Climate Change Lesson Plan

Aim
To learn about climate change; what it is, what causes it, what the impacts are on the environment and how we can help to stop it.

Time requirements
Approximately 120 minutes (additional time may be needed for preparation, videos and research)

Resources
- Interactive water resource
- Whiteboard or projector
- Post its and A3 sheet of paper
- Pens
- Internet access

Experiment (Equipment/Greenhouse Set Up)
- Two clear plastic 2-liter bottles per team (cut one near shoulder and one 4 inches from the bottom)
- Plastic wrap or clear plastic bags to cover the "greenhouses"
- String or rubber bands to hold the plastic in place
- Two thermometers per team
- Two 2" x 2" pieces of thin cardboard (to hold thermometer in place)
- Soil, ice cubes and water
- Plastic rulers
- Masking tape to tape thermometer to inside of bottle
- Utility knife or saw for cutting the plastic bottles (can be done by teacher in advance or by students)
- Clip-on light source with at least a 100 watt bulb (if cloudy or doing in doors) per team of students

Learning objectives
To investigate the issue of climate change through discussion, experimentation and observation in order to further students understanding of the topic and the impact their own activities have on their surroundings, as well as, encouraging students to take action to prevent further climate change.

Curriculum Strands
Geography
Senior cycle- Elective Unit 4: Patterns and Processes in Economic Activities (4.5 Environmental Impact)
Junior Cycle -Unit A2: The Restless Atmosphere: the heat engine
Civic, Social and Political Education
Junior Cycle – Strand 2 Global Citizenship

Skills
Questioning, discussing, cooperating, environmental design, investigating, observing, recording, analysing, interpreting and presenting data

Links to Green-Schools
Step 2 Environmental Review – Water audit
Step 3 Action Plan – Awareness raising discussion and experiment, water audit, research of water issues
Step 6 Informing and Involving – Information posted on notice board, display of videos and art

Vocabulary
Climate change, greenhouse effect, experimental errors, carbon calculator, water footprint

Running the activity

1) Climate Change Discussion

Put the class in pairs or small groups, handout 4 post it's per group, pose the below questions asking the students to place their answers on the post it's:

- What is climate change?
- What are the causes?
- What are the impacts?
- What are the solutions?

Collect and display the answers on a sheet. Go through Section 3 of the resource, checking and discussing the answers as you go. Have students design and put together an informational poster including the answers to the questions above and place around the school. You could show a film on climate change from the following website: www.filmsforaction.org/watch_climate_change_videos/, to raise awareness in the school as a whole. Relevant films could be played on monitors around the school at lunch time during a water awareness week or shown at assembly.

2) Experiment – Recreate the Greenhouse Effect

- Explain the experiment (see below points and greenhouse set up) e.g. what it is testing and how it will be carried out. Ask students to brainstorm for ways to test the effects of greenhouse gasses on air, soil and water temperatures, as well as polar ice caps, using the aforementioned equipment. Set up a sample experiment as a guide (see Note for ideas).
- Provide each team with the equipment listed above and ask the students to select one effect to test. The student-designed experiment should include a hypothesis, a procedure (including a sketch) and a data recording table, including appropriate units of measure.
- Once the experiment is approved students should carry out their experiments for approximately 30minutes and record their observations, before, during and after the period the bottles are in the light.
- After completion each team will report on their experiment, listing their hypothesis, set up, findings and whether there were any experimental errors. They should also relate their findings to the real life impacts of the excessive release of greenhouse gasses into the environment and what might happen if this continues.
- **Note:** Students should create a control experiment using the shorter plastic bottle without a plastic cover as this will not trap the air as well. The bottles should be in direct sunlight or by a light source for the duration of the test and thermometers should be facing the same direction relative to light source. If testing the effects on damp soil, make sure the soil and the amount is the same in each bottle. If testing water temperature, there must be the same amount of water in each bottle and thermometer must be at the same depth. If testing effect on polar ice caps use the same amount of water and ice cubes in each bottle. In the latter experiment change in water level is more important than the temperature difference and the experiment should finish when all ice is melted.

3) Water Audit

To find out the ways your school uses water, how much water is used and how you can reduce it:

- Put students into teams to go around the school to count and list everything that uses water.
- Students could research how much water each of the appliances uses and brainstorm for ideas to reduce their water usage.
- Put all the results together in tables and graphs and/or a poster, using images if possible and post on your Green-Schools notice board.

Students could then calculate the schools water-related CO_2 emissions. See the Green-Schools website for carbon calculator www.greenschoolsireland.org/energy/carbon-calculators.339.html. Students could calculate the schools water footprint (water footprint measures the amount of water used to produce each of the goods and services we use) using the following website waterfootprint.org/en/. Students could identify how much water is involved in producing a certain product e.g. a pair of jeans and place this on the Green-Schools notice board covered with a question mark, so people can guess and reveal the answer.

See Section 3 of the Water Resource

Questions

See running the activity

Go further

- Do research projects on various renewable energy sources.
- Research and carry out relevant experiments to show students during an awareness week.