Is BC in the Hot House?

We often hear about Global Climate Change and the increasing number of storms and other unusual weather events around the world. But what is happening here in British Columbia? And what will our future be like should temperatures continue to rise?

Activity Time:
Part I: 60 minutes
Part II: 90 minutes (can be done in several smaller increments)

Setting:
Classroom

Materials:
- A copy of the poster Temperature Rising: Climate Change in southwestern British Columbia.
- One copy of each of the 12 sections of the poster for student use – if possible, obtain 2 copies of the poster and cut and laminate the sections from the second poster for student use.
- Chart paper and Markers and/or Overhead Transparencies and Markers.
- Notebooks to use as climate change journals, one per student

Grade Level:
Upper Intermediate, Middle School, High School

Summary

Using the jigsaw method of presentation, students explore a multi-topic poster on Climate Change and summarize their learning.

Objectives

Students will:
- Summarize information on topics concerning global climate change
- Present relevant information from their topic area to the class
- Synthesize information presented by fellow students
- Develop a comprehensive understanding of how climate change may affect British Columbia

Making Connections

Global Climate change is a large and often confusing subject. The scale of the issue makes it hard to pinpoint the causes and effects of rising global temperatures. It is not easy to make committed changes to mitigate the impacts of climate change without developing some personal understanding of the situation. Bringing it all home to British Columbia helps students make those personal connections and develop a realistic understanding of how our future may unfold in an age of climate change.

Background

Canadians are ranked second in the world for per capita Carbon Dioxide (CO_2) emissions. In part this is due to our cold winters but while we cannot avoid them, we can make better use of our resources. For many years a debate took place regarding the authenticity of the threat that increased greenhouse gases would have on the earth's atmosphere. It is now widely accepted that global climate change is taking place. Scientists have collected such a comprehensive body of evidence that it cannot be refuted.

The earth's climate has fluctuated throughout its history. Fortunately, for the past 10 000 years conditions have remained fairly stable and an atmosphere conducive to human life developed.

There has been continued variation in climate during that 10 000 year period, such as the medieval warm period that allowed the Vikings to settle in Greenland, but overall the earth's climate has remained fairly constant.

This has been achieved by the natural greenhouse effect that regulates the amount of the sun's energy that is retained in the

Is BC in the Hothouse?

Subject Areas:
Biology, Chemistry, Ecology, Earth Science, Geography, Physical Science, Resource Science, Science and Technology, Social Studies

Skills:
Analysis, communication, critique, explanation, oral presentation, prediction, researching, summarizing

Group Size:
Any

Keywords:
Atmosphere, Climate Change Climatologist, CO_2 Emissions Energy Budget, Energy Efficiency, Enhanced Greenhouse Effect, Greenhouse Effect Greenhouse Gas, Hydroelectric Power, Latitudes

Note:
This lesson plan was developed for use with the poster Temperature Rising developed to explore the impacts of climate change on southwestern British Columbia. The poster is available from:
Geological Survey of Canada
101-605 Robson St.
Vancouver BC V6B 5J3
Telephone: 604 666 0529
Fax: 604 666 1124
E: Info-vancouver@gsc.nrcan.gc.ca

earth's atmosphere. Without this effect the average temperature of the earth would be –18°C. With it we live at a balmy 15°C. For most of the past 10 000 years, the concentration of the most abundant greenhouse gas, CO_2, has remained fairly steady at 280 parts per million (280 molecules of CO_2 for every million molecules of air). Since the Industrial Revolution began in the 1700's humans have increased this concentration by 31% and it continues to increase at a rate of 0.4% per year. Other greenhouse gases are also on the rise: methane by 151%, nitrous oxide by 17% and a host of human made compounds that did not exist before the 1930's but which now account for 12% of today's enhanced greenhouse effect.

The changes in the earth's atmosphere are trapping more of the sun's energy and leading to an overall rise in global temperature. Scientist predict the impacts of this change could include a one-meter rise in sea level which would displace millions of people living in low-lying communities, altered weather and precipitation patterns leading to changes in agricultural output and significant alterations in the ecosystems that support all life on the planet.

Humans are affecting the CO_2 balance in two ways. Huge quantities of CO_2 have been added to the atmosphere by the burning of fossil fuels such as coal, oil and natural gas. At the same time, about 50% of the worlds forests have been harvested or burned and cleared for agriculture or housing reducing the natural ability of the earth to absorb and store CO_2 through photosynthesis. In British Columbia 60 – 70 million tons of greenhouse gases are produced each year. This translates to 18 tonnes for each resident of the province. Most of this is CO_2 (80%) .

Understanding the effects of climate change on the province will motivate residents to decrease their greenhouse contributions. Impacts in BC may include reduced salmon stocks, fresh water shortages, changes in forest composition, increased forest and grassland fires, insect invasion, reduced air quality and an altered growing season for agricultural production. These impacts will reach into every sector of the population.

As we gain an understanding of how we are producing greenhouse gases, we can take steps to reduce our contribution. In BC, 41% of emissions comes from the transportation sector. This is followed by industry at 33%, residential at 8%, landfills at 7.5%, commercial at 6% and finally agriculture at 4.5%. From this information we can begin

Is BC in the Hothouse?

to construct meaningful changes that will lead to a more sustainable lifestyle, not just for British Columbians, but for all of us who share one planet and one atmosphere.

Procedure

Warm up

Put the keyword "climatologist" up on the board or overhead. Ask students if they know, or can guess, what a climatologist studies. Ask if they can identify a recent news story that involved the work of a climatologist. Then put the words "atmosphere" and "greenhouse effect" up and ask students how they link to the work of climatologists. Students may equate the term "greenhouse effect" with global warming. It is important that they understand the natural greenhouse effect is vital for our survival.

Explain to students that they are about to become experts on one aspect of climate change. As an expert, they will be called upon to participate in a climate change conference where they will present their data to an audience of their peers – the experts in the other areas. Together they will piece together an understanding of how climate change may affect the residents of British Columbia.

The Activity

Part I

1. Explain to students that they will be given one piece of the jigsaw that, when placed together, provides a comprehensive explanation of the causes and effects of climate change.

2. Their job will be to summarize the information in their jigsaw piece and using their own words, present that information to the rest of the class.

It is essential that the class understand their section as all the work hangs together to make a whole. They may use overhead transparencies or chart paper to create diagrams, graphs or illustrations. They will have 5 minutes in which to make their presentation.

The criteria for the presentation will be (5 marks total):

- Title stated and written up on board or overhead – 1 mark
- The topic and big question clearly stated – 1 mark
- Minimum one diagram, graph or illustration. Must be neat and easy to read – 1 mark
- Information presented clearly – 1 mark
- All group members equally involved in presentation – 1 mark

3. Hand out the climate change journals.

In these notebooks students will create their summaries and take notes from other presentations. Students will be expected to hand in the journals at the end of the activity. Have students put the title, date and name on their notebooks immediately.

The criteria for the presentation summaries will be (5 marks total):

- Title and group members– 1 mark
- Summary of information
- What is the topic of this section – 1 mark
- What is the "big question" for this section – 1 mark
- Minimum two important pieces of information – 2 marks

4. Break students into 12 groups – one for each section of the map. Hand out map sections.

5. Students have 40 minutes to summarize the information in their piece, create their presentation and practice.

Everyone must record their summary and an outline of their presentation in their journal.

Is BC in the Hothouse?

Part II

1. Beginning with the group looking at the question, "Is Climate Changing?" students present their findings to the rest of the class.
The other students must take notes in their journals during the presentation. Be sure the group presenting gives a clear title for their presentation and that students record it before the presentation begins. At the end of the presentation, encourage students to ask questions of the presenters, particularly for clarity of understanding and elaborating notes.

2. When all 12 sections have made their presentations, lead the class in a brief discussion of each of the 12 areas using the journals as a guide.
Let students know they will be receiving a set of questions to answer regarding the 12 sections and invite them to elaborate on their notes during the discussion. Tell them that at this point, the jigsaw should be complete and a picture should be clear in their mind regarding the causes and consequences of climate change.

3. Hand out the worksheet containing the 16 questions taken from the map.
Have students complete them individually using their journals as their resource material.

Assessment

- Use criteria given to mark group presentations
- Use criteria given to mark summaries in the climate change journals
- Collect worksheets and mark the 16 questions. The answers will be varied and often open ended but should demonstrate understanding of the issues.

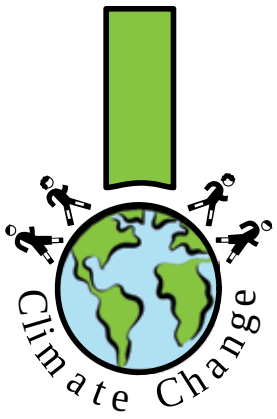
Extensions

- Have students create a poster on their topic area to be displayed on a bulletin board or in the hallway.
- Have students prepare an article on each of the topic areas and include these articles in the school newsletter.
- In their groups, students do further research and prepare a report on their topic.
- As a class, undertake a carbon reduction challenge. Brainstorm ideas about how to cut down on fuel use and choose one to commit to.
- The Government of Canada website provides a link to a series of questions developed from the poster used in this lesson plan. These questions would provide an excellent starting place for further research into the causes and consequences of climate change http://adaptation.nrcan.gc.ca/posters/

References

Grant and Littlejohn. 2001. Teaching About Climate Change: Cool Schools Tackle Global Warming. Toronto, Ont.: Green Teacher & Gabriola Island, B.C. New Society Publishers.

Mussel, Severson-Baker and Diggins. 1999. Climate Change Awareness and Action: A Multimedia Education Kit. Drayton Valley, A.B.: Pembina Institute for Appropriate Development.



Is BC in the Hot House?

Use the questions below to test your knowledge about Climate Change.

1. Experts have different opinions about the future of our climate. How do you determine who is right?
2. How can we be sure that the warming of the last two decades is not related to the natural rhythm of climate?
3. How can we reduce the amount of carbon in the atmosphere?
4. What can be done to reduce the amount of air pollution in the Fraser Valley?
5. Have you noticed a change in air quality where you live? What has caused this change? Or not?
6. Is our community safe from floods?
7. If sea level is going to be higher in the future, should we restrict development along our shore lines?
8. Climate change will affect the habitat, food supply and migration patterns of birds. Some bird species will increase, and others will decline. What impact would the loss of Fraser Delta marshes have on ducks, geese and shorebirds that migrate along the Pacific Flyway?
9. What can be done to ensure that salmon continue to survive in our rivers?
10. What impact would fewer salmon returning to spawn in the Fraser River and its tributaries have on the economy of British Columbia?
11. As demand for water increases, what can be done to conserve and share this precious resource?
12. What will happen to forests in our community if summers become hotter and drier?
13. How might the BC forest industry adapt to climate change?
14. What might farmers do to adapt to climate change?
15. Why do you think Canadians rank second in per capita CO_2 emissions? One reason is our cold winters. This cannot be changed, but what can?
16. How can you help reduce greenhouse gas emissions?
    a) As a consumer
    b) As a voter
    c) Through community involvement