Lesson 2: Climate Models

Supplemental Material

Introduction:

This document will help you adapt **Lesson 2: Climate Models** for different age groups, time spans, and educational settings. It will also point to additional resources and strategies for helping students find their footing with this challenging lesson.

Different Approaches

2D Modelling

As mentioned in the main lesson, there are two approaches to teaching this lesson. The optional approach has students create 2D models based on their identification of the components a climate model should include and connecting them in a way similar to a water cycle diagram.

See this approach in Lesson 2 Lower Grade Levels.

Alternative Data Analysis Approach

Jennifer Broo used a similar approach to David's in her classroom which can be done in a single class period.

- Jennifer divided her students into groups and gave them copies of Temperature 1880-1995 graph (included in the supplemental folder).
- Students were told that they were going to try to predict the trend from 1995-present. The most accurate group would receive a prize (candy).
- Students were asked to use a marker and add their prediction to the Temperature 1880-1995 graph. Next she told her students that she had more data to give them.
- She then passed out the Volcano, CO_2, Solar and SOI graphs one at a time (included in the supplemental folder). Each time the group was asked to choose a new colored marker and modify their prediction based on the new data (they also had the option not to change their prediction).
- She then passed out the Temperature 1880-2017 graphs and had students evaluate their predictions.
- After determining the winning teams she led a discussion on how complex climate is and how difficult it was to make sense of all the data.

Different Age Groups

Younger Age Groups

The easiest way to adapt this lesson for younger age groups is to simplify the number of components used in creating climate models. The main lesson focuses on using a variety of variables to produce more and more accurate climate models through time. This ensures that students will gain understanding of how these models have been developed, and how they incorporate new scientific methods and findings. Advanced math or unfamiliar scientific concepts (eg. geochemistry) are not required for basic understanding of the construction of climate models, and can be omitted for lower grade levels.

See this approach in Lesson 2 Lower Grade Levels.

More Advanced Groups

The best way to adapt this lesson for more advanced students who have understanding of a greater scope within the physical sciences is to focus on the various lines of evidence that are used to construct climate models. For example, add-on activities could focus on more in-depth carbon cycle dynamics (sources and sinks), or on how stable isotopes are used to track environmental processes through time.

https://www.hhmi.org/biointeractive/geologic-carbon-cycle

Additionally, more time could be spent explaining the IPCC Assessment Reports and mitigation scenarios.

https://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_All_Topics.pdf

Different Time Spans

The lesson presented in the webinar is intended to take **2-3 50 minutes class periods**. The version of the lesson provided for lower grades is designed to take **50 minutes** to complete. Alternate version of the lesson developed by NCSE Ambassador Teacher are also available in the shared folder. We encourage you to explore each version of the lesson for the one that suits your needs the best.

Here is the link to the shared folder:

https://drive.google.com/drive/folders/1IxVIkAXkO7p07U8ijeE-dEc7P7nGJMlN

Different Educational Settings

This lesson is intended for classroom applications, but it could also be done in informal science settings. The lesson could be used as an after school or summer camp activity, for instance, without modification.

Unlike lesson 1, this lesson states the misconception at the beginning and then leads students through the activity that helps them see the value of models. The students then return to the misconception at the end by focusing on the misconception. The lesson could also be flipped by starting with the FLICC component and then using the data analysis to support the debunking of the misconception.

If you are interested in discussing additional ways to use this lesson in informal settings, contact Brad Hoge at hoge@ncse.com

Additional Resources

Lessons in the shared folder also include additional resources such as links and worksheets that can be used with both the data analysis and FLICC portions of this lesson.

NCSE Ambassador Teacher David Amidon provides a more involved dataset in which the students use excel to construct climate trends themselves.

NCSE Ambassador Teacher Jennifer Broo provides another short clip depicting the alignment of model predictions and observations (https://www.youtube.com/watch?v=tPSIvu0gQ90&feature=youtu.be).

NCSE Ambassador Teacher Nina Corley includes a Kahoot for Engagement and links to Galveston area specific reference datasets.