teri school of advanced studies

Google Earth Education

LESSON TITLE GREEN CHEMISTRY

TIME 50[minutes]

OVERVIEW [One sentence describing how teachers will use Google Earth to add engaging, real world connections to an inquiry based lesson.
The Google voyager tool will be used in this lesson, to engage the students' attention and open new vistas of their vision.

SUBJECT/TOPIC **SCIENCE/ ENVIRONMENTAL CHEMISTRY**	**AGE LEVEL 14-15years**
LEARNING OBJECTIVES: • Students identify the topic "Green Chemistry" • Students will research and identify the design of chemical products and processes that reduce or eliminate the use and/or the generation of hazardous substances. • Students will participate in collaborative discussions Green chemistry is a proactive approach to pollution prevention that teaches chemists how to develop products and materials in a manner that does not use hazardous substances, thus avoiding much waste, hazards and associated costs. • To introduce students to the 12 Principles of Green Chemistry and how they relate to a chemical process. • Students will apply their learnings in the form of an educational campaign informing the public of the rblem and actions they can take to solve it.	 1. **Inquiry** What is our responsibility as a human being to protect our environment ?

MAT ERIALS NEEDED:

• Access to Google Earth.
• Student copies of the http://blossoms.mit.edu/videos/lessons/introducing_green_chemistry_scien...

• Student internet access

Lesson Summary

- Engage: To locate principles to provide a framework for scientists, engineers and chemistry students to use when designing new materials, products, processes, and systems.
- Explore: To gather information on The Principles that focus on sustainable design criteria that have proven to be the source of innovative solutions to a wide range of problems.
- Explain: To identify changes to be able to think critically about a process and how it might be improved.
- Revise: Through this lesson, students will also use weight and measurement to understand the concept of a recipe as it is applied to a chemical process and think critically about that process and how it might be improved.
- Apply: Students will be asked to use a wasteful, inefficient procedure to make glue and be challenged to improve the procedure-during which they will unknowingly use the 12 principles.

Sustainable Development Goals [One or more Sustainable Development Goals addressed in this lesson.]

Culminating Task/Assessment

Students will be asked to use a wasteful, inefficient procedure to make glue and be challenged to improve the procedure-during which they will unknowingly use the 12 principles.

Textbook Chapter

Ch 14: ENVIRONMENTAL CHEMISTRY, Class 11, NCERT.

Engage (5 minutes)

1. Students should have been introduced to the periodic table and properties of matter..
2. Introduce the essential question that will guide the inquiry investigation ie what is our responsibility as a human being to protect our environment.

Explore (25 minutes)

1. Teachers introduce the first source of information using an Earth story or *Voyager Story*. https://earth.google.com/earth/rpc/cc/drive?state=%7B%22ids%22%3A%5B%221V8lBIJOkN8JKIZUHzzHVVvAsl86thTt1%22%5D%2C%22action%22%3A%22open%22%2C%22userId%22%3A%221061955784425311163 29%22%7D&usp=sharing
2. Students record observations or evidence as it relates to the inquiry.
3. Students identify relationships or patterns and form a hypothesis based on information gained.

Explain (20 minutes)

1. Teachers organize students into small groups or partners.
2. Students share first "hypothesis" with small group or a partnerie Water pollution
3. Teachers facilitate whole group discussion in which students share their hypotheses and evidence ie BOD, pathogens,organic wastes,chemical pollutants.
4. Students test hypotheses and record findings. Students need to visit local water sources and observe if the river/lake/pond/tank are polluted /slightly polluted/moderately polluted/unpolluted by checking the pH of the water.

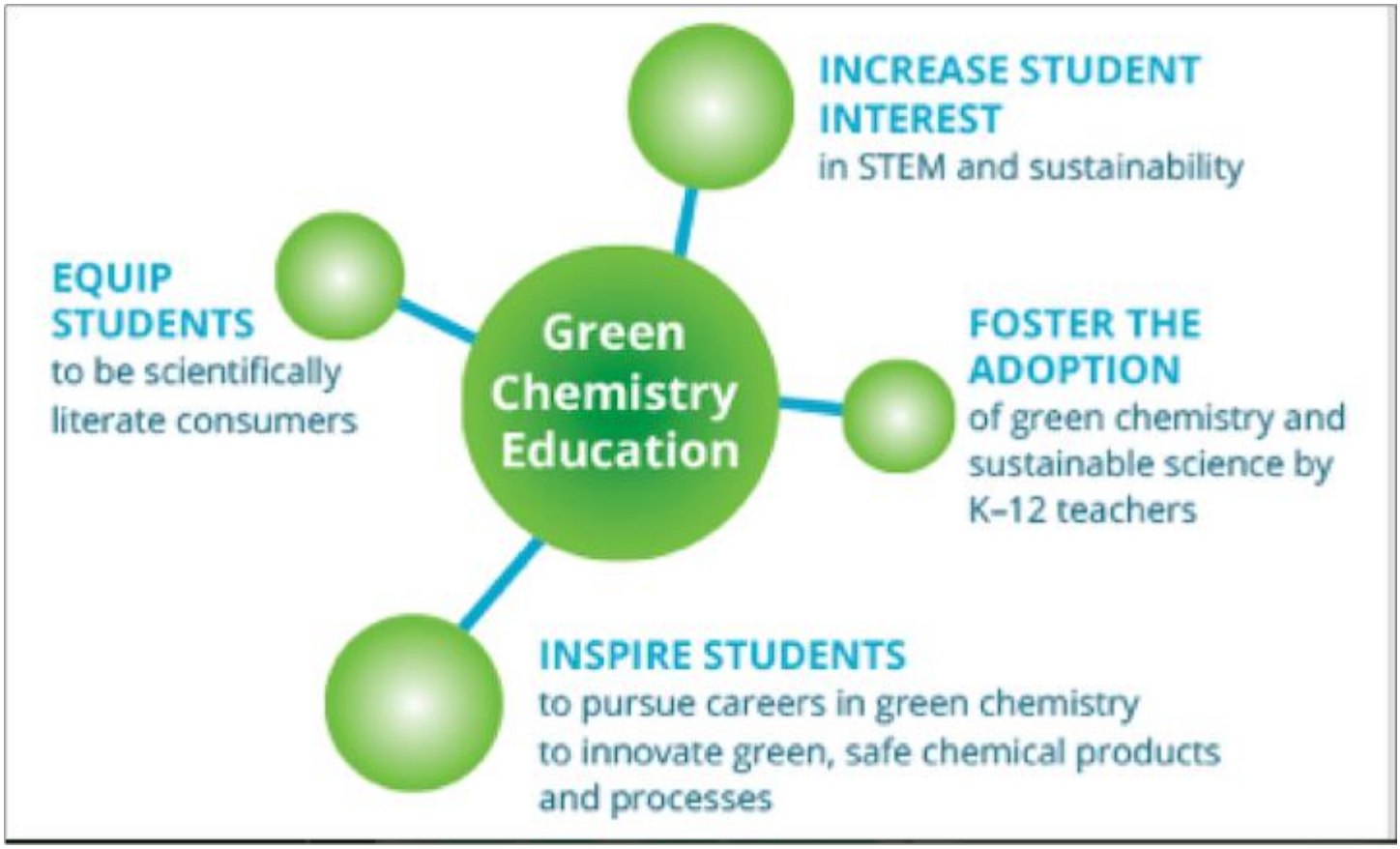
Revise (10 minutes)

1. Students will make adjustments to their hypothesis based on information gained in discussion or test findings and inform the pollution control office to measure pollution levels.

Next, repeat the process with a second source of information.

Explore (25 minutes)

1 Teachers introduce the second source of information, green chemistry in day to day lives.



2 Students will be introduced to synthesis of chemicals, bleaching of paper and dry cleaning of clothes and how these affect the environment.
3. Students record observations or evidence as it relates to the inquiry which is, what is our responsibility as a human being to protect our environment.
4. Students identify relationships or patterns and form a hypothesis based on information gained.

Explain (20 minutes)

1. Teachers organize students into small groups or partners.
2. Students share first "hypothesis" with small group or a partner.
3. Teachers facilitate whole group discussion in which students share their hypotheses and evidence.
4. Students test hypotheses and record findings

Revise (10 minutes)

1. Students will make adjustments to their hypothesis based on information gained in discussion or test findings.

(Option to repeat this process with additional sources of information, each time resulting in an updated hypothesis.)

Apply (80 minutes)

1. Students reflect on outcomes and communicate findings.
2. Students use findings to draw conclusions and generate a solution to a problem. Eg use a cloth bag and avoid using plastic or always set up a compost bin in your garden or ensure all newspapers , glass, aluminium and other items in the vicinity can be recycled

Evaluate: Exemplar Response and/or Rubric

- Conduct a case study on a garden for which compost producing bin has been developed. Discuss the process in the light of bad odour, flies and recycling of wastes for a good produce. Assessment to be done as per the rubric below:

Treatment	Observation 1	Observation 2	Observation 3	Deduction

Additional Resources

Links to texts or websites that relate to the topic and/or lesson.

WRITING THE PRINCIPLES: ORIGINAL PROCEDURE (WORD FORMAT) *328 KB*

WRITING THE PRINCIPLES: LAB PROCEDURE (PDF FORMAT) *326 KB*

THE 12 PRINCIPLES OF GREEN CHEMISTRY HAND-OUT (PDF FORMAT) *501.3 KB*

This Beyond Benign site provides infomation on Green Chemistry curriculum and teacher training.

Options for Differentiation

- Possible modifications, adaptations or extension activities specific to this lesson: Create a padlet on " environment protection begins with us"

Credits

Written by ANJALI KAKAR and designed by SUKHDEEP KAUR
The additional resources links are by courtesy the Royal society of Chemistry.