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TEACHERS AND RESEARCHERS EXPLORING AND COLLABORATING

Understanding the Greenhouse Effect

Overview

Attached is a resource for lessons and simulations that involve studying the Greenhouse Effect and how it affects temperature readings on our planet. The simulations created by PHET are incredible. https://phet.colorado.edu/ Aside from the Greenhouse Effect simulation in this lesson, this site has a large variety of resources for any grade levels to be used as lessons, labs, or classroom demonstrations.

Objectives

Each lesson plan is slightly different as far as their objectives, but overall the students will be able to understand how the Greenhouse Effect works, make correlations between based on data collection since the last ice age, and how humans have made an impact on greenhouse gas concentrations over time. The simulations offer students the ability to change climate variables and see what type of changes happen due to those changes.

Lesson Preparation

This simulation can be used as an introduction to studying the greenhouse effect or to reinforce what was learned in the classroom about climate change. If taught as a reinforcement activity the students should know about the different levels of our Earth's atmosphere. Including where the ozone layer is located. Understanding how heat is transferred by the process of radiation through space and absorbed by our planet.

Details

- Lesson
- Arctic
- About 1 period
- Download, Share, and Remix
- All Ages

Materials

Classroom computers
Worksheet based on the age level being taught

Standards

Middle School NGSS (2015)

Topic: Engineering Design (MS-ETS1-2)

Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

Associated PhET Simulation

Procedure

1. Using a computer go to https://phet.colorado.edu/ and register yourself as a teacher to create an account. The simulations are free to use.
2. Once your account is created search for “The greenhouse Effect” under simulations. Click on the “For Teachers” tab and select a lesson that would work in your time frame and appropriate grade level.
3. Once a lesson is chosen download the required worksheets and give it a try. Most of the documents are in Microsoft word format and can easily be manipulated to the needs of your classroom.
4. Reserve the computer lab for your classroom and watch your students have fun with these simulations as they drive greenhouse gas concentrations and climate change.

Resources

University of Colorado PHET Simulations
https://phet.colorado.edu/

Assessment

Depending on which lesson you choose for your classroom will determine how the students are to be evaluated. There are labs and lessons that could be used at the beginning of your unit or as a final assessment on what they learned. Some rubrics are included with the lessons listed under the Teacher tab.

Author / Credits:

All lessons come from various authors that upload lessons to use on The University of Colorado PHET Simulations
https://phet.colorado.edu/

The Greenhouse Effect (Java)

Portions of PE Addressed by Simulation

Use the simulation to investigate the effects of possible solutions to the problem of human impact on global temperatures.

Topic: Earth and Human Activity (MS-ESS3-3)

Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

Associated PhET Simulation

The Greenhouse Effect

Portions of PE Addressed by Simulation

Use the simulation to investigate the effects of possible solutions to the problem of human impact on the environment.

Topic: Earth and Human Activity (MS-ESS3-5)

Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

Associated PhET Simulation

The Greenhouse Effect

Portions of PE Addressed by Simulation

Investigate the factors that contribute to global temperatures to rise.

National Science Education Standards

Content Standards, Grades K-4

Content Standard A: Science As Inquiry

a. Abilities necessary to do scientific inquiry
b. Understandings about scientific inquiry

Content Standard D: Earth and Space Science

a. Properties of earth materials
b. Objects in the sky
c. Changes in earth and sky

Content Standard E: Science and Technology

a. Abilities of technological design
b. Understandings about science and technology
c. Abilities to distinguish between natural objects and objects made by humans

Content Standard F: Science In Personal and Social Perspectives

a. Changes in environments
b. Science and technology in local challenges

Content Standard G: History and Nature of Science

a. Science as a human endeavor

Content Standards, Grades 5-8

Content Standard A: Science As Inquiry

a. Abilities necessary to do scientific inquiry
b. Understandings about scientific inquiry

Content Standard D: Earth and Space Science

a. Structure of the earth system
b. Earth's history

Content Standard E: Science and Technology

a. Abilities of technological design
b. Understandings about science and technology

Content Standard F: Science In Personal and Social Perspectives

a. Personal health
b. Populations, resources, and environments
c. Natural hazards
d. Risks and benefits
e. Science and technology in society

Content Standard G: History and Nature of Science

a. Science as a human endeavor
b. Nature of science
c. History of science

Content Standards, Grades 9-12

Content Standard A: Science As Inquiry

a. Abilities necessary to do scientific inquiry
b. Understandings about scientific inquiry

Content Standard D: Earth ad Space Science

a. Energy in the earth system
b. Geochemical cycles
c. Origin and evolution of the earth system
d. Origin and evolution of the universe

Content Standard E: Science and Technology

a. Abilities of technological design
b. Understandings about science and technology

Content Standard F: Science In Personal and Social Perspectives

a. Personal and community health
b. Population growth
c. Natural resources
d. Environmental quality
e. Natural and human-induced hazards
f. Science and technology in local, national, and global challenges

Content Standard G: History and Nature of Science

a. Science as a human endeavor
b. Nature of scientific knowledge
c. Historical Perspective