

Climate Engineering Teaching Module

Lesson 5: Culminating Event

Grade Level: 6-12

Estimated Time for Activity: 90 minutes

Learning Outcomes and NGSS

	Content Knowledge	Skills
Expected Learning outcome	<p>Students will prepare a presentation that highlights their climate engineering designs as well as the risks and limitations of deploying their technology in the real world</p> <p>Students will give their presentations to an audience consisting of climate scientists, engineering, stakeholders, and/or policymakers</p>	<p>Students will practice their skills of presenting and communicating to the public and professionals about their project.</p> <p>Students will practice their skills of giving and receiving feedback from the audience.</p>
NGSS	<p>MS-ETS1-1 Engineering Design. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.</p> <p>MS-ESS3-4 Earth and Human Activity. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.</p> <p>MS-ETS1-2 Engineering Design. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.</p> <p>HS-ETS1-3 Engineering Design. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.</p> <p>HS-ESS3-2 Earth and Human Activity. Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.</p>	

Materials:

Climate Engineering Blueprints, previous lessons' designs, worksheets, and knowledge.

Key Terms:

Climate engineering, collaborative design thinking, project presentation, science communication

Background:

In this culminating event, students will present their climate engineering design to an audience consisting of climate scientists, engineers, stakeholders, and/or policymakers. Engineers and scientists give presentations of their work to a wide variety of audiences. This task challenges the students to take their work outside of the classroom, to communicate their designs to a new audience, and to gather feedback from new sources.

Activity:

Each student should prepare a 5- to 10-minute presentation of their climate engineering design that highlights how the technology works as well as its limitations and risks. The answers to the worksheet from Lesson 3 and the topics discussed during the Model U.N. in Lesson 4 should be used to help create a thorough presentation.

Realistically, if each student presents for more than 5 minutes, the time for this lesson would approach a couple hours. Therefore, it may be beneficial to have each group select one or two designs to be presented to the audience. This would create about 5-10 presentations for a classroom. Each group member could be tasked with presenting a different part of the design or present on the limitations and risks of the design and climate engineering. A potential template of the presentation for a group of five students:

Student 1: Presents the blueprint, features, size, materials, and costs.

Student 2: Describes how the technology will function to slow global warming and/or climate change.

Student 3: Explains the limitations of the design. Is it a regional or global solution to warming and climate change? Is it a long- or short-term solution?

Student 4: Depicts who (persons or nations) benefits and acknowledges possible unintended consequences and risks.

Student 5: Describes how this technology should be deployed. By whom? When? Who pays?

Each group should spend about 30 minutes preparing their presentation. A PowerPoint presentation template is available at the Module's website. A class period (about 50 minutes) should be dedicated to presenting their designs discussing what they have learned about climate change and climate engineering to scientists, engineers, or decision makers.

It is important for students to present to professionals outside of the school. The project lead, Paul Goddard (pgoddard@iu.edu) will make an effort to be available for your

students to present their projects to, either by visiting the class, video conferencing, or by sending him videos of the presentations and responding back. Other professionals to consider are local naturalists, extension scientists, city park officials, librarians, city council members, industry leaders, etc (all sorts of professionals do science!). Such presentations push accountability and sources of feedback beyond the walls of the classroom.

In addition or alternatively, students can write letters to decision makers about their climate engineering ideas and what they have learned. This provides a great opportunity to demonstrate to the students the power of letter writing. These letters should also reflect on climate change's impact on their personal lives and why it is important to them that they see appropriate decisions being made by politicians and industry leaders. Amanda Figolah, Catherine Peterson, and Kirstin Milks (Bloomington High School South) created an assignment to help their students write the letter or create a video to send to Indiana's governor. They graciously shared [their assignment here](#).