Toronto District School Board

toronto hydro corporation

The Toronto Wind Turbine: Virtual Tour for Kids

@ http://ecoschools.tdsb.on.ca

TEACHER'S RESOURCE

ecoschools

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The Toronto Wind Turbine Virtual Tour: Teacher's Resource

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Wind: The No-Fuel Solution!

Wind power has a unique characteristic:
it requires no fuel.
Therefore it has zero fuel price risk,
zero fuel costs, no external energy
dependence and
extremely low operation and
maintenance costs.

Wind is power without fuel.

Who can say no to that?

Ian Mays
Conference Chair
European Wind Energy Association
February 27, 2006

The TDSB-Toronto Hydro Energy Education Project

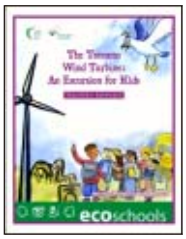
The Toronto District School Board in partnership with Toronto Hydro has developed a series of resources to help teachers deliver exemplary energy education. To download PDF versions of all print guides listed, go to **http://ecoschools.tdsb.on.ca.**

1. The Toronto Wind Turbine: Virtual Tour for Kids

Our mascot Ringo the ring-billed gull takes students on a virtual tour of the Toronto Wind Turbine. Students learn about wind energy, how the turbine works, and how they can make a difference. The Virtual Tour is a delightful introduction to energy and energy conservation. To launch the tour, visit **http://ecoschools.tdsb.on.ca**

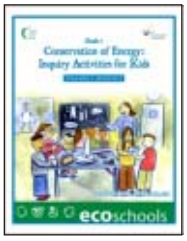
2. The Toronto Wind Turbine Virtual Tour for Kids: Teacher's Resource

This guide provides teachers with general curriculum connections and classroom management strategies as well as teaching and learning strategies for using the Virtual Tour described above. It also provides a summary of each of the six sections of the Virtual Tour.



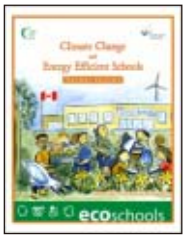
3. The Toronto Wind Turbine: Excursion for Kids

Many grade 5 classes have already visited the wind turbine at Exhibition Place. This guide provides teachers with lessons and black-line-masters to use before, during, and after the excursion to the turbine. It offers opportunities to creatively integrate numeracy and literacy into your program.



4. Grade 5 Conservation of Energy: Inquiry Activities for Kids

This resource outlines various hands-on and minds-on activities whose purpose is to promote inquisitiveness about energy concepts. Many of the activities support the EcoSchools program whose aim is to support school communities as they improve their environmental performance and, eventually, reach certified EcoSchools status.



5. Climate Change and Energy Efficient Schools

The Toronto District School Board has an important role to play in ensuring that its schools are energy efficient. This resource provides background information about climate change and updates teachers on the TDSB's ongoing efforts to reduce its energy consumption, and thus its greenhouse gas emissions.

Introduction

We hope that this guide will serve as a useful workbook for teachers as they take students through *The Toronto Wind Turbine Virtual Tour for Kids*. http://ecoschools.tdsb.on.ca. The tour consists of six sections:

1. **The Toronto Wind Turbine**
2. **Parts of the Wind Turbine**
3. **From Wind to Light**
4. **Toronto's Energy Story**
5. **Your Addiction to Fossil Fuels**
6. **From Ideas to Action**

This guide provides teachers with general curriculum connections, teaching/learning strategies and recommended accommodations. It also provides a summary of each section of the Virtual Tour. It notes the prior knowledge that would benefit students, and suggests questions for discussion that teachers can use before, during, or after the tour. Answers to the questions are not provided. This guide also reminds teachers of several proven pedagogical strategies for presenting the Virtual Tour.

Curriculum Connections

Reference
The Ontario Curriculum Unit Planner
http://www.ocup.org/

This web site was designed primarily for students in Grade 5 studying the Conservation of Energy unit. The three overall expectations for this unit are:

5s54 demonstrate an understanding of the importance of conservation of energy in relation to the wise use of renewable and non-renewable energy sources;

5s55 design and construct devices that use a form of energy to meet a specific need or want, and investigate how the energy is transferred to a specified output;

5s56 evaluate the reasons for conserving natural resources and identify possible ways of conserving energy.

Teachers may also wish to use this content to introduce or deepen students' understanding of the Grade 5 Forces Acting on Structures and Mechanisms unit. Overall expectations for this unit are:

5s77 demonstrate an understanding of the effect of forces acting on different structures and mechanisms;
5s78 design and make load-bearing structures and different mechanisms, and investigate the forces acting on them;
5s79 evaluate the design of systems that include structures and mechanisms, and identify modifications to improve their effectiveness.

Finally, teachers may want to cross disciplines and have students think about wind energy as a natural resource used by ancient civilizations (the relationship between sailing technology, territorial expansion, and trade). The three social studies overall expectations are:

5z1 identify and compare the ways in which people in various early civilizations met their physical and social needs, including how they interacted with and used the natural environment;
5z2 use a variety of resources and tools to investigate characteristics of a number of early civilizations, including their significant innovations and technological advances;
5z3 show how innovations made by various early civilizations have influenced the modern world.

Further curriculum connections can be found in the Prior Knowledge sections that follow.

Planning Notes

1. Prior to booking a computer lab or library check the web site to ensure it is working.
2. Whenever planning a lesson that involves a web site, prepare a back-up resource in the event that the TDSB server fails to perform adequately.
3. Schedule sufficient time to ensure that all students can complete the tour.

Accommodations

The Virtual Tour was designed to support the learning of all students. Careful attention to the amount of reading, use of specialized language, and relevant visual support addresses the learning needs of weak readers and ESL/ESD students. In some cases, new words appear in blue to indicate a hyperlink to a new page that provides expanded explanations and visual support. The navigational bars on the top and left side have been designed to provide a visual cue to students to ensure that they do not "get lost" in the Virtual Tour. Other accommodations to consider:

- Provide additional time.
- Take a step-by-step approach by presenting the Virtual Tour to the whole class with a data projector first.
- Pre-teach important concepts to students prior to introducing the Virtual Tour.
- Provide students with organizers that facilitate note-taking of main ideas and supporting facts.
- Pair a strong reader with a weak reader at the computer to facilitate peer coaching and leadership.
- Provide one-on-one assistance by taking advantage of special education teachers, educational assistants, parent volunteers, and senior student tutors.
- Consider using 2- or 3-part carbonless copy paper so that all students can receive a copy of the jot notes.

Evaluation and Assessment

The Virtual Tour is a learning tool. Students need not be evaluated. Assessment for learning through questioning is recommended. See the section-by-section play of prior knowledge and suggested questions for discussion.

Teaching/ Learning Strategies

1. Classroom Management Strategies

Choose an appropriate method to show your class the Virtual Tour. There are basically three options. Consider the advantages and disadvantages of each. Consider using whole-class instruction at first, and then provide time for students to explore alone or in small groups.

Method	Advantages	Disadvantages
I. Use one computer for the whole class with a data projector.	Teacher can address student questions as a whole class. Everyone is on the same page at the same time.	Students can't direct the pace of their learning. Students can't navigate to review sections or replay animations to suit their interests and needs.
II. Use one computer per group of two or three students.	Students can share ideas and reactions as they take the tour.	Not all students have a chance to control the pace of learning as they wish.
III. Use one computer per student.	Students have maximum control over the pace of learning.	This method does not facilitate dialogue, which is known to increase understanding and retention of knowledge.

2. Small Group Learning with a Computer

Ensure that students have opportunities to discuss the content and graphics on each page of the Virtual Tour.

The student who uses the mouse is often the only student that reads the text on the monitor carefully. To ensure that this does not occur, consider separating the role of mouse-user and decision-maker.

Reference
Bill MacIntyre. "Celestial Simulations," *The Science Teacher*. December 1999.

- The student using the mouse is called **The Hand**.
- The student not holding the mouse is called **The Mind**. The Hand cannot move without instructions from the Mind.
- If there is a third student in the group, then this student is **The Recorder**. The Recorder makes point form notes of what students are learning.

In this way, students are forced to communicate and learn key terms for navigating the Virtual Tour. Every 10-15 minutes, or after each section, the Hand, the Mind and the Recorder should change positions and roles.

The Mind
Teach these students to give the Hand polite instructions such as:
- *Please select the second section in the top menu.*
- *Could you please use the left navigation bar to jump to the end.*
- *Let's see the next page. Use the "next" button on the left.*
- *Let's see the photo gallery. Please click on the camera icon on the left.*
- *Let's see the videos. Please click on the first video icon beside the photo.*

The Hand
Remind the Mind to be patient and follow instructions.

The Recorder
Assign the task of pacing to the Recorder. The reporter has the task of jotting down notes, reading aloud and monitoring student learning:
- *Let's review the previous page. Select the "back" button.*
- *Did you understand what I read? Explain it in your own words.*
- *Do you understand what the main idea is?*

3. Reading Strategies

Reference
Just the Facts? Teaching Non-Fiction, Grades 4-8.
TDSB 2003

Choose appropriate before, during, and after reading strategies to optimize student learning.

Before

- Provide students with a list of key words to focus on for each section.
- Tell students that an animal has been chosen to be the guide of the Virtual Tour. Ask them to predict what kind of animal would make an appropriate guide, considering the turbine's location and purpose. But let them discover who the guide is when they see the tour.
- Help students see the big picture before they take the Virtual Tour. Bring in articles on energy sources, conservation of energy, problems with conventional sources — the papers and magazines are full of them! — to discuss energy issues with students.

Consider this idea if you plan to visit the wind turbine

Reference
The Toronto Wind Turbine: Excursion for Kids
Teacher's Resource.
TDSB 2006

During

- Consider "during reading" strategies such as summarizing sub-sections, connecting ideas, reflecting on ideas and images.
- At the end of each section, ask students to paraphrase and discuss two to three of the main ideas.
- Ask students to record the wind energy capacity for each country shown in Section 4 based on 2005 data. Ask students to construct a bar graph ranking countries from most to least. On the excursion to the wind turbine, students will compare their bar graph with one on-site that was prepared based on 2001-2002 data.

After

- Ask students to reflect on the Virtual Tour by summarizing the main ideas, answering questions, making connections to prior learning, and/or posing questions for future learning.
- Consider putting students in the role of Web Designer — set the context:

  "The Virtual Tour will be expanded to include more content to help students learn about renewable sources of energy and conservation of energy. Your task is to write one new section of content and suggest artwork that is beautiful and helps students learn."

SECTION 1

The Toronto Wind Turbine

Summary

In this section, students are introduced to Ringo, a ring-billed gull who serves as the Virtual Tour guide to the Toronto Wind Turbine. Students learn about some of the features for navigating the web site.

Prior Knowledge

Students should have a basic understanding of how a typical web site is constructed. "Next" and "back" buttons help students move from one page to the next. Navigation menus at the top and side help students see where they are in relation to the entire web site. This helps teachers too as they monitor their students' progress.

On some pages, contact between the mouse and an element of the graphic will produce some movement. For example, the wind turbine will turn, or the boat will move. These features are called animated gifs. They occur throughout the web site.

Questions for Discussion

Ask students to study the first painting.

- *Which features of the painting can you identify?*
- *Which is taller, the CN tower or the wind turbine? By how much?*
- *Is the drawing accurate? Why has the artist chosen to draw the waterfront this way?*

SECTION 2

Parts of the Wind Turbine

Summary

This section provides students with an overview of all the parts of a wind turbine. It makes heavy use of photos and video footage taken on-site during the construction phase. As a result, it may take longer than anticipated for students to complete this section.

Prior Knowledge

Before students begin this section, ensure that they know how to pronounce the names of the main parts of the wind turbine: foundation, tower, nacelle (sounds like "nay-sell"), anemometer (aneh-má-mitter - rhymes with "thermometer"), yaw gears (rhymes with saw), generator, blades, and rotor.

It might benefit students to review what they have learned in the Grade 4 Pulleys and Gears unit of the Science and Technology curriculum. This knowledge will help them connect their prior learning to the structure and function of the yaw gears.

Questions for Discussion

Help students broaden their knowledge using questioning. Here are some sample questions to consider using before or after students visit the web site.

- *What other structures require strong and deep foundations?*
- *How do cranes work?*
- *What other devices use blades?*
- *Where else might you find an anemometer? Where else is knowledge of wind speed and direction important?*
- *What were the safety issues that workers faced during the construction of the turbine?*

SECTION 3

From Wind to Light

Summary

This is the science section. Ringo explains how wind energy turns the blades. A basic explanation of the generator is provided to explain how mechanical energy is converted into electricity. Ringo also briefly explains how electrical energy is transmitted to our homes.

Prior Knowledge

Students may not recall what they have learned from Grade 2 Energy from Wind and Moving Water. The concept of density as it pertains to hot air rising may be new for many students. A discussion of how wind is created may need some attention beyond the brief discussion presented in this section. Relating generators to magnets and coils and the transmission of electricity through wires is formally introduced in the Grade 6 Electricity unit, although students may recall various applications of magnets from their Grade 3 Magnetic and Charged Materials unit.

Questions for Discussion

Help students review the content of this section.

- *Where does the wind come from?*
- *Where do you find strong winds?*
- *Which areas of Toronto are suitable sites for wind turbines?*
- *How is wind energy converted into electrical energy?*
- *How is the electrical energy transferred to our homes?*

SECTION 4

Toronto's Energy Story

Summary

First, students learn that Toronto depends on many different energy sources. Then, students use a timeline to learn about the development of Toronto's newest energy source, the Wind Turbine. To personalize the discussion, Ringo interviews a Windshare member and a Vice President of Toronto Hydro. Students are taken out of Toronto to see how much wind energy is generated around the world. Finally, they return to Ontario to preview our new energy sources.

Prior Knowledge

Some students may remember the blackout in August, 2003. It highlights our dependence on energy in our daily lives.

Questions for Discussion

For those who don't remember the blackout, consider reviewing the event and the impacts it had on daily life in Toronto and across Ontario. This kind of discussion can help focus students on understanding the difference between essential and non-essential uses of electricity.

- *How would your life be affected if you did not have electricity for 2 days? 5 days? 2 weeks? 1 month*?
- *Whose lives would be affected the most? The least? Why?*
- *What is a co-operative? How is it different from a corporation? What other kinds of co-operatives are there?*
- *Which of Ontario's new sources of energy (landfill gas, hydroelectric, wind) are renewable? (See the "Other Sources of Energy across Ontario" screen at the end of this section.)*
- *Why are most of the new sources in Southern Ontario? What other observations do you have?*

SECTION 5

Your addiction to fossil fuels

Summary

Ringo discusses our energy-using habits and the advantages and disadvantages of burning fossil fuels. This leads to a brief explanation of climate change and sets the context for changing our habits.

Prior Knowledge

Reference
Grade 5 Conservation of Energy: Inquiry Activities for Kids
Teacher's Resource (© 2006)

Students will benefit from knowledge of renewable and non-renewable sources of energy, and the advantages and disadvantages of each. The subject of climate change is complicated at every level. Experiences with thermometers and different systems that heat up at different rates will make the subject of climate change concrete and understandable.

Questions for Discussion

Reference
The Official Web site of the City of Toronto, Smog Alert
http://www.toronto.ca/health/smog/smog_new.htm

- *What is a smog alert? Why does the Ministry of Ontario issue smog alerts? Who benefits from these alerts?*
- *How can conservation of energy improve air quality?*
- *What is the connection between conservation of energy and the reduction of acid rain?*
- *What is the connection between conservation of energy and climate change?*

SECTION 6

From Ideas to Action

Summary

In this concluding section, Ringo reminds students of six ways that they and their families can contribute to reducing energy, from joining a school EcoTeam to reducing parents' car idling and other conservation efforts at home.

Students are encouraged to explore two significant opportunities for action: the Government of Canada's One-Tonne Challenge and Toronto Public Health's 20/20 The Way to Clean Air.

Reference
http://ecoschools.tdsb.on.ca

Prior Knowledge

The EcoSchools program contains many resources that can help teachers and students gain the knowledge required to transform our energy-wasteful schools into energy efficient schools.

Questions for Discussion

Here are some questions that will promote student involvement in energy management solutions in school:

- *Can our school be more energy efficient than it is? Who can help us find this out?*
- *How can our classroom become more energy efficient?*
- *How can we share our knowledge of energy efficiency with the rest of the school?*
- *How can we monitor our electricity and gas use over several months to see if our efforts are making a difference?*
- *What is our school board doing to improve the energy efficiency of our schools?*

TDSB Ecoschools Energy Conservation Standards

Lighting and Equipment

1. When adequate light is available from the sun, or when rooms are not being used, all lights are to be turned OFF.

2. Computer monitors are either turned OFF, or computers are put to SLEEP when not in use.

3. Computer peripherals such as printers, scanners and other electronic equipment are to be turned OFF when not in use.

4. All outside lights are to be turned off during daylight hours and at night after caretakers leave the school, unless authorized by a Superintendent of Education.

5. Portable electric heaters may only be used as a short-term emergency measure when heating problems arise and when mechanical equipment is being repaired. Principals must authorize their use in these circumstances.

6. Small "bar" refrigerators are prohibited unless there are compelling reasons for their use. A Superintendent of Education may authorize their use in exceptional circumstances.

7. Only the most energy efficient equipment is purchased (e.g., Energy Star).

8. An equipment consolidation program is implemented to ensure that energy is not wasted by using more equipment than is necessary (e.g., unplugging and/or removing unnecessary refrigerators and reducing the number of computer printers through networking).

TDSB Ecoschools Energy Conservation Standards

Heating and Air Conditioning

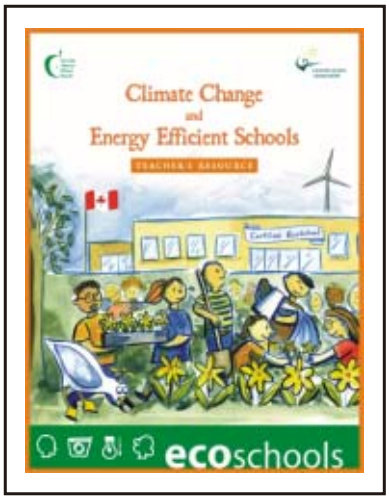
9 Windows and curtains are to be closed at the end of the school day.

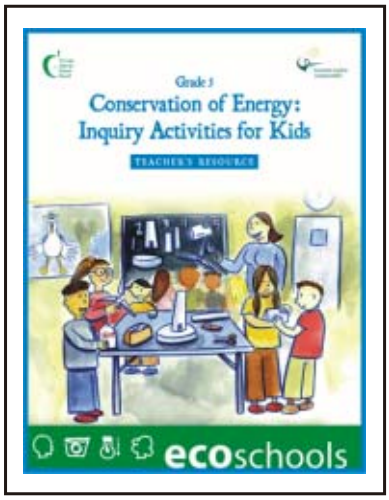
10 Space around vents on walls or windowsills is to be kept free of obstruction.

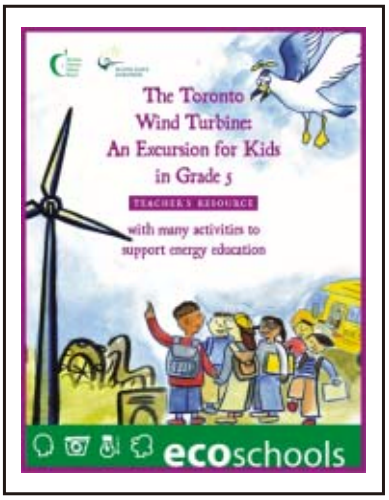
11 Doors to the outside of the building are not to be left open longer than necessary.

12 The school adheres to Board standard room temperatures and makes maximum use of its computer controlled temperature system (if available).

13 Mechanical equipment and water faucets are checked regularly and problems are reported promptly.







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these and other EcoSchools resources

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