Beat the Heat

Unit Summary
In this project, students as environmentalists, investigate silent crimes against our environment. Students understand about environmental issues such as greenhouse effect and global warming by undertaking chemical investigations in the lab. They conduct research as well as an awareness survey of their neighbours, parents and friends to gauge their awareness level regarding the greenhouse effect; and speak to experts to gain a more informed perspective on their research. They use wiki as a research base to develop and share knowledge about the environmental issues. The class blog is used by the groups to debate and share thoughts and reflections. Students conduct an awareness campaign for making students and parents aware about global warming.

Curriculum Framing Questions

- **Essential Question**
  Are we progressing irresponsibly?

- **Unit Question**
  Are we responsible for global warming?
  What can we do to stop global warming?

- **Content Questions**
  What is green house?
  What is greenhouse effect?
  Which are greenhouse gases?
  What is global warming?
  What are the causes of global warming?

Assessment Processes
View how a variety of student-centered assessments are used in the Beat the Heat Unit Plan. These assessments help students and teachers set goals; monitor student progress; provide feedback; assess thinking, processes, performances, and products; and reflect on learning throughout the learning cycle.

Instructional Procedures
Prior to instruction

- Prepare a brainstorming sheet to trigger thinking process while discussing the Essential question.
- Prepare a discussion rubric for explaining expectations during discussions.
• Prepare a K-W-L chart to gauge students' needs.
• Prepare a research checklist to help students in the research process.
• Set up a class wiki and create an introduction page.
• Set up a class blog and create an introduction page.
• Prepare what is wiki? handout and wiki rubric and wiki guidelines to assist students while working on wiki.
• Prepare what is blog? handout, blog guidelines and blog checklist to assist students while working on the blog.
• Arrange for science lab and all equipments for experiment.
• Organise video conference with experts.
• Make a publication scoring guide to assist students while working on poster / flyer.

**Introduce the unit (1 period)**

Ascertain students' prior knowledge concerning the Essential question, *Are we progressing irresponsibly?* Activities could include:

- Dividing students in groups of 5 students each.
- Brainstorming on the global issues we are facing today.
- Providing a brainstorming sheet (DOC 25KB) and letting students put down their points.
- Sharing a discussion rubric (DOC 53KB) for explaining expectations during discussions.
- Discussing the brainstorming sheet of each group.

Conclude the discussion and have students note down the points in their books.

**Gauge students’ needs (1 period)**

Make students sit in the same groups. Orient students that their project is based on global warming and greenhouse effect. Assign the role of environmentalists. Encourage a large group discussion about the topic by asking students to share their thoughts on global warming and greenhouse effect. Put forward some questions such as:

1. What is global warming?
2. Why is it called as a global phenomenon?
3. Can you share some changes that we see around us due to global warming?

Provide a K-W-L chart (DOC 25KB) and have each group fill in K & W columns. Check the K-W-L charts of each group.

**Conduct Research (3 periods)**

Provide time for students to explore the basics of greenhouse effect by conducting Internet research. Lay down the rules for the use of Internet and online resources including online etiquette, language, laws and requirements for documentation. Orient students about the rules and research checklist (DOC 41.5KB). Put forward the research questions for the session:

- What is a greenhouse?
- What is greenhouse effect?
- What are greenhouse gases?
- What is global warming?
- What are the causes of global warming?

Provide time for students to conduct research. Recommend the following Web sites for an animated explanation of greenhouse effect and global warming.
Ask students to summarise their research findings in the research log (DOC 35.5KB). Remind students to follow the research checklist (DOC 41.5KB) and adjust their research process accordingly.

**Introduce class wiki (3 periods)**

Orient students that they would be using a wiki in the project. Explain wiki and its features by providing a handout what is wiki? (DOC 30KB). Provide a demonstration of different features of the class wiki*. Share the wiki guidelines (DOC 389KB) and arrange for students to do hands on activities for at least 2 periods.

Ask students to add their research findings on the class wiki*. Orient students to check the work of other groups on wiki pages. Instruct students to use the query corner in the class wiki to ask any question. Assign each group the role of query corner editor for one week. Share the wiki rubric (DOC 36KB).

**Science Lab Experiment (3 periods)**

Provide the group of students with Greenhouse Gases...Rising Gases or Poisons? Lab sheet (DOC 62KB) and make students conduct an experiment to find out Does excess of greenhouse gases cause any harm to plants?

Provide 5 large gas jars with one-holed lids, 5 delivery tubes, experimental setup to prepare carbon dioxide, water vapour, carbon monoxide, nitrogen dioxide and methane [separately], 5 watered plant saplings, 5 stop watches, video camera for each group. Instruct students to read through and follow the procedure provided in the lab sheet. Closely monitor each group and provide assistance wherever required.

Ensure that students fill in their observations in the lab sheet using the images recorded on the video camera. They will need to note accurately, the state of each plant at regular time intervals.

Ask students to record their learnings in the after lab (DOC 36KB) worksheet. Monitor students and provide help when needed. Ask students to add the results of their experiment on the class wiki*. Orient students to check the work of other groups on wiki pages.

**Blog (3 periods)**

Introduce blog - Orient students that they would be using a blog in the project. Explain what a blog is and its features by providing a handout what is a blog? (DOC 40.5KB). Provide a demonstration of the different features of a blog.

Provide blog guidelines (DOC 404KB) and arrange for students to do hands on activities for at least 2 sessions.

Give an opportunity to discuss about “Are we progressing irresponsibly?” in small groups. Have students go through their research notes. Have students post their views on Are we responsible for global warming? on the class blog*. Share and explain the blog checklist (DOC 44.5KB). Provide time for students to conduct Internet research, if needed. Instruct students to go through each other’s blog entries and post comments.

**Awareness Survey & Analysis (4 periods)**

Have students conduct an awareness survey of their parents and neighbours with the survey handout (DOC 32.5KB) either in hard copy or via e-mail.
Ask students to add their survey results on the class wiki*. Then, ask students to analyse their findings using a graph or pie-chart.

**Video conference (2 periods)**

Give an opportunity to discuss, *What can we do to stop global warming?* in small groups. Have students go through their research notes.

Arrange a videoconference to discuss the Unit question, *What can we do to stop global warming?* with an expert. Orient students on how to conduct videoconferencing, how to record dialogues and how to pose questions when speaking with experts online. Instruct each group to share their survey and analysis with an expert *[pre-decided by the teacher at a mutually convenient time]* via videoconferencing.

Orient students to check the work of other groups on wiki pages.

**Blog (1 period)**

Have students share their thoughts *What can we do to stop global warming?* on the class blog*. Provide time for students to conduct Internet research, if needed. Instruct students to go through each other's blog entries and post comments.

**Awareness Campaign (2 periods)**

Ask students to arrange an awareness campaign in the school and share their learning with parents, students of other classes, teachers etc. using posters (DOC 127KB) or flyers. Provide time for students to make posters or flyers. Distribute the publication scoring guide (DOC 38.5KB) and discuss the same with students. Have students self – assess using the publication scoring guide and make changes. Send invitations for the awareness campaign. Ask students to divide responsibilities within the group.

**Project reflection on the blog (1 period)**

Culminate the project by asking students to reflect on the entire project and post their entry on the blog about the overall experience of the project. Have students fill in the L column of the K-W-L chart and share the same on the blog. Encourage students to go through the blog entries of other students and comment on them.

**Prerequisite Skills**

**Conceptual Knowledge**

- Basic knowledge of photosynthesis, pollution, gases such as CO2 and water vapour.

**Technical Knowledge**

- Knowledge of Internet research.

**Differentiated Instruction**

**Resource Student**

- Provide help for interpretation of information during research.
- Provide extra time for research, lab work and online activities.
- Allow suitable graphic organisers during lab work and research to minimise writing.
- Provide assistance to ensure transaction of thoughts to presentation.
**Gifted Student**

- Extended research, including presenting findings in a 250 word essay.
- Create a 3-D graph/chart to summarise findings from the lab investigation.

**Credits**

This Unit Plan is adopted from the project idea implemented by Ms. Sinduja Sridhar, Inventurer Academy, Bangalore.

*Note: The hyperlinked support documents are not part of the PDF. They can be downloaded and printed individually.*
Designing Effective Projects: Beat the Heat

Assessment Plan

Assessment Plan

Assessment Timeline

Before project work begins

Students work on projects and complete tasks

After project work is completed

- K-W-L Chart
- Brainstorming
- Discussion Rubric
- Questioning
- Research Log
- Research Checklist
- Class Wiki
- Wiki Rubric
- Lab Sheet
- After Lab Worksheet
- Blog Checklist
- Blog Entries
- Questioning
- Observation
- Discussion Rubric
- Poster/Flyer Checklist
- Blog Entries
- Discussion Rubric
- Class Wiki
- Questioning
- K-W-L Chart

Assessment Summary

The assessments will be a mix of student self-assessment and teacher-based feedback. Use questioning, discussions and observation throughout the unit to assess students' understanding of the Curriculum-Framing Questions as well as other important questions about the greenhouse effect and global warming. The K-W-L and questioning is used to gauge students' needs. Discussion rubric is used throughout the project for the discussion process. The brainstorming sheet is used to check whether the students are thinking with a wider perspective. The research log and research checklist is used to guide students during research. Class wiki is used to monitor students' progress during the entire project. The query corner of the class wiki is used to check for understanding of concepts. The lab sheet and after lab worksheet help students during lab work. As students post their entries for debate and share their thoughts, ask them to use the blog checklist to guide their work. Use the publication scoring guide to guide students while making flyers or posters. Have students note their learnings of the project using a K-W-L chart.
Designing Effective Projects: Beat the Heat

Content Standards and Objectives

Targeted State Frameworks/Content Standards/Benchmarks
The aims are set out below and describe the educational purposes of a course in Chemistry for the IGCSE examination.

1. Provide through well-designed studies of experimental and practical science a worthwhile educational experience for all students, whether or not they go on to study science beyond this level and, in particular, to enable them to acquire sufficient understanding and knowledge to

- Become confident citizens in a technological world, able to take or develop an informed interest in matters of scientific import
- Recognise the usefulness, and limitations, of scientific method and appreciate its applicability in other disciplines and in everyday life

2. Develop abilities and skills that:

- Encourage efficient and safe practice
- Encourage effective communication

3. Develop attitudes relevant to Chemistry such as:

- Concern for accuracy and precision
- Objectivity
- Enquiry
- Initiative
- Inventiveness

4. Stimulate interest in, and care for, the environment.

5. Promote awareness that:

- Scientific theories and methods have developed, and continue to do so, as a result of cooperative activities of groups and individuals
- The applications of science may be both beneficial and detrimental to the individual, the community and the environment

Student Objectives/ Learning Outcomes
Students will be able to:

- Know about greenhouse effect and global warming
- Understand the harmful consequences and implications of greenhouse effect
- Apply their findings and learning on greenhouse effect and global warming
- Analyse the reasons for environmental degradation as caused by greenhouse effect
- Suggest strategies to reduce global warming
- Evaluate the existing global scenario with regard to greenhouse effect and global warming
- Debate whether global warming is a real threat
• Create awareness about the hazards of global warming
Designing Effective Projects: Beat the Heat

Resources

**Materials and Resources**

**Printed Materials**
- Lab manuals
- Reference books based on Science concepts

**Supplies**
- 5 large gas jars with one-holed lids
- 5 delivery tubes
- Experimental setup to prepare carbon dioxide, water vapour, carbon monoxide, nitrogen dioxide and methane [separately]
- 5 watered plant saplings
- 5 stop watches

**Internet Resources**
- [http://earthguide.ucsd.edu/earthguide/diagrams/greenhouse/](http://earthguide.ucsd.edu/earthguide/diagrams/greenhouse/)

**Other Resources**

**Technology – Hardware**
- Computers
- Digital Camera
- Internet Connection
- Printer
- Projection System
- Video Camera
- Video Conferencing Equipment

**Technology – Software**
- Database/Spreadsheet
- E-mail Software
- Encyclopedia CD
- Image Processing
- Internet Web browser
- Multimedia
- Web Page Development