Climate Change Lesson 8 - Greenhouse Gas

Objectives

- Students will understand the source of greenhouse gas (GHG) emissions understand the difference between natural and enhanced GHG
- Students will understand the direct correlation to greenhouse gas emissions and the rise in earth's temperature
- Students will understand that the arctic is melting twice as fast as the rest of the world, causing land and sea ice to melt and currents to change
- Students will know the direct and indirect effects of a rise in temperature on people, the planet and animals

Vocabulary

- Atmosphere
- Climate trends
- Greenhouse Gas Emissions
- Land Ice/Sheet Ice
- Ozone
- Rising Sea Level
- Sea ice

Materials

Classroom computer with Internet or smartboard, materials for game:

- 28 game board playing pieces, representing spaces
- Tokens (see copy pages), three types (e.g., colour or shape), approximately 50 per type (150 total) to represent greenhouse gases
- Bags to hold tokens, one per team*
- Blackboard, ip chart, or other large surface to record greenhouse gases and create key for token type; alternatively, card size key for each team*
- Clipboards, weights and/or tape to hold down game board playing spaces
- 4-8 large dice: one per team* OR one shared between two teams
- Optional: square cardboard boxes to make dice

Warm up

Discussion Questions:

- What is a Greenhouse?
- What does it feel like to be inside a greenhouse?
- How does a gardener control the temperature inside a greenhouse?



Explain how the atmosphere acts as a gardener to control the earth's temperature through GHG. Introduce the 3 main GHG:

Table: Movement of Main Greenhouse Gases		
Greenhouse Gas	Released into atmosphere by	Removed from atmosphere by
Carbon Dioxide (CO ₂)	Human Activity: burning and production of fossil fuels, clearing of land using fire (combustion) Natural Activity: Volcanic activity, forest fires, respiration by organisms, decomposition	Human Activity: less CO2 is removed by natural activity because of deforestation, degrading of soils, and wetland destruction Natural Activity: Plants and algae (photosynthesis); oceans (go into solution)
Methane (CH ₄)	Human Activity: Digestive processes of grazing domestic animals, decomposition (anaerobic or without air) in solid waste landfills, fossil fuel production Natural Activity: Decomposition in swamp and wetland areas, melting of permafrost, digestive process of grazing animals	Human Activity: Burning as a source of energy, forms carbon dioxide (CO2) and water (H2O) Natural Activity: chemical reactions in the upper atmosphere, soil, ocean sediments
Nitrous Oxide (NO ₂)	Human Activity: Agriculture, especially the use of synthetic nitrogen fertilizers and raising of cows, pigs and chickens; burning of fossil fuels; creation of synthetic nitrogen based fabric (e.g., nylon) Natural Activity: Emitted by bacteria in soils and oceans	Natural Activity: Bacteria (especially nitrogen fixing bacteria)

Lesson: Greenhouse Gas emission game

https://hctfeducation.ca/wp-content/uploads/2014/09/GreenhouseGasGame_Lesson.pdf

Assignment

Have students break into three groups: carbon dioxide, methane, and nitrous oxide.

- 1) Each group should prepare the human and natural causes of their greenhouse gas, with metrics on each.
- 2) Have students propose solutions for the local (classroom, school, community) and global (local government, national government, international groups, international companies, etc.) levels.
- 3) Have student prepare an action plan for the classroom to mitigate the greenhouse gas.



Wrap Up

Have students present to the class. For an additional challenge, have each group track the classroom activities and outcomes based on the proposed solutions.

Resources

Basic Information: https://www.youtube.com/watch?v=sTvqlijqvTg http://www.explainthatstuff.com/globalwarmingforkids.html https://earthobservatory.nasa.gov/Features/WorldOfChange/decadaltemp.php http://www.ipcc.ch/publications_and_data/ar4/syr/en/spms2.html

