Climate Change

Objectives

You will be able to

- **Apply scientific principles to design a method for monitoring and minimizing a particular human impact on the environment.**
- **Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.**

How do we know human activity is influencing climate, and what can we do about it?

Evaluation and Feedback

To evaluate your work, you will:

- **Use the "Asking Questions and Defining Problems" row of the Science and Engineering Practices Rubric.**
- **Use the "Analyzing and Interpreting Data" row of the Science and Engineering Practices Rubric.**
- **Use the "Constructing Explanations and Designing Solutions" row of the Science and Engineering Practices Rubric.**
- **Use the "Engaging in Arguments from Evidence" row of the Science and Engineering Practices Rubric.**
- **Use the Science Content Rubric**
- **Use the Oral Presentation Rubric (one or two aspects as decided by your teacher)**

Group Culminating Project: School Board Presentation

As a group:

Create a presentation to the school board in which you describe:

- **How and why climate change is happening**
- **The effects climate change has on our school, town, or the surrounding area**
- **One way that the school contributes to climate change by producing greenhouse gases**
- **Your plan to reduce the amount of greenhouse gases produced by your school**

Vocabulary

- **climate change**
- **carbon dioxide**
- **greenhouse gases**

Individual Culminating Project

- **Write a draft of your newsletter article, outlining the ways in which you can reduce CO_2.**
- **Get feedback from your teacher and peers.**
- **Finalize your newsletter article.**

Group Culminating Project: School Board Presentation

Stanford LTP Project *DATE*

School Board Meeting

Keeping Us "Just Right"

Request for Presentations

Global climate change poses serious challenges to people, other species, how much food we can grow, and the economy. The more we do today to reduce greenhouse gas emissions, the more we can reduce these effects. The School Board would like the district or school to do their part. We will be holding a special session to hear proposals that provide ideas for reducing the production of greenhouse gases by the school and/or district.

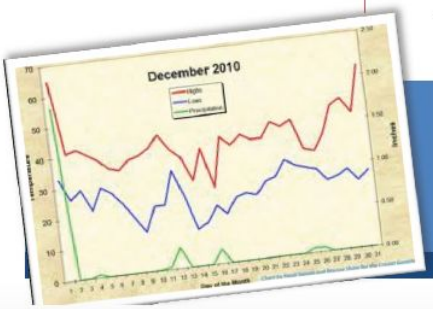
Conference Details

[date]	*Due: Draft proposal*
[date]	*Due: Revised proposal*
[date]	*School/District Board Meeting: Presentation*

Presentations should include:

- *What classroom behaviors or equipment you suggest be changed*
- *What data you collected in the audit that tells you this behavior and/or equipment could and should be changed*
- *How your plan will reduce emissions or reduce the impact of climate change*
- *Specific costs associated with implementing the plan*
- *Challenges of implementing the plan*
- *Other benefits of implementing the plan (such as health, costs, or social)*
- *References you used in researching your plan*

Please note: Our board meetings are always well attended, and you can expect that citizens will have many questions and concerns. Be prepared to respond to them.



As a group, develop a presentation to convince and urge the school board to support your suggested carbon-saving methods, plans, or suggestions.

Your presentation should:

- ❑ **Be between 3 to 4 minutes long**
- ❑ **Be engaging, interesting, and well-rehearsed**
- ❑ **Include participation by all group members**
- ❑ **Include a graphic to describe your solution (strongly recommended)**

You will prepare and present your presentations as follows:

- ❑ **I: Outline presentation and write scripts**
- ❑ **II: Practice your presentation**
- ❑ **III: Present your proposed solutions**

Use the rubrics to make sure you have met all expectations of the project.

Individual Culminating Project: Newsletter Article

Your plan to reduce CO_2 emissions in your classroom has been approved!

Write a short article (1 page) about your plan to reduce greenhouse gas emissions. Your article will go in the school newsletter to inform the public about your plan.

Include in your article the following:

- ❑ **How and why climate change is happening**
- ❑ **Your plan to reduce classroom CO_2 emissions**
- ❑ **How and why your plan will reduce emissions or reduce the impact of climate change**
- ❑ **The challenges of implementing your plan**

Steps in preparing your newsletter article:

1. **Outline newsletter article.**
2. **Get peer feedback.**
3. **Write draft of newsletter article, incorporating suggestions.**
4. **Get another peer's feedback.**
5. **Write final draft of newsletter article, incorporating feedback.**

Use the rubrics to make sure you have met all expectations of the project.

Individual Project Organizer—Lift-Off Task

Lift-Off Task: What Is Climate Change, and Why Do We Care about It?

- **Use the videos and classroom discussions to identify the problem you are going to address and what areas you still need to explore in order to do so. Describe for the school board what climate change is, why it is a problem, and what questions you still need to explore to get to a good solution. Write using complete sentences.**

Individual Project Organizer—Task 1

Task 1: The Effects of Carbon Dioxide on Climate

1. Explain to the school board why the climate in your area has generally been "just right" in temperature—not too hot and not too cold. Use a diagram to aid in your explanation.
2. Describe the evidence that CO_2 is a greenhouse gas.

Individual Project Organizer—Task 2

Task 2: What Is Causing Climate Change, and How Do We Know?

1. Explain to the school board what is causing climate change.
2. Provide evidence and reasoning to support your claim.

Individual Project Organizer—Task 3

Task 3: The Effects of Climate Change on Humans and the Environment

1. **Explain the impacts of climate change so the school board can better understand how urgent and important this issue is. Use evidence from the stations to back up your explanation.**
2. **How are you, the area you live in, or wildlife affected by climate change now?**
3. **How might you be affected by climate change in the future?**

Individual Project Organizer—Task 4

Task 4: What Can We Do?

1. Describe for the school board what changes your school should make to reduce the amount of carbon dioxide that is emitted into the air (mitigation).
2. Explain how these changes will reduce carbon dioxide production.
3. How much will carbon dioxide production be reduced if these changes are made?

Science Content Rubric

Assess Using Individual Culminating Project Script

SCIENCE CONTENT RUBRIC				
THE STUDENT DEMONSTRATES THEIR SCIENTIFIC KNOWLEDGE OF THE FOLLOWING CONTENT STANDARD	EMERGING	DEVELOPING	PROFICIENT	ADVANCED
Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. (MS-ESS3-5)	The concept is modeled, used, explained, interpreted, argued OR otherwise applied incompletely, inappropriately, and/or incorrectly.	The concept is modeled, used, explained, interpreted, argued OR otherwise applied correctly but incompletely.	The concept is modeled, used, explained, interpreted, argued OR otherwise applied correctly and completely.	The concept is modeled, used, explained, interpreted, argued OR otherwise applied completely and correctly AND synthesizes or makes connections across multiple contexts.
Human activities have altered the biosphere, sometimes damaging it, although changes to environments can have different impact for different living things. Activities and technologies can be engineered to reduce people's impacts on the Earth. (MS-ESS3-3)	The concept is modeled, used, explained, interpreted, argued OR otherwise applied incompletely, inappropriately, and/or incorrectly.	The concept is modeled, used, explained, interpreted, argued OR otherwise applied correctly but incompletely.	The concept is modeled, used, explained, interpreted, argued OR otherwise applied correctly and completely.	The concept is modeled, used, explained, interpreted, argued OR otherwise applied completely and correctly AND synthesizes or makes connections across multiple contexts.
Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). (MS-ESS3-5)	The concept is modeled, used, explained, interpreted, argued OR otherwise applied incompletely, inappropriately, and/or incorrectly.	The concept is modeled, used, explained, interpreted, argued OR otherwise applied correctly but incompletely.	The concept is modeled, used, explained, interpreted, argued OR otherwise applied correctly and completely.	The concept is modeled, used, explained, interpreted, argued OR otherwise applied completely and correctly AND synthesizes or makes connections across multiple contexts.

Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities. (MS-ESS3-5)	**The concept is modeled, used, explained, interpreted, argued OR otherwise applied incompletely, inappropriately, and/or incorrectly.**	**The concept is modeled, used, explained, interpreted, argued OR otherwise applied correctly but incompletely.**	**The concept is modeled, used, explained, interpreted, argued OR otherwise applied correctly and completely.**	**The concept is modeled, used, explained, interpreted, argued OR otherwise applied completely and correctly AND synthesizes or makes connections across multiple contexts.**

Science and Engineering Practices Rubric

The Climate Change unit will be assessed using the highlighted rows.

SCIENCE AND ENGINEERING PRACTICES RUBRIC				
SCORING DOMAIN	**EMERGING**	**DEVELOPING**	**PROFICIENT**	**ADVANCED**
ASKING QUESTIONS AND DEFINING PROBLEMS	**Asks general questions that cannot be investigated.**	**Asks specific questions that can be investigated but do not require empirical evidence.**	**Asks questions that require empirical evidence to answer.**	**Asks questions that require empirical evidence to answer and evaluates the testability of the questions.**
❑ **No Evidence***	Writes a problem or design statement but it does not match the intent of the problem or the need of the client.	Writes a problem or design statement that matches the intent of the problem or the need of the client with minor errors.	Writes a problem or design statement that accurately matches the intent of the problem or the needs of the client.	Writes a problem or design statement that accurately and completely matches the intent of the problem or the need of the client.
DEVELOPING AND USING MODELS	Makes models (drawings, diagrams, or other) with major errors.	Makes models (drawings, diagrams, or other) to represent the process or system to be investigated with minor errors.	Makes accurate and labeled models (drawings, diagrams, or other) to represent the process or system to be investigated.	Makes accurate and labeled models (drawings, diagrams, or other) to represent the process or system to be investigated and explains the model.
❑ **No Evidence***	Explains the limitations of the model with major errors.	Explains the limitations of the model with minor errors.	Explains the limitations of the model as a representation of the system or process.	Explains the limitations of the model as a representation of the system or process and discusses how the model might be improved.
PLANNING INVESTIGATIONS	Plans an investigation that will not produce relevant data to answer the empirical question(s).	Plans an investigation that will produce some relevant data to answer the empirical question(s).	Plans an investigation that will produce relevant data to answer the empirical question(s) and identifies the dependent and independent variables when applicable.	Plans an investigation that will completely produce relevant and adequate amounts of data to answer the empirical question(s) and identifies the dependent and independent variables when applicable.
❑ **No Evidence***	Plans a design that does not match the criteria, constraints, and intent of the problem.	Plans a design and writes an explanation that partially matches the criteria, constraints, and intent of the problem.	Plans a design and writes an explanation that accurately and adequately matches the criteria, constraints, and intent of the problem.	Plans a design and writes a detailed explanation that accurately and completely matches the criteria, constraints, and intent of the problem.
CARRYING OUT INVESTIGATIONS	Writes procedures that lack detail so the procedures cannot be duplicated by another person.	Writes procedures with enough detail that another person can duplicate (replicable) but does not conduct a sufficient number of trials.	Writes detailed replicable procedures with descriptions of the measurements, tools, or instruments and conducts adequate number of trials.	Writes detailed replicable procedures with descriptions of the measurements, tools, or instruments and conducts adequate number of trials with an explanation for the proposed data collection.
❑ **No Evidence***				

*** If there is no student response then check the No Evidence box.**

The Climate Change unit will be assessed using the highlighted rows.

SCIENCE AND ENGINEERING PRACTICES RUBRIC				
SCORING DOMAIN	**EMERGING**	**DEVELOPING**	**PROFICIENT**	**ADVANCED**
ANALYZING AND INTERPRETING DATA *"Accurately labeled" means inclusion of title, column titles, description of units, proper intervals.* ❑ No Evidence*	Makes spreadsheets, data tables, charts, or graphs that are not accurately labeled or do not display all the data. **Uses inappropriate methods or makes major errors analyzing the data.**	Makes accurate and labeled spreadsheets, data tables, charts, or graphs to summarize and display data but does not arrange the data to examine the relationships between variables. **Uses appropriate methods but makes minor errors analyzing the data.**	Makes accurate and labeled spreadsheets, data tables, charts, and/or graphs to summarize and display data and arranges the data to examine relationships between variables. **Uses appropriate methods to accurately and carefully identify patterns or explains possible error or limitations of analyzing the data.**	Makes accurate and labeled spreadsheets, data tables, charts, and/or graphs and uses more than one of these methods to summarize and display data; arranges the data to examine relationships between variables. **Uses appropriate methods to accurately and carefully identify patterns and explains possible error or limitations of analyzing the data.**
CONSTRUCTING EXPLANATIONS AND DESIGNING SOLUTIONS ❑ No Evidence*	**Constructs an explanation that includes an inappropriate claim, inaccurate evidence, and/or unclear reasoning.** **Uses no data to evaluate how well the design answers the problem and the redesign of the original model or prototype is inappropriate or incomplete.**	**Constructs or evaluates an explanation consisting of minimal claim(s), limited sources of accurate evidence, and/or minimal reasoning.** **Uses minimal data to evaluate how well the design answers the problem and describes an appropriate redesign of the original model or prototype with minor errors.**	**Constructs or evaluates an explanation that includes a claim, multiple sources of accurate evidence, and reasoning using accurate and adequate scientific ideas or principles.** **Uses adequate data to evaluate how well the design answers the problem and accurately explains an appropriate redesign of the original model or prototype.**	**Constructs, evaluates, or revises an explanation that includes a claim, multiple sources of accurate evidence, and reasoning using accurate and adequate scientific ideas or principles.** **Uses adequate data to evaluate how well the design answers the problem and accurately provides a detailed rationale for the appropriate redesign of the original model or prototype.**
ENGAGING IN ARGUMENTS FROM EVIDENCE ❑ No Evidence*	**Constructs an argument that includes an inappropriate claim, inaccurate evidence, and/or unclear reasoning.**	**Constructs or evaluates an argument consisting of minimal claim(s), limited sources of evidence, or minimal reasoning.**	**Constructs and/or evaluates an argument consisting of appropriate claim(s), multiple sources of evidence, and reasoning using accurate and adequate scientific ideas or principles.**	**Constructs, evaluates, or revises an argument consisting of appropriate claim(s), multiple sources of evidence, and reasoning using accurate and adequate scientific ideas or principles.**
OBTAINING, EVALUATING, AND COMMUNICATING INFORMATION ❑ No Evidence*	**Communicates information that is inaccurate and/or inconsistent with the evidence.**	**Communicates accurate but minimal information consistent with the evidence but does not explain the implications or limitations of the investigation or design.**	**Communicates accurate, clear, and adequate information consistent with the evidence and explains the implications and/or limitations of the investigation or design.**	**Communicates accurate, clear, and complete information consistent with the evidence and provides a rationale for the implications and limitations of the investigation or design.**

*** If there is no student response then check the No Evidence box.**

Oral Presentation Rubric

ORAL PRESENTATION RUBRIC							
SCORING DOMAIN	**EMERGING**	**E/D**	**DEVELOPING**	**D/P**	**PROFICIENT**	**P/A**	**ADVANCED**
CLARITY *What is the evidence that the student can present a clear perspective and line of reasoning?*	**Presents an unclear perspective** **Line of reasoning is absent, unclear, or difficult to follow**	❑	**Presents a general perspective** **Line of reasoning can be followed**	❑	**Presents a clear perspective** **Line of reasoning is clear and easy to follow** **Addresses alternative or opposing perspectives when appropriate**	❑	**Presents a clear and original perspective** **Line of reasoning is clear and convincing** **Addresses alternative or opposing perspectives in a way that sharpens one's own perspective**
EVIDENCE *What is the evidence that the student can present a perspective with supportive evidence*?	**Draws on facts, experience, or research in a minimal way** **Demonstrates limited understanding of the topic**	❑	**Draws on facts, experience, and/or research inconsistently** **Demonstrates an incomplete or uneven understanding of the topic**	❑	**Draws on facts, experiences, and research to support a perspective** **Demonstrates an understanding of the topic**	❑	**Synthesizes facts, experience, and research to support a perspective** **Demonstrate an in-depth understanding of the topic**
ORGANIZATION *What is the evidence that the student can use language appropriately and fluidly to support audience understanding?*	**Lack of organization makes it difficult to follow the presenter's ideas and line of reasoning**	❑	**Inconsistencies in organization and limited use of transitions detract from audience understanding of line of reasoning**	❑	**Organization is appropriate to the purpose, audience, and task and reveals the line of reasoning; transitions guide audience understanding**	❑	**Organization is appropriate to the purpose and audience and supports the line of reasoning; effectively hooks and sustains audience engagement, while providing a convincing conclusion**
LANGUAGE USE *What is the evidence that the student can use language appropriately and fluidly to support audience understanding?*	**Uses language and style that are unsuited to the purpose, audience, and task** **Stumbles over words, interfering with audience understanding**	❑	**Uses language and style that are at times unsuited to the purpose, audience, and task** **Speaking is fluid with minor lapses of awkward or incorrect language use that detracts from audience understanding**	❑	**Uses appropriate language and style that are suited to the purpose, audience, and task** **Speaking is fluid and easy to follow**	❑	**Uses sophisticated and varied language that is suited to the purpose, audience, and task** **Speaking is consistently fluid and easy to follow**

ORAL PRESENTATION RUBRIC							
SCORING DOMAIN	**EMERGING**	**E/D**	**DEVELOPING**	**D/P**	**PROFICIENT**	**P/A**	**ADVANCED**
USE OF DIGITAL MEDIA / VISUAL DISPLAYS *What is the evidence that the student can use digital media/visual displays to engage and support audience understanding?*	**Digital media or visual displays are confusing, extraneous, or distracting**	❑	**Digital media or visual displays are informative and relevant**	❑	**Digital media or visual displays are appealing, informative, and support audience engagement and understanding**	❑	**Digital media or visual displays are polished, informative, and support audience engagement and understanding**
PRESENTATION SKILLS *What is the evidence that the student can control and use appropriate body language and speaking skills to support audience engagement?*	**Makes minimal use of presentation skills: lacks control of body posture; does not make eye contact; voice is unclear and/or inaudible; and pace of presentation is too slow or too rushed** **Presenter's energy and affect are unsuitable for the audience and purpose of the presentation**	❑	**Demonstrates a command of some aspects of presentation skills, including control of body posture and gestures, language fluency, eye contact, clear and audible voice, and appropriate pacing** **Presenter's energy and/or affect are usually appropriate for the audience and purpose of the presentation, with minor lapses**	❑	**Demonstrates a command of presentation skills, including control of body posture and gestures, eye contact, clear and audible voice, and appropriate pacing** **Presenter's energy and affect are appropriate for the audience and support engagement**	❑	**Demonstrates consistent command of presentation skills, including control of body posture and gestures, eye contact, clear and audible voice, and appropriate pacing, in a way that keeps the audience engaged** **Presenter maintains a presence and a captivating energy that is appropriate to the audience and purpose of the presentation**
INTERACTION WITH AUDIENCE *What is the evidence that the student can respond to audience questions effectively?*	**Provides a vague response to questions; demonstrates a minimal command of the facts or understanding of the topic**	❑	**Provides an indirect or partial response to questions; demonstrates a partial command of the facts or understanding of the topic**	❑	**Provides an indirect or partial response to questions; demonstrates a partial command of the facts or understanding of the topic**	❑	**Provides a precise and persuasive response to questions; demonstrates an in-depth understanding of the facts and topic**