EXTENSIONS

Active Transportation

Challenge students to use forms of transportation other than cars for a period of time. Students that come by bus could choose a location close to their home that they visit frequently (or they could be the —tally recorders or —cheerers for their group). Divide the students into small groups and have them choose a name for their group. Post the group names on a poster board. Place a check mark beside the group name each time a student in that group used active transportation for getting to school (or another location they choose to travel to from their home). When the time is up, select the group with the most check marks and award them the —Commuter Challenge prize. You could award certificates and/or create awards like a golden shoe award (paint an old running shoe with a water-based gold paint and glue it to a piece of wood).

Air Pollution Illustration - Getting Active Exercise

This activity will illustrate issues related to air pollution and the impact of poor air quality. Divide the class into two groups with one group called CLEAN AIR and the other group called AIR POLLUTION. Mark out a rectangular playing area with a start area on one end and a finish area on the other end (if using the gym, use the whole gym). The center is the pollution zone. The CLEAN AIR team will line up in the start area, and their goal is to run across the pollution zone to the finish zone. The AIR POLLUTION team will need soft-foam balls, and their goal is to tag members of the CLEAN AIR team as they cross through the pollution zone with the soft-foam balls. If a CLEAN AIR player is hit with a ball, they return to the start area and sit down. Once all of the players are either sitting in the start zone or have entered the finish zone, the game is over. You can switch players on the two teams and increase or decrease the number of Air Pollution team members to illustrate better or poorer air quality days.

Airsick: An Industrial Devolution

Lucas Oleniuk, a photographer with the Toronto Star, illustrates climate change and the state of our environment using 20,000 images in this short DVD (6 minutes). Share the DVD with your students and have them respond with a written reflection paper, creative writing, artwork, discussion or a proposed plan for action.

AQHI

Record the AQHI (http://www.ec.gc.ca/cas-aqhi/)for a location closest to your school over the school year. Use a spreadsheet to track the information. The spreadsheet could also include the weather and temperature for each day (Weather Network). The data could be used to compare the AQHI with weather patterns and seasonal effects. Students could provide information for announcements or postings on the school's bulletins for days that the AQHI is moderate to very high. They may wish to include other health information such as the UV rating and Pollen report (both are found on the Weather Network - http://www.theweathernetwork.com).

Commuter Challenge

Host a Commuter Challenge to include staff, students, parents and local celebrities. Include three to five people and assign a mode of transportation to each person (e.g., bus, car, bike, long board, and walking). Determine one starting point for all participants and set the end point as the school. Assign a time for participants to leave, and ensure that the start timer and end timer are synchronized. Create a large poster display to list the different participants and their times and post the results in school newsletters or bulletins. Invite the media to share in the event and to share the results.

Connections: Our Food Source and Air Quality

Ask students to investigate and explore the source of their food. Questions they may ask include: Where is it grown? How do we know? What types of food are imported and from where? What food can be grown locally? As they discover more about the food that they consume connect the food sources to air quality in those regions. Students will have to investigate current air quality conditions for the areas where food is sourced. What pollutants could be found in food sourced from the ocean? What harm can poor air quality have on the nutritional value of the food? How does air pollution affect food systems? What can students do about the food they eat? What can they do about global and local air quality?

The following links may be helpful:

Agri-Food Trade Service, Government of Canada Website
http://www.ats-sea.agr.gc.ca/stats/4679-eng.htm

Canadian Food Inspection Agency
http://www.inspection.gc.ca/food/eng/1299092387033/1299093490225

Data Analysis

Conduct an activity or project using current local data. BC Mathematics for Grades 2 through 7 has prescribed learning outcomes specific to data analysis. When educating students on these prescribed learning outcomes take a look at the data made available through http://www.bcairquality.ca/readings/index.html

Using local relevant data can increase interest in the learning of such data analysis concepts. When accessing the link above:

Select a municipality, such as Prince George. A map with the local monitoring stations will appear, from which each monitoring site will provide location specific data when clicked. To see each reading in more detail, scroll over the pollutant of choice and click. Data will be presented in line graph format.

Exploring the Complexities of Air Quality

Abstract

Students demonstrate the issue of air quality as complex as they explore its contributors and discuss solutions through a visual exercise.

Logistics

Time Required

- Class Time: 1 hour
- Prep Time: 10 minutes

Materials

- Air Quality Issues Cards, 1 per student (or 1 per pair if class size is greater than 15 students). Fold and seal the cards so the information is not revealed.
- White board or Large Bulletin Board

Learning Objectives

Students will:

- Visually experience the connections and complexities of air quality issues
- Understand how a change in one issue can positively and negatively affect a change in another issue
- Be introduced to systems thinking

Inquiry Questions

What makes the issue of air quality complex?

How does change in one air quality contributor affect other air quality contributors?

How are solutions to air quality problems interconnected?

Classroom Implementation

Part A

Students are introduced to the idea of complexity.

1. Project or write the following quotes for the class to see. Allow students to create a journal entry in response to one of the quotes.

"Man is not born to solve the problem of the universe, but to find out what he has to do; and to restrain himself within the limits of his comprehension."
-Johann Wolfgang von Goethe

"Remember, always, that everything you know, and everything everyone knows, is only a model. Get your model out there where it can be viewed. Invite others to challenge your assumptions and add their own."
-Donella H. Meadows, *Thinking in Systems: A Primer*

2. After they write for a 5 to 10 minutes, lead a class discussion about the quotes, allowing students share their thoughts.

3. Inform students that they will now conduct an exercise that will explore the complexities of air quality.

Part B

Students create a mind map of interconnectedness as they explore air quality.

1. As a class arrange classroom if necessary so that students can all see and hear one another. This can be in the form of a circle or simply open posture to their peers at desks or tables.

2. Introduce the concept of mind mapping. Invite one student to write "Air Quality" at the center of the board.

3. Hand out the *Air Quality Issues Cards* to students. If the class is larger than 16, hand out one card per pair. Ask students to keep cards sealed.

4. Invite students to add to the mind map with contributors to air quality. Be sure to expand into some detail for each contributor. For example, *weather*: which type of weather conditions affect air quality and how.

5. If students have exhausted ideas, allow all the students to open their *Air Quality Issues Cards*. The cards can be used to supplement or inspire ideas that have not already been mentioned.

6. Conclude the lesson with a discussion using the reflection questions below.

Part C

Students reflect on concepts from exercise using reflection questions.

1. Why might it be helpful to understand existing air quality contributors as well as how and why they are interconnected?

2. How can understanding the connections between contributors to air quality help us find solutions to the problems surrounding poor air quality?

For Advanced Students:

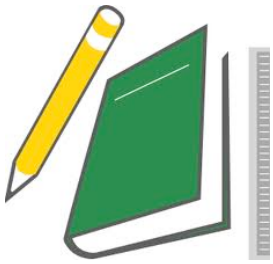
Introduce concepts of systems thinking:

- A system is composed of parts.
- All the parts of a system must be related (directly or indirectly)
- A system is encapsulated, has a boundary.
- The boundary of a system is a decision made by an observer, or a group of observers.
- A system can be nested inside another system.
- A system can overlap with another system.
- A system is bounded in time.
- A system is bounded in space, though the parts are not necessarily co-located.
- A system receives input from, and sends output into, the wider environment.
- A system consists of processes that transform inputs into outputs.

3. Understanding the interconnectedness of parts of an issue can often be the first step in problem solving. Interconnectedness is an important and key concept in "systems thinking." By understanding that a system consists of parts that are connected or related, we can begin to see when and where we can intervene in a system to make change. What are some examples of places we could intervene in the system outlined with the mind map and maximize positive connections between various components? Have the students discuss the idea of intervening in a system and making positive changes.

4. Identify how one action can have a snowball effect, a triggering of other reactions in the system with positive results. Consider an action that could trigger a series of negative results. Are there any small changes that could multiply into large or widespread change in air quality?

TECHNOLOGY 	TRANSPORTATION (rail, plane, fleet, etc.) 
ECONOMY 	INDUSTRY (mining, forestry, factory, restaurants, etc.) 
WEATHER (sunlight, wind, etc.) 	HEALTH CARE (medical services, treatment, awareness) 
HUMAN BODY SYSTEMS (response to pollutants, respiratory and cardiovascular illnesses) 	POLLUTANTS (ozone, particulate matter, nitrogen dioxides, sulphur dioxides, road dust, wood smoke, etc.) 

HEATING METHODS (wood heat, natural gas, electric, diesel generator, etc.) 	FEDERAL AND PROVINCIAL POLICY (Environment Canada, Ministry of Environment) Canada
LOCAL POLICY (City bylaws) 	FOOD PRODUCTION/CONSUMPTION (local, imported, pesticide use, organic) 
ENERGY PRODUCTION (coal, hydroelectric dams, wind, solar)  	EDUCATION (schools, public campaigns, etc.) 
PERSONAL TRANPSORTATION INCLUDING ACTIVE TRANSPORTATION (biking, walking, carpooling, single occupancy vehicle, public transit) 	LAND USE PLANNING (city planning, zoning for industry, agriculture, residential) and TOPOGRAPHY (geographic layout of the populated area including valley or flat land)

Implementing Change- Getting Active Exercise

To illustrate how hard it is to make changes to how we do things, divide the students into two groups and have them complete a number of tasks in two different rotation orders. This can be done in the gymnasium, outdoors or in another large space. Have each group complete the rotation at least once (you may wish to have them complete the same rotation more than once). Change the order of the tasks, and have each group complete the new rotation (at least once). Ask students to identify how many times (or turns) it took for each group to get the new rotation correct. How does this compare to our efforts to make change to routines in our daily lives? Discuss the challenges involved in implementing change on a larger scale.

Task rotation: shoot a small ball into a container, bounce a ball three times, juggle two bean bags, run around the room once, do five sit-ups, and do five jumping jacks.

Indoor Air Quality Activity

Students can research indoor air quality to learn ways to ensure that the places where they spend time indoors have good air quality. There are many indoor air quality topics that students could research such as asbestos, tobacco smoke, carbon monoxide, moisture and mould, chemical contaminants and lead. Canada is one of the world's largest asbestos producers and exporters – more than 95% of what Canada produces is exported. Asbestos is classified as hazardous to health and is under restricted use in Canada.

Interview

Ask students to interview someone with asthma. This activity/homework assignment could be done in connection with another course, such as Language Arts where the students develop the guide themselves to conduct the interview.

Local Relevance

Share a local community example of success in reducing air pollution. Discuss whether students were aware of the story and how their awareness could impact their perspective on what is happening locally. Discuss where and how students might find this kind of information. For example, Canfor Pulp Limited Partnerships has done a number of projects to improve environmental performance and to reduce emissions. Check out what they have done by visiting the following website:
http://www.canforpulp.com/greentransformation/projects/overview.asp

Me to We

Share the Me to We Campaign as a powerful example of youth leading and helping to shape change. While not everyone can contribute in the way that the Keilburgers have, Me to We is a powerful example and speaks to the abilities and potential of young people to create positive change.

At the age of 12, Craig Keilburger decided to take action to reduce the amount of child labour in the world. He started his own organization. Craig and his brother Marc now run Me to We, an international organization helping children go to school instead of having to work. The two brothers travel all over the world, motivating other youth to be leaders in their communities and creating new opportunities for young people with few or no opportunities in countries with many difficulties. (Source: http://metowe.com)

Mind Map

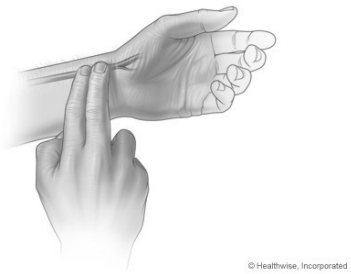
Ask students to work in groups to create a mind map that compares the strengths and challenges between two countries and suggest solutions to challenges. Ask the groups to share their thoughts.

Monitor Heart Rate and Breathing - Getting Active Exercise

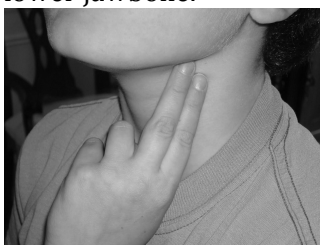
Knowing your heart rate helps you measure your exercise level and progress in a fitness program. Ask each student to develop a personal physical fitness goal. Ask them to pick one moderate- to vigorous-intensity physical activity to focus on over a period of weeks. Over a period of weeks students measure and record their breathing and heart rate during this activity, and then analyze the impact of regular physical activity on their breathing and heart rate. With the class discuss the principles of fitness training – FITT- frequency, intensity, time and type. Share information about target heart rates during exercise using the Target Heart Rate Calculator. http://exercise.about.com/cs/fitnesstools/l/bl_THR.htm

To monitor their heart rate, students count their rate for 10 seconds and then multiply by 6 to record their heart rate per minute. To find their pulse:

Radial Pulse: Using the tips of your middle and index finger of the right hand, place these fingers on your other wrist (palm facing up) just below the base of the thumb.



Carotid Pulse: Using the middle and index finger of the right hand, find the carotid artery. This artery is found on the neck between the windpipe and the neck muscle, just under the lower jawbone.



Students will feel a pulse once they have found the artery. Have them hold the two fingers in place while counting the pulse for 10 seconds.

Give an activity handout for students to take home for the duration of this assignment. When the period of weeks is complete, ask students to return the analysis to class and discuss the results together during a class period.

Novel Study

The City of Ember written by Jeanne DePrau and *Green Boy* by Susan Cooper are appropriate novels for English grades 5 to 7. Use either one of these books as a means of integrating curriculum. Both novels address ideas and concepts of energy generation and use, pollution, human behavior and technology. Linkages can be found in the content of these books with Social Studies and Science 5, 6 and 7. Multiple study guides and teaching resources can be found online for these two books.

Timeline

Print six copies of the "Choosing to Act- A Fork in the Road Timeline." See Table of Contents to locate this document. Divide the students into six groups and provide each group with a copy of the worksheet. If you wish, you can remove the dates from the timelines and have students complete research to identify the year. Ask the students to cut out the squares and create a timeline of the information. Ask the groups to identify the timeline fact that was most surprising to them.

Walk Score

Transportation is one of the biggest contributors to climate change and ground level ozone (a component of smog). Close to 30% of the total energy consumed in Canada is for transportation. More than 50% of all of the energy we use for transportation is used for personal vehicles. Choosing more active types of transportation is a great way to increase activity levels while also reducing air pollution and the greenhouse gas emissions that contribute to climate change. Have students use Google Maps — http://maps.google.ca— to get directions for different ways of getting to school. Students enter their home address, and then click on —Get Directions and enter the school address. Google Maps will create a map indicating the driving route from their home to school. Click on the icons on the left to get directions for taking the bus, walking, or biking. Google Maps also provides the distance and estimated travel time.

Walk Score — http://www.walkscore.com— can help students compare the walkability of different neighborhoods. Have students enter their home addresses and compare the walk scores of different communities. The map lists local restaurants, shops, schools, and parks, and the distance to each.