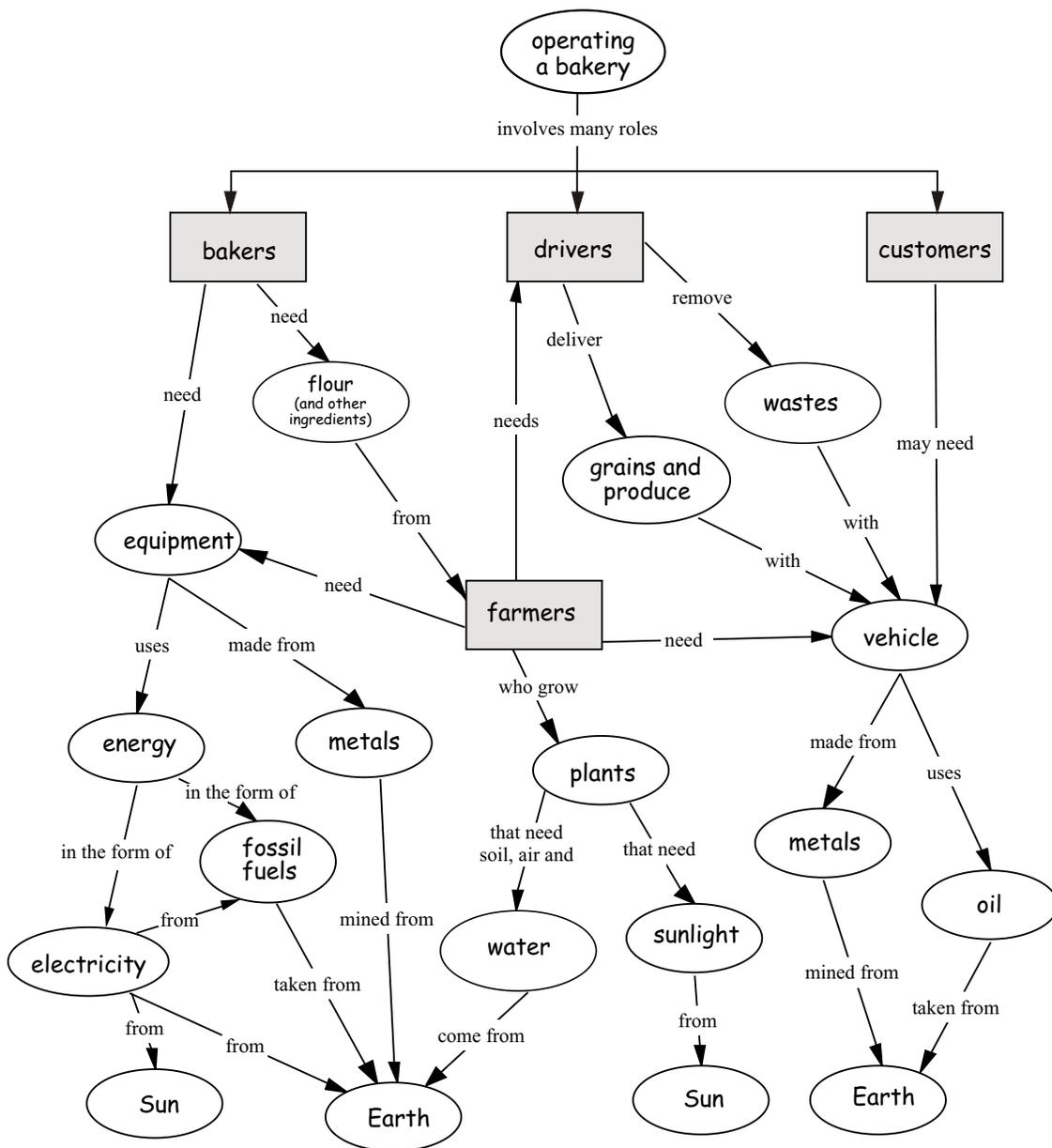
The energy driving these ecological cycles flows from the sun, and the diversity and cooperation among a community's members are the source of a community's resilience.

Fritjof Capra in *Ecoliteracy: Mapping the Terrain*, 29.



Sample scenario 2: Making the Family Bakery into a Green Business

Your classmate’s family owns a bakery. The family has recently become interested in making the bakery into a more environmentally friendly business. You are brought in as a big-picture thinker to help them look at all aspects of the business and make recommendations about what they can do.



Start by asking students to trace the connections from the buyer of a loaf of bread back to the distributor and the baker, and then beyond to the equipment, raw materials and energy needed for all aspects of the operation that they can think of. Ultimately students will discover that everything comes from the Earth and the Sun. That sums up *dependence*. Students then examine every part of the map to see where the *impact* of people and technology can be lessened. It doesn't matter what your map looks like — different people will see different connections. Some will be more elaborate than others.

Here's an example of a scenario where asking about the third connection — a student's possible *relation* to nature — may draw a blank, at least when “relation” is seen as growing out of direct experience of the natural world.

Use the incomplete scenario map *BLM S.1 Operating a Bakery Depends on the Earth and the Sun* on page 34 as an ecosystems thinking exercise for students.

“Reading” a scenario map

Here are specific questions to give students practice in reading the bakery scenario map, and help them see how each of the linked elements on the map is dependent on the others:

- ◆ *What happens if the plants don't get enough water?*
- ◆ *What happens if the price of fuel goes up?*
- ◆ *What happens if the bakery cuts down on the waste it produces?*
- ◆ *What happens if the farmer's soil gets polluted?*



Going beyond the map

Also ask questions that go beyond the map to illustrate what the map is missing:

- ◆ *Why is oil needed in vehicles? What wastes are produced by vehicles?
Where do these wastes go?*
- ◆ *What kinds of waste are produced on a farm? Where do these wastes go?*
- ◆ *Where does the farmer get seeds for plants?*
- ◆ *How is flour made? Where does the sugar for baking come from?*
- ◆ *What are the advantages and disadvantages of baking your own bread?*

Writing questions like these for your own scenario will help you and your students reveal how, directly and indirectly, the scenario's elements can be traced back to the Sun and the Earth. Uncovering the undeniable human dependence on the natural world is what this exercise is all about.

Whatever the rich performance task scenario, have the students in groups practice assuming different roles in exploring dependence by getting them to trace connections back to the Earth and the Sun. Then engage them in thinking about how we can restructure the scenario so that the impact of the human activity is diminished. This will deepen students' ecosystem thinking skills since they will see how changing one part of the map has a domino effect on both the human systems and natural systems that intersect in the scenario.





ROLE: How can the role that a student assumes develop his or her ecological literacy?

Almost any role can develop ecological literacy, or an understanding of human-nature interconnections. We all use energy and matter in the activities that make up our lives. This fact becomes the basis for questions about the student's role:

- ◆ *In this scenario, how do I use energy?*
- ◆ *How do I use matter?*
- ◆ *How does my activity in this scenario draw on the “goods and services” of nature?*

Sometimes the relation/impact/dependence will be very direct; sometimes, only indirect – but always present.

Needed: the dimension of scale

As Einstein has said, “we can't solve problems by using the same kind of thinking we used when we created them.” We need to practise new thinking.

For most of us, thinking in terms of scale is not very common. Students need practise in using the dimension of scale – how much difference does it make whether small or large numbers are involved? local or global? short- or long-term?

As an illustration of “trying on” different roles, in one class students studied the impacts of a proposed development project situated between two rivers. From every environmental angle, the impacts were great. In role as environmentalists and scientists thinking in the long term, students decreed that the development be shelved. However, when the same students were put in roles such as Ministers of Housing, Finance, and Economic Development, the project took on a different complexion. They concluded that the development should proceed. This exercise surprised students and teachers alike, highlighting how difficult it is to limit growth.



This discrepancy may disappear when the different roles are analysed more closely. Here are some tough questions to contend with:

- ◆ *In what ways were the different groups' criteria for decision making similar and different? Is it possible that they used the same criteria, yet on different scales of space (local vs. global) and time (short-term vs. long-term)?*
- ◆ *What might the immediate and local effects be?*
- ◆ *What might the longer-term and global effects be?*
- ◆ *Who in this generation benefits from the decision to allow development on the land? Who in this generation does not benefit, and why? Who might benefit or suffer in future generations? Should the answers to any of these questions influence my decision? Why or why not?*

Role-playing can facilitate this exercise as students use language in many different scenarios, and for specific purposes and audiences. They will see the often difficult and real challenges that people face in making decisions that have an impact on the environment.

Helping students understand their role

Buehl (2001) recommends that teachers help students understand their role on a deeper level by asking them to brainstorm the important characteristics of their roles in groups. The following questions are included as *BLM R.1 Understanding Your Role* on page 35.

- ◆ *In what specific ways do who I am and what I do in this situation touch nature and the environment?*
- ◆ *What perspective or point of view does my role take in the scenario?*
- ◆ *Where would I look to find out more about this perspective?*
- ◆ *How can I give my role personality?*
- ◆ *What attitude does my role have?*
- ◆ *What special knowledge and skills does my role have?*



Diversity of views within a single role

Can different people assuming this role respond differently to the issue arising in the scenario? For intermediate and senior students, an instrument developed by Aikenhead (1992) called Views On Science Technology and Society (VOSTS) can be used to help intermediate and secondary students explore a variety of different views on many issues related to science, technology, society and the environment.

A VOSTS instrument begins with a statement, and then lists several different positions for students to think about. VOSTS can also be used:

- ◆ as a diagnostic assessment of student views;
- ◆ to initiate classroom discussions;
- ◆ to help students “try on” a perspective;
- ◆ to help students identify their own views;
- ◆ to see how students thinking has changed after a discussion, video, project;
- ◆ as prompts for writing paragraphs.

The VOSTS instrument in *BLMR.2 Energy Choices* in Ontario on page 36 was modified from Aikenhead's resource to be relevant for teachers wishing to explore energy issues in Ontario. This is a particularly timely application of VOSTS as our province wrestles with energy issues on scales involving future generations of Ontarians. 114 of these instruments can be found at <http://www.usask.ca/education/people/aikenhead/>. Modify as needed to suit your students' readiness for this activity. For younger students (12-14 years old) fewer positions could be presented.



Sample General Roles

The table below is a list of general roles. The list may help you identify roles that you wish your students to explore.

advertiser	computer technician	historian	police officer
archeologist	dental hygienist	inventor	programmer
architect	dentist	midwife	psychologist
astronaut	detective editor	museum curator	reporter
author	draftsman	nutritionist	statistician
biographer	elected official	mathematician	technician
carpenter	electrician	optometrist	tour guide
cartoon character	engineer in...	paramedic	tutor
caterer/chef	expert in ...	pharmacist	veterinarian
chemist	filmmaker	photographer	web designer
chiropractor	firefighter	physician	welder
clinical nurse	flight attendant	physiotherapist	zoo keeper
computer analyst	food technologist	pilot	
consultant in ...	geologist	plumber	

Sample Environmental Careers

Profiles many environmental careers written as a narrative for secondary students are available at the ECO Canada web site (www.eco.ca/_student/occprofilelist.aspx) in the student section. These narratives are valuable, since they provide students with background information on their role, so that they can better imagine the scenario that frames their task.

agriculture engineer	emerging energy researcher	environmental technician	naturalist
agronomist	energy auditor	fisheries technician	oceanographer
air quality technician	entomologist	forester	ornithologist
analytical chemist	environmental analyst	forestry technician	park interpreter
aquaculturist	environmental chemist	geographer	pollution control technologist
arborist	environmental economist	geological technician	recycling coordinator
avalanche forecaster	environmental educator	GIS analyst	remediation specialist
biochemist	environmental engineer	glaciologist	seismologist
biotechnologist	environmental epidemiologist	hazardous materials specialist	soil conservationist
botanist	environmental geologist	horticulturalist	sustainable architect
cartographer	geophysicist	hydrologist	wastewater treatment operator
chemical technician	environmental health officer	industrial designer	water and wastewater plant engineer
climatologist	environmental lawyer	landfill engineer	water quality technician
conservation biologist	environmental policy analyst	landscape architect	wildlife biologist
crop and livestock producer	environmental reporter	marine biologist	wind energy developer
ecologist	environmental salesperson	meteorologist	zoologist
ecotourism operator		microbiologist	





AUDIENCE: What specific audience, real or fictional, will provide a focus for and enhance the students' work?

The real audience for a performance task is always the teacher. But the presumed audience for a task can enhance the interest of the task *and* the nature of the assessment. It is also possible to invite a particular audience to witness the products or presentations and participate in a discussion afterwards, for example, students in another grade, school, senior citizens or parents.

Completing a rich performance task for different audiences requires attention to appropriate levels of language and content. Having to tailor their product or performance to the specific needs of an audience helps students focus their thinking and writing.

As an aid in brainstorming, here is a list of sample audiences:

advertisers	group	museum curator	school board
animal	expert in ...	neighbours	school staff
chair of	fictional character	parent	scientists
committee...	friends	parent council	self
children	gallery manager	peer	sibling
customers	government officials	pen pals	sponsor
director	homeowners	principal	TV viewers
editor of...	judge	radio listeners	visitors from...
employer	jury	readers of...	
environmental	land developer	relative	

Consider the different effect on students' approach if their audience is:

- ◆ an adult or a child
- ◆ a novice or an expert
- ◆ friendly or unfriendly
- ◆ real or imaginary

It is worthwhile to discuss with students the impact that the wrong tone of voice can have on an audience. This could also be the place where cultural differences with regard to communication norms are shared and explored (3).





PRODUCT or PERFORMANCE:

What will the students' product or performance be?

The choice of product or performance may flow naturally from the scenario that gives the performance task its context. Or, you may wish first to think of the skills that you want your students to acquire, shape the task to that end, and then build the scenario. For some tasks, it is beneficial if all students create the same product or performance. For other tasks, providing students with choice honours their strengths and provides an avenue to express creativity. You may need to remind them that in some way they need to address the human-nature interconnection, its benefits and/or its consequences as part of their product or performance.

Products and performances to help you begin the brainstorming process:

action plan	pamphlet	sales pitch
advertisement	photo essay	science exhibit
announcement	poster	structure
children's book	recommendation	supported opinion
complaint	persuasive essay	telephone
display	poster	dialogue
editorial	proposal	TV script
invention	prototype	video
memo	radio broadcast	written debate
model	report	
news story	resume	



STEP 2. Presenting the Task to Make it Special

Present the task to tap into students' skills, creativity and desire to make difference. Once you have identified the goal, role, audience, scenario and product for your student's rich performance task, it still needs to be written in a way that will intrigue, excite and motivate students. Describe the scenario in enough detail and with enough context to help students understand the relevance of their role and the task. (Don't forget to mention that in some way there will be an exploration of the human-nature relationship, direct or indirect.)

In the GRASP example from *The Toronto Wind Turbine: An Excursion for Kids in Grade 5* (TDSB, 2006), the culminating task has students become wind energy salespeople. To be successful in this role, the student has to learn about the advantages and disadvantages of our different energy sources, as well as developing persuasive communication techniques. What follows is a breakdown of the elements of this rich performance task into its GRASP elements:

	Goal	<p>To persuade a homeowner to purchase energy from a green energy source</p> <p>While pursuing this goal, students will:</p> <ul style="list-style-type: none"> ▼ deepen their understanding of the role that both energy conservation and alternative sources of energy play in meeting our energy needs ▼ learn about the Toronto Wind Turbine and wind energy ▼ learn about persuasive communication techniques
	Role	<p>All students assume the same role. All students pretend that they work as a salesperson who has to convince a homeowner to purchase energy from a green energy source, in particular, wind energy.</p>
	Audience	<p>The audience is a reluctant homeowner who is concerned about paying more for energy. Other teachers in the school assume the role of the homeowners that students have to persuade.</p>
	Scenario	<p>A wind energy salesperson has a tough job selling wind energy to homeowners. It costs more money to purchase from a wind energy company than from a conventional supplier. Homeowners often ask challenging questions of door-to-door salespersons.</p>
	Product and/or Performance	<p>Students will:</p> <ul style="list-style-type: none"> ▼ keep a folder of their work (handouts, research notes, and BLMs from this resource) for assessment purposes ▼ submit a written summary of their sales pitch to be evaluated by their teacher ▼ role-play an energy salesperson to "sell" wind energy to another teacher/adult in the school to be evaluated by that teacher/adult



The task is then presented to students in the form of a Letter of Agreement that sets out the terms of their employment for a wind energy company. Presenting the task to students in a creative way sets the tone for students right from the very beginning as they adopt their role. Assigning the task in the form of a Letter of Agreement tells the students that they are embarking on a course of learning which may be different from what they are accustomed to.

**Wind Breeze
POWER INC.**

Letter of Agreement

We are pleased to confirm your being employed by our firm in the capacity of wind energy salesperson. You will report directly to our Vice-President of Sales, Raj Pathria, commencing with the completion of your job training as described below:

1. learn about persuasive communication techniques
2. learn about energy conservation and energy sources
3. practice using your new knowledge so you can be an effective salesperson

Your salary shall be \$350.00 per week plus commissions on sales. After 3 months, you will be eligible for our standard group benefit plans. Vacation time shall be 3 weeks per year as discussed.

If you agree, please sign the enclosed copy and return when your training is completed.

We look forward to your joining the company.

Sincerely,
Stan Pepperall
Vice President - Human Resources

Signature

Date



STEP 3. Developing Lessons

A rich performance task benefits from a rich experience common to all students, such as excursions to a site related to the scenario or guest speakers who could speak knowledgeably about it. These experiences add authenticity and help to make the task special.

As you develop lessons think of the learning in three stages: before the experience, during the experience and after the experience. At each of these stages find opportunities for students to read and write.

Reflection along the way

As work towards the rich performance task is completed, it is important to help students reflect on their progress toward the goal through focussed discussions, journaling and/or concept mapping. These kinds of activities will help the teacher assess whether the learning is occurring as desired. Teachers might consider using something like *BLM G.1 Reflective Learning Log* to assess students' progress.

Prepare for change

After the rich performance task is completed, spend a few moments preparing for change. Keep samples of students' work to share with future students. List the strengths and weaknesses of the task, and think about the changes that you would like to see for the following year. Share the results of your project with others in your department and ask them for their insights. Invite a teacher with responsibility for the same course or grade to further develop and use the rich performance task.



STEP 4. Assessment and Evaluation

Ideally it is best to develop assessment/evaluation criteria for the task with your students. The students will benefit from this process, and be better equipped to monitor their progress and assess the quality of their own work. As always, it is important to consider the assessment accommodations that are required so that all students can demonstrate their learning. Students who have an IEP are entitled to the accommodations specified in these plans.

If the outcome is a product, for example, a brochure, it is best to provide students with samples of brochures in order to engage them in a discussion of the criteria for evaluation of a brochure. In general, ensure that students have seen exemplars of the product so that they understand the criteria by which you will judge their work. If the outcome is a performance in role that will be assessed or evaluated, elementary teachers should give careful attention to the prior experiences students already have or will need. Techniques and strategies related to role-play must be taught before any assessment is made of a role-play performance, with many opportunities given to students to practise what they know and can do. Reference should be made to the Drama and Dance Overall Expectations (4). For secondary teachers, the Communication criteria in the Achievement Chart provide sufficient flexibility for assessment and evaluation of students writing or speaking in role, for a specific purpose and audience.

Students will benefit from opportunities to

- ◆ respond to constructive feedback from the teacher and their peers as they are developing their presentations. They can use the feedback to make self-adjustments to enrich and polish the form, content, and delivery of their presentations, and
- ◆ reflect on their effectiveness in conveying the ideas and information required to persuade the intended audience to think more critically, and perhaps act in response to their *relation to, impact on and dependence on* the environment.



Claiming Points toward EcoSchools Certification

We have chosen the GRASP rich performance task for teaching ecological literacy because it enables students to apply their learning in scenarios or situations that mimic the world beyond the classroom. GRASP may also permit the development of a broader range of skills and knowledge, making it an apt instrument for accommodating many learning styles.

The requirements for claiming ecological literacy points toward EcoSchools certification are motivated by several objectives:

- ◆ to improve student learning with respect to our relation, impact and dependence on the ecosystems that sustain us
- ◆ to deepen students' understanding of energy flow, material cycles and life webs
- ◆ to provide a framework for teachers who see their role as creative and disciplined curriculum developers
- ◆ to create a language of curriculum development that deepens ecological literacy by design
- ◆ to facilitate the sharing of best practice

To these ends, to claim points toward Ecoschools certification teachers are asked to:

1. complete the template on page 31 by describing briefly the goal, role, audience, scenario and product/performance of the task
2. complete the Reflective Learning Log
3. include samples of student work that are representative of several levels of achievement



Summary of Rich Performance Task

Title of Performance Task: _____

Teacher: _____ Grade: _____ School: _____

Subject: _____

 Goal	
 Role	
 Audience	
 Scenario	
 Product or Performance	



Reflective Learning Log

Title of Performance Task: _____

Teacher: _____ Grade: _____ School: _____

Subject: _____

Which part of the rich performance task did you feel good about?

What did your students learn?

What was difficult or frustrating about the rich performance task?

What will you do next?



Reflective Learning Log

NAME:

Discuss your findings with a classmate as you complete this log.

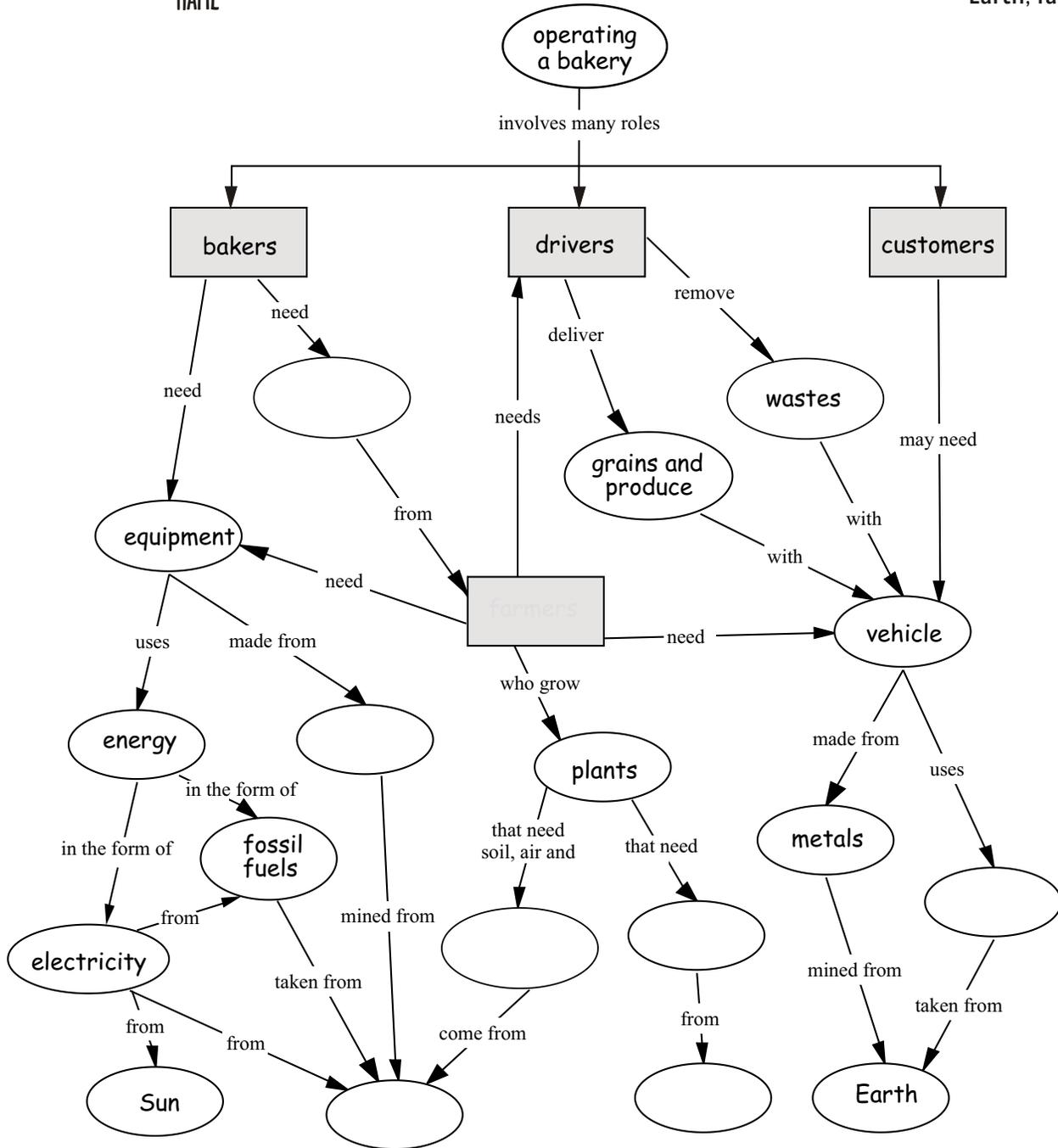
Date(s)	Which part of learning today did I feel good about?	What did I learn?	What was difficult or frustrating to understand?	What will I do next?



Operating a Bakery Depends on the Sun and the Earth

Use these words to complete this map:
wastes, water, flour, metals, oil, sunlight, Earth, farmers.

NAME _____



Understanding Your Role

NAME: _____

Role: _____ Audience: _____ Scenario: _____

1. In what specific ways do who I am and what I do in this situation touch nature and the environment?

2. What perspective or point of view does my role take in the scenario?

3. Where would I look to find out more about this perspective?

4. How can I give my role personality?

5. What attitude does my role have?

6. What special knowledge and skills does my role have?



Energy Choices in Ontario

NAME: _____

The Statement: Scientists and engineers should be the ones to decide what types of energy Ontario will use in the future (for example, nuclear, hydro, solar, or coal burning) because scientists and engineers are the people who know the facts best.

Your position, basically (Please read from A to J, and then choose one.):

- A Scientists and engineers should decide, because they have the training and facts, which give them a better understanding of the issue.
- B Scientists and engineers should decide, because they have the knowledge and can make better decisions than government bureaucrats or private companies, both of whom have vested interests.
- C Scientists and engineers should decide, because they have the training and facts, which give them a better understanding. BUT the public should be involved — either informed or consulted.
- D The decision should be made equally; viewpoints of scientists and engineers, other specialists, and the informed public should all be considered in decisions that affect our society.
- E The government should decide because the issue is basically a political one, BUT scientists and engineers should give advice.
- F The public should decide because the decision affects everyone, BUT scientists and engineers should give advice.
- G The public should decide because the public serves as a check on the scientists and engineers. Scientists and engineers have idealistic and narrow views on the issue and thus pay little attention to consequences.
- H I don't understand.
- I I don't know enough about this subject to make a choice.
- J None of these choices fits my basic viewpoint.

- ◆ Explain your position in your own words. Give reasons for your choice.

(Based on Aikenhead's VOSTS model discussed on page 22.)



Grade 2 (Science — Language Focus)



Goal

To create a media work from the point of view of a Canadian animal that is experiencing a change in its environment.



Role

TVO Kids Cartoonist.



Audience

The Producers of TVO Kids.



Scenario

The Producers of TVO Kids would like to produce some new cartoons with Canadian animal characters. The animals are experiencing changes in their environment, and have to use their problem solving skills to adapt to the changes.



Product

Students will create a storyboard of 3-5 pictures. Under each picture, 1-2 sentences will describe the scene.

Building prior knowledge

- ◆ Ask students to brainstorm a list of cartoons and the animals that are featured in them.
- ◆ Do the animals live in their own environments, or in human environments? Use this question as a way to begin the process of investigating the real habitats of the animals and the changes that these animals experience throughout the four seasons. Teach about the characteristics that the animals have that allow them to survive in their environment.
- ◆ Brainstorm the kinds of sudden environmental changes that occur both naturally and as a result of human activity that animals may have to face, such as storms, heat waves, floods and habitat reduction.

Completing the task

- ◆ Ask students to choose an animal for their storyboard and think about how their animal would behave during an environmental change.
- ◆ Show students an example of a storyboard. For their draft storyboard, teach students how to draw their own storyboard by carefully constructing vertical and horizontal lines. For final storyboards, provide students with a ready made template including the number of required squares.
- ◆ Instruct students on how to plan, design, and develop their storyboard and how to write the captions.



Grade 4-5 (Social Studies — Science Focus)



Goal

To list environmental changes in the Arctic and their consequences as they relate to First Nations communities.



Role

President of Inuit Tapirisit Kanatami.



Audience

Government of Canada, Minister of Indian Affairs.



Scenario

Changes in the Arctic are affecting snow and ice cover, permafrost, caribou migrations and growing seasons. The President feels it is very important to understand the consequences of these changes.



Product

A letter to the Government of Canada that includes the list of changes and their consequences.

Building prior knowledge

- ◆ Brainstorm the ways that any group, such as a community group or a company, benefits from a president. Discuss the characteristics of a president, and the role that presidents play.
- ◆ Study data of snow cover and travel time available at <http://amap.no/acia/>
- ◆ Visit websites such as <http://www.itk.ca/environment/climate-change-index.php> and <http://www.arcticnetulaval.ca/index.php?fa=Medias.show>. to view personal testimony and pictures of changes in the Arctic.

- ◆ Engage students in a creative writing competition. See the website: http://www.pch.gc.ca/special/mdc/contest/index_e.cfm

Completing the task

- ◆ Students must understand the environmental conditions in the Arctic as they existed when it was first inhabited to understand how the current Arctic climate changes are affecting northern communities.
- ◆ Students will benefit from instruction/scaffolding of the writing task. The elements of a formal letter should be taught.



Grade 7 - Interactions within Ecosystems and Heat (Science — Math — Art Focus)



Goal

To apply knowledge gained from the Interactions within Ecosystems and Heat strands to a school ground greening project or design of an energy efficient school. Students work as a team, or in teams competing against each other, on the design of their own school ground greening project that supports the energy management strategy of their school.



Role

Students assume the role of landscape architects and energy consultants for the design team. They have to understand how trees and green roofs can provide shade and energy conservation benefits to the school in order to make recommendations to the design team.



Audience

The School Greening Design Team consists of the principal, teachers, parents, members of the community and Evergreen, TDSB's partner in school greening initiatives.



Scenario

Schools support actions to reduce greenhouse gas emissions by engaging in local school projects. A Design Team for a school greening project would like to incorporate shade trees and /or green roofs into their design. They commission the senior students of the school to investigate the benefits that would be gained.



Product

Students present their findings to the Design Team as a report including relevant drawings, outlining the beneficial effects on the energy management strategy of the school.

Building prior knowledge

- ◆ Provide context for school ground greening by studying the urban heat effect, and its relationship to energy conservation, air quality, and public health. Visit the Green Roofs in Toronto Web site at <http://www.toronto.ca/greenroofs/findings.htm>
- ◆ Study *TDSB School Ground Greening: Designing for Shade and Energy Conservation* to learn how to find the best places to plant trees for shade and energy conservation. Print copies are available from Fran Raymond at fran.raymond@tdsb.on.ca or 416-394-7276.

Completing the task

- ◆ Coordinate with your school's caretaker or environmental engineer to tour the school's facilities to understand how the school is heated in the winter and cooled in the summer.
- ◆ Obtain a site map of your school to share with students that shows the location of the school on the school grounds. Coordinate a tour of the school grounds to complete an informal survey of tree locations, and tree sizes.
- ◆ Ensure that students have had sufficient instruction on how to complete the drawing.



Grade 10 (Academic Science)



Goal

To understand the costs and benefits associated with the transportation of acids.



Role

Research analyst for Pollution Probe

Pollution Probe is a Canadian environmental organization that

- ◆ defines environmental problems through research;
- ◆ promotes understanding through education; and,
- ◆ presses for practical solutions through advocacy.



Audience

Ontario Minister of Transportation



Scenario

There have been many train derailments in the past few years involving hazardous chemicals. This has made it clear that there are costs and benefits related to the transportation of the hazardous chemicals. The research analyst will recommend an improvement of the standards for transporting hazardous chemicals, and ways of reducing our dependence on these hazardous chemicals.



Product

Report in which students have demonstrated their achievement by employing the following strategies:

- ◆ Consequence mapping
- ◆ Analysing perspectives
- ◆ Cost-benefit analysis

Building prior knowledge

- ◆ Provide time for students to research the effects of these spills. What environmental damage did they cause? What is the frequency of such accidents in recent years?
- ◆ Ask students to learn about a) the people whose incomes depend on the hazardous chemicals; b) the industries that use the chemicals; and c) how their own lives depend on the use of these hazardous chemicals.

Completing the task

- ◆ Ensure that students have had sufficient instruction on how to complete a consequence map, analyse perspectives, and complete a cost-benefit analysis.



Grade 12 (Chemistry)



Goal

To build a team of environmental specialists for an expanding business



Role

Project Leader for EnviroRemedia Consultants Ltd



Audience

Vice President of Operations (Teacher in role as an authority figure)



Scenario

The demand for expertise in the area of water quality has increased dramatically. Your company currently has experience with air quality. The Vice President of Operations would like to expand the services offered by the company by entering the water quality market. Start-up costs of \$300,000 are available to hire up to 5 specialists.



Product and Performance

Students complete report outlining who should be on the team and why. A sample ad is prepared that includes a job description, salary range and required experience. Where time permits, each group performs a mock interview to illustrate the knowledge required by both the Project Leader and applicant.

Building prior knowledge

- ◆ Ask students to scan a list of the environmental careers listed at https://www.eco.ca/_student/occprofilelist.aspx (one must register as a new user).
- ◆ Ask them to list 10 career profiles that seem suitable candidates for the positions at EnviroRemedia Consultants Ltd.
- ◆ Teachers may wish to provide time for students to explore the career matching section of the website: https://www.eco.ca/_student/interestmatching1.asp

Completing the task

- ◆ Identify 2 to 3 criteria required for the job, and then shortlist to 5 career profiles for the report outline. Students can complete this work in groups to promote discussion.
- ◆ Ensure that students have had sufficient instruction on how to write a report and advertisement.
- ◆ Ensure that students have been involved in a discussion of the format of a mock interview, and understand the criteria for evaluating such a performance.



Curriculum Connections for Elementary Grade GRASP Examples

The chart below summarizes the sample GRASP rich performance tasks and identifies opportunities to integrate lessons from several subject disciplines.

Legend	Grade 2 TVO Cartoonist	Grade 4/5 President of Inuit Tapirisit Kanatami	Grade 7 Landscape Architect
■ Opportunity for significant integration ★ Opportunity for moderate integration			
LANGUAGE			
Writing	■	■	■
Reading	■	■	■
Oral and visual communication	■	■	■
MATHEMATICS			
Mathematical Process Expectations			★
Number Sense and Numeration			★
Measurement			★
Geometry and Spatial Sense	★		■
Patterning and algebra			
Data Management and Probability		■	★
SCIENCE AND TECHNOLOGY			
Life Systems	■	■	■
Matter and Materials			■
Energy and Control		■	■
Structures and Mechanisms			★
Earth and Space Systems	■	■	★
SOCIAL STUDIES			
Heritage and Citizenship (1-6)		■	
Canada and World Connections (1-6)		■	
Geography (7-8)			■
History (7-8)			
ARTS			
Drama/Dance	■	★	★
Visual Arts	■	★	★
HEALTH AND PHYSICAL EDUCATION			
Active Participation	■		★



TDSB Resources

A Teaching Resource for Dealing with Controversial and Sensitive Issues in Toronto District School

Board Classrooms. TDSB, 2003.

Drama and Dance/Movement: A Beginner's Handbook (Grades 1-8). TDSB, 2001.

"Equitable Schools website" <www.tdsbequity.ca>

Fresh AER: Assessment, Evaluation and Reporting for Elementary Schools. TDSB, 2006.

Fresh AER: Assessment, Evaluation and Reporting for Secondary Schools. TDSB, 2006.

Instructional Strategies for Making Connections in Science (Grades 9-12). TDSB, 2004.

The Toronto Wind Turbine: An Excursion for Kids. TDSB, 2006.

Other Resources

Aikenhead G., and A. Ryan. "The Development of a New Instrument: Views on Science-Technology-Society (VOSTS)." *Science Education*, 76.5 (1992): 477-491.

[Barlow, Zenobia, editorial director.] *Ecoliteracy: Mapping the Terrain.* Berkeley, California: Centre for Ecoliteracy, 2002.

Benyus, Janine M. *Biomimicry: Innovation Inspired by Nature.* New York: Morrow, 1997.

Buehl, D. *Classroom Strategies for Interactive Learning* (2nd edition). Newark, Delaware: International Reading Association, 2001.

Galbraith, D., L. McClelland, P. McLeod, G. Johansson, and M.K. Winter. *Analyzing issues: science, technology, and society.* Toronto: Trifolium Books: 1997. This small book provides outlines for two role-play scenarios. The first role-play involves a public hearing related to municipal water supplies. The second role-play involves a commission on acid rain. For each scenario, many roles and tasks are defined.

Hogan, K. *Eco-Inquiry.* Dubuque, Iowa: Kendall/Hunt Publishing, 1994. This book is a true gem. It provides teachers with beautifully designed black-line-masters to foster student engagement in the inquiry process using environmental themes. This is a wonderful resource for any teacher who teaches the Life Strand of the Science and Technology curriculum.



Orr, David. *Earth in Mind: On Education, Environment and the Human Prospect*. Washington: Island Press, 1994.

Orr, David. *Ecological Literacy: Education and the Transition to a Postmodern World*. Albany: State University of New York, 1992.

Sussman, A. *Dr. Art's Guide to Planet Earth: For Earthlings from 12 to 120*. San Francisco: West Ed, 2000. This is one of the simplest and clearest accounts of how a focus on matter, energy and life webs can be used to explain all the fundamental environmental issues facing our planet.

Van der Ryn, Sim and Stuart Cowan. *Ecological Design*. Washington: Island Press, 1996.

Wiggins, G. and J. McTighe. *Understanding by Design*. Alexandria, VA: Association for Supervision and Curriculum Development, 1998. The GRASP model for curriculum development is a small part of the curriculum design strategy developed by Wiggins and McTighe. This book is recommended for teachers who wish to dig deeper.

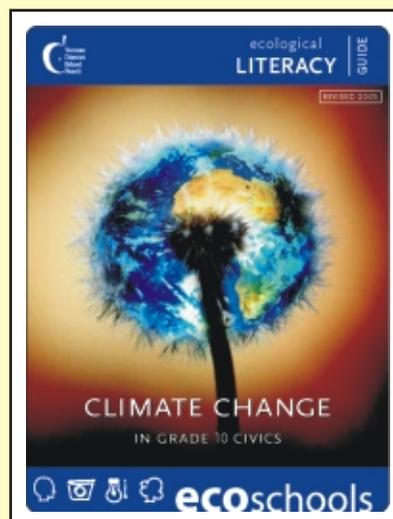
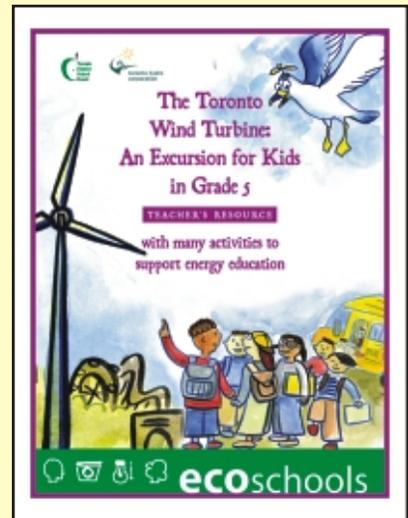
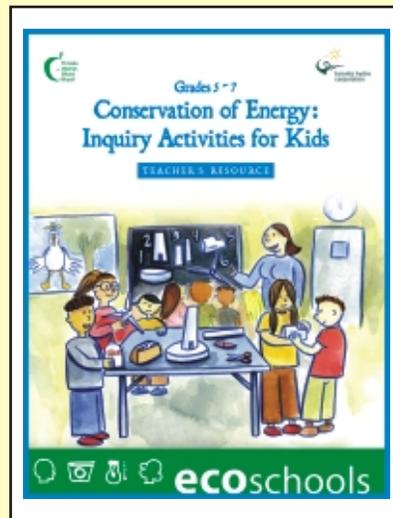
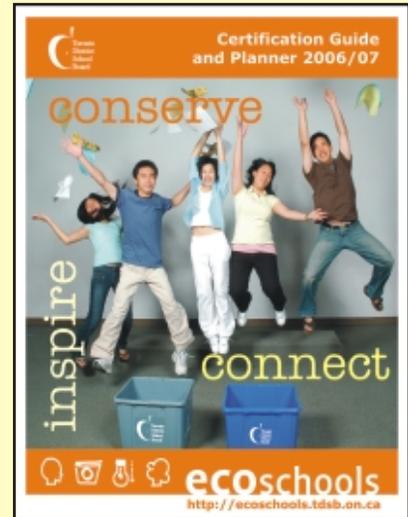
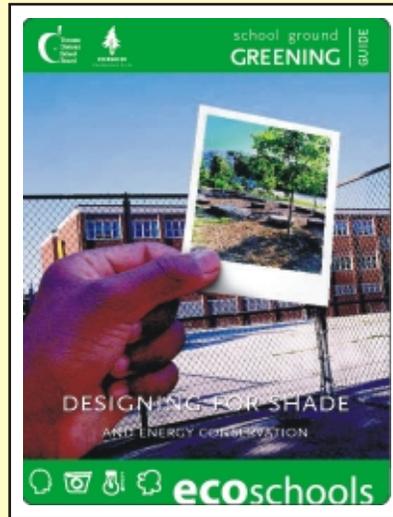
Notes

1. Art Sussman, *Dr. Art's Guide to Planet Earth: For Earthlings from 12 to 120*, San Francisco: West Ed, 2000.
2. For in-depth discussions of biomimicry and ecological design, refer to the works by Benyus and Van der Ryn and Cowan listed above.
3. For a fuller discussion of student voice in role, go to the Equitable Schools website: www.tdsbequity.ca
4. *Drama and Dance/Movement: A Beginner's Handbook (Grades 1-8)*, TDSB 2001, is available from Library and Learning Resources





DOWNLOAD



For these and other EcoSchools resources, go to
<http://ecoschools.tdsb.on.ca>