Integrating Environmental Education into Pre-Service and In-Service Science Teacher Training

NSTA National Harbor Area Conference
Thursday, November 11th
11:00 AM-11:30 AM

Brian Gordon
IS289: Hudson River Middle School
CUNY Brooklyn College
Environmental Studies Course Padlet
Environmental Studies Course Padlet

Fall 2021 GSCI 2050: Environmental Studies
This padlet will be our digital classroom bulletin board. All announcements, class agendas, updated syllabi, assigned readings, assignments, etc. will be posted here. Please make sure to review this padlet regularly. Readings will be placed on the padlet at least one week ahead of time. Agendas will be placed on the padlet the evening before each class.
1 Sentence Mission Statement
What is the point of my course?
Agenda

- Welcome & Overview
- Connector/Box Breathing
- Integrating Environmental Education into Pre-Service and In-Service Science Teacher Training
  - A Tour of a Course Padlet through Pictures
- Questions, Suggestions, Contact Information
One Sentence Mission Statement

- What is the point of my course?
- Turn & Talk!
Box Breathing

1. Breathe in for 4
2. Hold for 4
3. Breathe out for 4
4. Hold for 4

Start here
Urgent issues such as climate change, food scarcity, malnutrition, and loss of biodiversity are highly complex and contested in both science and society (1). To address them, environmental educators and science educators seek to engage people in what are commonly referred to as sustainability challenges. Regrettably, science education (SE), which focuses primarily on teaching knowledge and skills, and environmental education (EE), which also stresses the incorporation of values and changing behaviors, have become increasingly distant. The relationship between SE and EE has been characterized as “distant, competitive, predator-prey and host-parasite” (2). We examine the potential for a convergence of EE and SE that might engage people in addressing fundamental socioecological challenges.

Since the end of World War II, SE has been driven primarily by a need to develop a sufficient pool of science and engineering talent to accelerate innovation and to remain competitive. EE emerged in the early 1960s out of a need to respond to emergent env...
## Integrating Environmental Education into Pre-Service and In-Service Science Teacher Training

### A Tour of a Course Padlet through Pictures

<table>
<thead>
<tr>
<th>Course Session</th>
<th>Main Student Work Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction</td>
</tr>
<tr>
<td>2 &amp; 3</td>
<td>Environmental History &amp; Ethics</td>
</tr>
<tr>
<td>4 &amp; 5</td>
<td>Biodiversity &amp; Conservation of Biodiversity</td>
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<tr>
<td>6</td>
<td>Agriculture, Food Systems, &amp; Consumption</td>
</tr>
<tr>
<td>7</td>
<td>Population Growth, Production, &amp; Consumption</td>
</tr>
<tr>
<td>8 &amp; 9</td>
<td>Environmental Justice: Systemic Racism &amp; Health Disparities</td>
</tr>
</tbody>
</table>
## Integrating Environmental Education into Pre-Service and In-Service Science Teacher Training: A Tour of a Course Padlet

<table>
<thead>
<tr>
<th>Course Session</th>
<th>Main Student Work Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 &amp; 11 Building an Anti-Racist Science Curriculum &amp; Classroom</td>
<td>Save the Last Word for Me Protocol, Commitments to our Practice</td>
</tr>
<tr>
<td>12 &amp; 13 Climate Change</td>
<td>Podcast Episode</td>
</tr>
<tr>
<td>14 Environmental UbD Unit Planning</td>
<td>Environmental UbD Unit Plan</td>
</tr>
</tbody>
</table>
Session 1
Introduction
Course Learning Outcomes

Environmental Literacy
- Demonstrate an interdisciplinary understanding of local and global environmental issues
- Develop an ethical approach to environmental issues
- Critically evaluate and debate current environmental news
- Understand issues facing the environment from a scientific and social perspective
- Explore how environmental issues affect humans
- Understand how humans shape landscapes for their use and how nature shapes cultures

Environmental Skills
- Clearly communicate information, observations, inferences and conclusions about environmental issues
- Analyze and debate local and global environmental problems
- Justify claims using scientific evidence and logical reasoning
# Course Syllabus

## Assessment

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Weight</th>
<th>Due Date</th>
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<tbody>
<tr>
<td>Attendance &amp; Class Participation</td>
<td>20%</td>
<td>Weekly</td>
</tr>
<tr>
<td>Reading Responses</td>
<td>15%</td>
<td>9/2, 9/9, 9/23, 10/7, 10/14, 11/4,</td>
</tr>
<tr>
<td>Reading Discussion Board</td>
<td>15%</td>
<td>9/2, 9/9, 9/23, 10/7, 10/14, 11/4,</td>
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<tr>
<td>Essential Questions Reflection</td>
<td>10%</td>
<td>8/26, 9/23, 11/11, 12/9</td>
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<tr>
<td>Papers</td>
<td>10%</td>
<td>9/30, 10/7, 10/21 (draft), 10/28 (published)</td>
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<tr>
<td>• Endangered Species Research Summary</td>
<td></td>
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<tr>
<td>• Environmental Justice Case Study Review</td>
<td></td>
<td></td>
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<tr>
<td>Teaching Tools</td>
<td>10%</td>
<td>9/30, 10/7, 10/21 (draft), 10/28 (published)</td>
</tr>
<tr>
<td>• Annotated Food Web Diagram</td>
<td></td>
<td></td>
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<tr>
<td>• Environmental Justice Case Study Infographic</td>
<td></td>
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<tr>
<td>Climate Change Podcast Episode (Focused on teaching content to colleagues)</td>
<td>10%</td>
<td>11/18 (draft), 12/2 (published)</td>
</tr>
<tr>
<td>Environmental UbD Unit Plan (Focused on teaching content to students)</td>
<td>10%</td>
<td>12/9</td>
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</table>
## Essential Project Design Elements Checklist

Whatever form a project takes, it must meet these criteria to be Gold Standard PBL.

<table>
<thead>
<tr>
<th>Does the Project Meet These Criteria?</th>
<th>✓</th>
<th>?</th>
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<tbody>
<tr>
<td><strong>KEY KNOWLEDGE, UNDERSTANDING, AND SUCCESS SKILLS</strong>&lt;br&gt;The project is focused on teaching students key knowledge and understanding derived from standards, and success skills including critical thinking/problem solving, collaboration, and self-management.</td>
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<tr>
<td><strong>CHALLENGING PROBLEM OR QUESTION</strong>&lt;br&gt;The project is based on a meaningful problem to solve or a question to answer, at the appropriate level of challenge for students, which is operationalized by an open-ended, engaging driving question.</td>
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<tr>
<td><strong>SUSTAINED INQUIRY</strong>&lt;br&gt;The project involves an active, in-depth process over time, in which students generate questions, find and use resources, ask further questions, and develop their own answers.</td>
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<tr>
<td><strong>AUTHENTICITY</strong>&lt;br&gt;The project has a real-world context, uses real-world processes, tools, and quality standards; makes a real impact, and/or is connected to students’ own concerns, interests, and identities.</td>
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<td><strong>STUDENT VOICE &amp; CHOICE</strong>&lt;br&gt;The project allows students to make some choices about the products they create, how they work, and how they use their time, guided by the teacher and depending on their age and PBL experience.</td>
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<td><strong>REFLECTION</strong>&lt;br&gt;The project provides opportunities for students to reflect on what and how they are learning, and on the project’s design and implementation.</td>
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<td><strong>CRITIQUE &amp; REVISION</strong>&lt;br&gt;The project includes processes for students to give and receive feedback on their work, in order to revise their ideas and products or conduct further inquiry.</td>
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<tr>
<td><strong>PUBLIC PRODUCT</strong>&lt;br&gt;The project requires students to demonstrate what they learn by creating a product that is presented or offered to people beyond the classroom.</td>
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For more PBL resources, visit bie.org ©2015 BUCK INSTITUTE FOR EDUCATION
## NGSS Connections

### LS: Life Science
- LS1: From Molecules to Organisms: Structures and Processes
- LS2: Ecosystems: Interactions, Energy, and Dynamics
- LS3: Heredity: Inheritance and Variation of Traits
- LS4: Biological Evolution: Unity and Diversity

### ESS: Earth and Space Science
- ESS1: Earth’s Place in the Universe
- ESS2: Earth’s Systems
- ESS3: Earth and Human Activity

### PS: Physical Science
- PS1: Matter and Its Interactions
- PS2: Motion and Stability: Forces and Interactions
- PS3: Energy
- PS4: Waves and Their Applications in Technologies for Information Transfer

### ETS: Engineering, Technology and the Application of Science
- ETS1: Engineering Design
NGSS Connections

Science and Engineering Practices

Asking Questions and Defining Problems
A practice of science is to ask and refine questions that lead to descriptions and explanations of how the natural and designed world works and which can be empirically tested.

Developing and Using Models
A practice of both science and engineering is to use and construct models as helpful tools for representing ideas and explanations. These tools include diagrams, drawings, physical replicas, mathematical representations, analogies, and computer simulations.

Planning and Carrying Out Investigations
Scientists and engineers plan and carry out investigations in the field or laboratory, working collaboratively as well as individually. Their investigations are systematic and require clarifying what counts as data and identifying variables or parameters.

Analyzing and Interpreting Data
Scientific investigations produce data that must be analyzed in order to derive meaning. Because data patterns and trends are not always obvious, scientists use a range of tools—including tabulation, graphical interpretation, visualization, and statistical analysis—to identify the significant features and patterns in the data. Scientists identify sources of error in the investigations and calculate the degree of certainty in the results. Modern technology makes the collection of large data sets much easier, providing secondary sources for analysis.

Using Mathematics and Computational Thinking
In both science and engineering, mathematics and computation are fundamental tools for representing physical variables and their relationships. They are used for a range of tasks such as constructing simulations; statistically analyzing data; and recognizing, expressing, and applying quantitative relationships.

Constructing Explanations and Designing Solutions
The products of science are explanations and the products of engineering are solutions.

Engaging in Argument from Evidence
Argumentation is the process by which explanations and solutions are reached.

Obtaining, Evaluating, and Communicating Information
Scientists and engineers must be able to communicate clearly and persuasively the ideas and methods they generate. Critiquing and communicating ideas individually and in groups is a critical professional activity.
NGSS Connections

### Crosscutting Concepts

<table>
<thead>
<tr>
<th>1. Patterns</th>
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<tr>
<td>Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.</td>
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<tr>
<th>2. Cause and Effect</th>
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<tr>
<td>Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.</td>
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<thead>
<tr>
<th>3. Scale, Proportion, and Quantity</th>
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<tr>
<td>In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.</td>
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<thead>
<tr>
<th>4. Systems and System Models</th>
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<tr>
<td>A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.</td>
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<th>5. Energy and Matter</th>
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<tr>
<td>Tracking energy and matter flows, into, out of, and within systems helps one understand their system's behavior.</td>
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<th>6. Structure and Function</th>
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<td>The way an object is shaped or structured determines many of its properties and functions.</td>
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<th>7. Stability and Change</th>
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<tbody>
<tr>
<td>For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.</td>
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</tbody>
</table>
Guidelines for Excellence

K-12 Environmental Education

For educators, administrators, policy makers, and the public
Questioning, Analysis, and Interpretation Skills
Environmental literacy depends on learners’ ability to ask questions, speculate, and hypothesize about the world around them, seek information, and develop answers to their questions. Learners must be familiar with inquiry; master fundamental skills for gathering and organizing information; and interpret and synthesize information to develop and communicate explanations.
STRAND 2

Environmental Processes and Systems

Environmental literacy is dependent on an understanding of the processes and systems that comprise the environment, including human social systems and influences. Students develop an understanding of how changes in one system (hydrosphere, atmosphere, geosphere, and biosphere) results in changes in another. They develop an understanding of how human activities affect environmental quality and long-term sustainability at local, tribal, national, and global levels. These understandings are based on knowledge synthesized from across traditional disciplines. The guidelines in this section are grouped in three sub-categories:
Skills for Understanding and Addressing

Skills and knowledge are refined and applied in the context of environmental issues at varying scales. Environmental literacy includes the abilities to define, learn about, evaluate, and act on environmental issues. Students investigate environmental issues; consider evidence and differing viewpoints; and evaluate proposed action plans, including likely effectiveness in specific environmental, cultural, social, and economic contexts. They analyze the intended and unintended consequences of their own actions and actions taken by other individuals and groups, including implications for long-term environmental, social, and economic sustainability. In this section, the guidelines are grouped in two sub-categories:
STRAND 4

Personal and Civic Responsibility

Environmentally literate community members are willing and able to act on their own conclusions about what should be done to ensure environmental quality, social equity, and economic prosperity. As learners develop and apply concept-based learning and skills for inquiry, analysis, and action, they also understand that what they do individually and in groups can make a difference.
Essential Questions

Fall 2021 GSCI 2050: Essential Questions Reflection (8/26/21)
Reflect on the essential questions at the beginning of the semester and track how your thinking about environmental studies shifts and grows based on your research, work, and discussions.

Essential Question #1: How are humans reliant upon the natural environment?

Anna Tsavaa
Humans are reliant upon the natural environment for natural resources such as water, food, gas, solar power and oxygen. We rely on the natural environment for survival. The sun, soil, products of the environment and other elements fuel our daily lives.

Essential Question #2: What positive and negative impacts do humans have on the natural environment?

Racquel Nurse- Humans are part of the ecosystem and the food chain. Without humans, the environment would be overrun with certain creatures that might be negatively impactful to the environment. But humans take a lot from the environment and cause pollution to the earth so that is one-way humans negatively impact the

Essential Question #3: What obligations do humans have to the natural environment currently and for future generations?

Jianing Lin
Obligations now is to maintain the environment, to not further harm it. For future, is continue to preserve and maintain the earth and find ways to make earth a better place.

Essential Question #4: How does systemic racism and the built environment affect human health?

Racquel Nurse- Systemic racism affects human health because generally speaking people of color are usually placed in the filthiest part of the community. The air quality is bad, the food is bad and the maintenance of that community is not kept. Therefore, health is usually a big issue for people of color when compared to their

Essential Question #5: How can we promote environmental justice for all individuals and communities?

Racquel Nurse- Just like education, all people deserve to have an equitable environment to live in. We should all be provided a safe and clean community to live in. Water, food, and air should be of high quality regardless of income because these are natural resources meant for everyone.
Essential Questions

- How are humans reliant upon the natural environment?
- What positive and negative impacts do humans have on the natural environment?
- What obligations do humans have to the natural environment currently and for future generations?
- How does systemic racism and the built environment affect human health?
- How can we promote environmental justice for all individuals and communities?

<table>
<thead>
<tr>
<th>Essential Questions Reflection Checklist</th>
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<tbody>
<tr>
<td>Communicate</td>
</tr>
<tr>
<td>I obtain, evaluate, and communicate environmental studies information in my essential questions reflection.</td>
</tr>
<tr>
<td>I write clearly and coherently in order to communicate environmental studies information from my research, assignments, and/or discussions in my essential questions reflection.</td>
</tr>
<tr>
<td>I synthesize environmental studies research, assignments, and/or discussions in order to develop big ideas and claims in my essential questions reflection.</td>
</tr>
<tr>
<td>Interpret</td>
</tr>
<tr>
<td>I infer, analyze, and develop ideas based on evidence</td>
</tr>
<tr>
<td>I support my big ideas or claims using appropriate, accurate, and sufficient evidence from my research, assignments, and/or discussions when responding to the essential questions.</td>
</tr>
<tr>
<td>I include scientific ideas in my essential questions reflection to explain why my evidence supports my claims.</td>
</tr>
<tr>
<td>I demonstrate in my writing how my thinking and understanding of the essential questions has changed and grown throughout the semester based on my research, assignments, and/or discussions.</td>
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Session 2
Environmental History & Ethics
Aldo Leopold

What is one big idea to remember from *A Sand County Almanac*?

- We are responsible for what we do to our nature.
- Our relationship with the environment is important.
- One little wrongdoing of a man has a ripple effect on mother nature.
- Everything is connected—removing one thing for the convenience of people will likely mess with everything.
- There is an interconnected relationship between humans and the ecosystem, all things work together. The removal of one thing can lead to a collapse.
- Species are interdependent and it is important to protect all living organisms for a proper functioning ecosystem.
- Take care of our environment.
- Don’t harm animals, it can mean lot to nature.
- One big idea is that nature needs to be respected and that it is important to maintain the relationships that nature has within itself and not change it to whatever humans desire.
- We as humans think what we’re doing is always right but if something is naturally done a certain way then we shouldn’t mess with it.
- Take care of all creatures.
- Appreciate the presence of nature.
- Treat the natural world with respect and love.
- Humans can’t survive only leaving other creatures.

We need to respect nature and think about different perspectives.

Do not mess with the natural order of the ecosystem.
What is one big idea to remember from Silent Spring?

1) We need to reduce the pollution.

- We should come up with better and safer alternatives to chemicals that disturb nature.
- Bringing awareness that pesticides are harmful to the environment. We need to do a better job of being eco-friendly with our surroundings.
- Killing is not a way to problem solving.

- The easiest solution is not always the best one. Spraying poison on bugs is easier than making them infertile, but worse in the long run for the world.
- Take care of the environment, be as eco-friendly as possible.
- Chemicals not only kill insects; it also brings disease to us through food or air. We can use chemicals that aren’t harmful to our nature and for us. Scientists are researching and found many other ways to prevent the

- Pesticides were harming the environment
- “Man can hardly even recognize the devils of his own creation”
- It allows readers to be aware of nature
- What we put out into the world will eventually come back to us.

- We are killing ourselves while trying to kill others.
- Find better ways to protect crops and animals

- Humans should not be polluting areas to support our needs, that we need to figure out a way to help ourselves without affecting nature.
Fall 2021 GSCI 2050: Environmental History & Ethics Reading Discussion Board (due 9/2/21)

Racquel's Initial Response (A Sand Almanac)

Well, from the perspective of the mountain, the wolf is the protector of the mountain. Unlike the deer and the humans, the mountain understood what the wolf's howl meant, and the deer took it as a warning, maybe to keep away from the mountain. The wolf protected the mountain from being overrun by deer that took plenty of the mountain's natural resources and depleted it. The wolf kept the balance of the mountain by just existing.

Racquel Nurse Initial response

Silent Spring

The following quotes come from Ch. 1 A Fable for Tomorrow:

"THERE WAS ONCE a town in the heart of America where all life seemed to live in harmony with its surroundings. The town lay in the midst of a checkerboard of prosperous farms, with fields of grain and hillsides of orchards where, in spring, white clouds of bloom drifted above the green fields."

and

"Then a strange blight crept over the area and everything began to..."
Environmentalism in Film
A Life on Our Planet: Implicit & Explicit Main Ideas

The Lorax Read Aloud
Mini-Lesson: Implicit and Explicit Main Ideas
What ideas are being told to us explicitly and which are being stated implicitly by Dr. Seuss?

Implicit Main Ideas
- Fight to protect nature, not destroy.
- Capitalism bad
- Protect the nature as a whole
- Nature is important
- Once-er represents human
- Once-er is not thinking about the nature and is harming the animals
- Deforestation/Lack of Resources

Explicit Main Ideas
- The Lorax speaks for the trees
- Once-er is greedy
- Trees are important for nature
- Once-er is the greedy business man
- Natural splendor good
- Greed

The Once-ler didn't listen to the Lorax. He was cutting down the trees and then he ruined the environment.

Stop overconsumption.

Be responsible for nature.

Stop destroying nature.

Be responsible.
Environmentalism in Film
A Life on Our Planet: Two-Column Notes

Key Ideas
Implicit
Humans need to be more careful about how their actions might affect the world we live in.
Biodiversity is dying.

Explicit
reconstruct the living world
population increase is leading to a decrease in wildlife
humans are affecting the environment and are not fully aware yet
without any human involvement, the ecosystem is healthy.
Human errors led to a catastrophe.

Response to Key Ideas
(Question, Interpretation, Connection)
“It is called natural history.”
How can we get humans to be more careful with their actions so it doesn’t harm nature?
How can we learn from our mistakes and prevent it in the future?

How do we stop what’s happening?
How can we protect wildlife?
Session 3
Environmental History & Ethics
Environmentalism in Film
A Life on Our Planet: Unpacking Subtopics

A Life on Our Planet
What subtopics within the field of environmental studies are discussed in the documentary?

- Stop killing the whale and bring awareness to the other people
- Sustainable living
- Sustainability
- Deforestation
- Extinction of certain species
- That for our human needs we destroying Forests all around the world
- Cutting trees because they are essential for life
- We have finite resources so we should look for sustainable ways to live
- Overpopulation
- Cutting down trees is unsustainable for the rain forest
- Cutting of trees and nature
- Take care of all animals, don’t let humans live alone.
- Animals are becoming extinct
- Killing the wild animals and cutting down the tree are harmful to our planet.
- Some animals are disappearing
- Using up all our natural resources
- Endangered species
- Capitalism and nature
- Stop cutting down trees
- Overpopulation
John Muir

What is one big idea to remember from The Hetch Hetchy Valley?

- People don't value nature and will go to destroy it for their own benefit.
- Water belongs to all the creatures not just human.
- Commercialism kills nature.
- Protect the beauty of nature.
- We have to be mindful of all species and not be selfish and think about ourselves only.
- Greedy businessmen even acting like philanthropists.
- Park can be serve as valuable ecosystem.
- Hetch-Hetchy is god's best gift.
- Preserve nature.
- Protect nature.
- Bring awareness to the environment destruction.
- The natural environment is worth preserving for its own sake. It doesn't need to contribute in a measurable dollars and cents way to have value.
- The Hetch Hetchy Valley was a rare site that should've been protected.
- Sed experience shows that there are people good enough and bad enough for anything according to Muir.
Personal Environmental Relationship Stories

**Personal Environmental Relationship Story**
What would you like to share about your relationship with the environment?

- **I feel very connected to nature and understand how important it is to show the earth some love.**
  - I have been made to camp a lot of times. I do not like camping. From a distance, I have found myself able to appreciate the idea of the beauty of nature after stubbornly trying not to for years.

- **The relationship with the environment depends on where you live. It's easier to appreciate nature when you're not much development.**
  - My relationship with nature is that as you get older, you don't go out as much as you used to as a kid. We will stay home, work, or just stay indoors more.

- **I want to make my connection stronger with nature.**
  - It's important to cultivate a good relationship with our natural environment.

- **I care about the Earth and its well-being. I believe everyone should be responsible and united to make a big resolution for “healing” the world because we are all “inmates” of the Earth.**

- **I want to be able to do more for our environment.**

- **I feel that I’m very disconnected from nature.**

- **Feel mysterious about the natural world.**

- **Take a balance between bad and good sides in the earth.**

- **Most of the time I am unable to understand the natural world and how its components are related. Still, I try to know it.**

- **I feel connected to nature whenever I get the chance to travel and explore. However, I will also like to learn more about the environment and expand my knowledge.**
Personal Environmental Relationship Stories

Kanta Nath

Yue Gao

Xin Yu Lu

Xiao Tong Deng

Racquel Nurse
Sessions 4 & 5
Biodiversity & Conservation of Biodiversity
Endangered Species Research Project
LIVES OF THE STARS

Stars are the universe's hottest real estate. These scorching balls of gas burn by joining atoms—tiny particles of matter—inside their cores. This is called nuclear fusion, and it creates incredible light and heat. That energy also fights gravity, so the star doesn't collapse.

Eventually, the star's fuel gets used up. As the star dies, it changes.

1. NEBULA
   Stars are born in giant clouds of gas. Gravity pulls the gases into a ball that gets hotter and hotter.

2. MEDIUM-SIZED STAR (LIKE OUR SUN)
   When the ball gets hot enough, hydrogen atoms begin to fuse (join). This action keeps the star going for billions of years.

3. RED GIANT
   The star uses up its hydrogen fuel. Gravity pushes the star's core. The outer layers expand and cool, creating a giant red star. The biggest stars with this hotred cores are red supergiants.

4. GIANT OR SUPERGIANT STAR
   A bigger star burns through its hydrogen fuel faster. It gets hot, it's blue.

5. BLACK HOLE
   If the star is big enough, the leftover particles collapse into an area of space called a black hole. Gravity is so strong in black holes, even light can't escape.

6. SUPERNOVA
   The red supergiant runs out of fuel. It collapses and explodes in an instant. This massive explosion can be as bright as 4 billion suns! The star's matter shoots into space. It ends up in nebulae that will form new stars and planets.

7. MEDIUM-SIZED STAR (LIKE OUR SUN)
   Leftover particles fly into an incredibly dense ball. It's a tiny fraction of the size of Earth, but its mass could be three times our sun's.
Analyzing Mentor Annotated Diagrams

What are the different parts of an annotated diagram?

- Small breakdowns of bigger ideas
- Breakdown of the big ideas and concepts
- able to use pictures to connect with the subject
- visualization with important summary
- One main idea was selected, then it is broken down into small parts to make it clear and understandable.
- pull out important details and information
- usually has sequential numbers, pictures, and information

What makes these mentor annotated diagrams strong and effective?

- Small parts with the definition
- there are lots of images and arrows to help understand
- visually appealing to children, will make them excited to read and learn
- short ideas to remember
- visual aids
- visual aids such as pictures and arrows
- Easy for visual learners to comprehend the heavy information. It breaks it down for them.
- easy to follow and has important
- words that are in big fonts can catch students attention
- Some students can understand and remember things easier by sight. They are more likely to learn by seeing pictures.
- some students are visual learners, it is best to show them images
- They contain short explanations that are easy to read and understand
Co-Constructing an Annotated Diagram Checklist

Co-Constructing an Annotated Food Web Diagram Checklist as a Group
What criteria do we agree on as a group to include in an annotated food web diagram?

**Design**
- Picture relating to a specific concept...food webs
- Arrows for sequencing

**Annotations**
- Headings & Subheadings
- Summary
- Numbering & Labels

**Enhancements**
- Use of Color
  - Color-Coding
## Annotated Food Web Diagram Checklist

<table>
<thead>
<tr>
<th>Annotated Diagram Parts</th>
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<th>Starting To</th>
<th>Not Yet</th>
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### ESS3: Earth and Human Activity

#### ESS3.C: Human Impacts on Earth Systems

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<tbody>
<tr>
<td>Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things.</td>
<td>Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth’s resources and environments.</td>
<td>Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth’s environments can have different impacts (negative and positive) for different living things.</td>
<td>The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources. Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation.</td>
</tr>
</tbody>
</table>
# Endangered Species Research Summary & NGSS

## Obtaining, Evaluating, and Communicating Information

Scientists and engineers must be able to communicate clearly and persuasively the ideas and methods they generate. Critiquing and communicating ideas individually and in groups is a critical professional activity.

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<th>High School (9-12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obtaining, evaluating, and communicating information in K-2 builds on prior experiences and uses observations and texts to communicate new information.</td>
<td>Obtaining, evaluating, and communicating information in 3–6 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods.</td>
<td>Obtaining, evaluating, and communicating information in 6–8 builds on K–5 experiences and progresses to evaluating the merit and validity of ideas and methods.</td>
<td>Obtaining, evaluating, and communicating information in 9–12 builds on K–8 experiences and progresses to evaluating the validity and reliability of the claims, methods, and designs.</td>
</tr>
</tbody>
</table>

1. Read grade-appropriate texts and/or use media to obtain scientific and/or technical information.
2. Obtain and combine information from books and other reliable media to explain phenomena or solutions to a design problem.
3. Communicate scientific and/or technical information orally and/or in written formats, including various forms of media and may include tables, diagrams, and charts.
4. Evaluate data, hypotheses, and/or conclusions in scientific and technical texts in light of competing information or accounts.
5. Communicate scientific and/or technical information (e.g., about a proposed object, tool, process, or system) in writing and/or through oral presentations.
6. Evaluate the validity and reliability of and/or synthesize multiple claims, methods, and/or designs that appear in scientific and technical texts or media reports, verifying the data when possible.
7. Communicate scientific and/or technical information or ideas (e.g., models, designs, procedures, processes, or systems) to general audiences.
Endangered Species Research Summary & NGSS

2. Cause and Effect

Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.

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</tr>
</thead>
<tbody>
<tr>
<td>Simple tests can be designed to gather evidence to support or refute student ideas about causes.</td>
<td>Cause and effect relationships are routinely identified, tested, and used to explain change.</td>
<td>Cause and effect relationships may be used to predict phenomena in natural or designed systems.</td>
<td>Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.</td>
</tr>
<tr>
<td>Events have causes that generate observable patterns.</td>
<td>Events that occur together with regularity might or might not be a cause and effect relationship.</td>
<td>Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.</td>
<td>Systems can be designed to cause a desired effect.</td>
</tr>
<tr>
<td>Cause and effect relationships can be classified as causal or correlational, and correlation does not necessarily imply causation.</td>
<td></td>
<td>Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation.</td>
<td>Cause and effect relationships can be suggested and predicted for complex natural and human designed systems by examining what is known about smaller scale mechanisms within the system.</td>
</tr>
<tr>
<td>Changes in systems may have various causes that may not have equal effects.</td>
<td></td>
<td></td>
<td>Changes in systems may have various causes that may not have equal effects.</td>
</tr>
</tbody>
</table>

7. Stability and Change

Below is the progression of the Crosscutting Concept of Stability and Change, followed by Performance Expectations that make use of this Crosscutting Concept.

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<tbody>
<tr>
<td>Things may change slowly or rapidly over time and may occur simultaneously.</td>
<td>Systems may change slowly or rapidly over time.</td>
<td>Systems may change slowly or rapidly over time.</td>
<td>Systems may change slowly or rapidly over time.</td>
</tr>
<tr>
<td>Systems appear stable, but over long periods of time will eventually change.</td>
<td>Some systems may change slowly or rapidly over time.</td>
<td>Some systems may change slowly or rapidly over time.</td>
<td>Some systems may change slowly or rapidly over time.</td>
</tr>
<tr>
<td>Stability may be determined by factors such as feedback mechanisms, internal relationships, and external factors.</td>
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<tr>
<td>Systems can be designed for greater or lesser stability.</td>
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</tr>
<tr>
<td>Feedback loops can stabilize or destabilize a system.</td>
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<tr>
<td>Change and rates of change can be described in models that vary over very long periods of time. Some extreme changes are irreversible.</td>
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## LS2: Ecosystems: Interactions, Energy, and Dynamics

### LS2.B: Cycles of Matter and Energy Transfer in Ecosystems

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<tr>
<td>1. Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment.</td>
<td>2. Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem.</td>
<td>3. Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes.</td>
<td>4. Plants or algae form the lowest level of the food web. At each link upward in a food web, only a small fraction of the matter consumed at the lower level is transferred upward, to produce growth and release energy in cellular respiration at the higher level. Given this inefficiency, there are generally fewer organisms at higher levels of a food web. Some matter reacts to release energy for life functions, some matter is stored in newly made structures, and much is discarded. The chemical elements that make up the molecules of organisms pass through food webs and into and out of the atmosphere.</td>
</tr>
</tbody>
</table>
Developing and Using Models

A practice of both science and engineering is to use and construct models as helpful tools for representing ideas and explanations. These tools include diagrams, drawings, physical replicas, mathematical representations, analogies, and computer simulations.

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<tr>
<td>Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.</td>
<td>Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.</td>
<td>Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.</td>
<td>Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed world(s).</td>
</tr>
<tr>
<td>1. Identify limitations of models.</td>
<td>1. Collaboratively develop and/or revise a model based on evidence that shows the relationships among variables for frequent and regular occurring events.</td>
<td>1. Evaluate limitations of a model for a proposed object or tool.</td>
<td>1. Evaluate merits and limitations of two different models of the same proposed tool, process, mechanism, or system in order to select or revise a model that best fits the evidence or design criteria.</td>
</tr>
<tr>
<td>1. Develop a model using an analogy, example, or abstract representation to describe a scientific principle or design solution.</td>
<td>1. Develop a model to describe and/or predict phenomena.</td>
<td>1. Develop or modify a model—based on evidence—to match what happens if a variable or component of a system is changed.</td>
<td>1. Design a test of a model to ascertain its reliability.</td>
</tr>
<tr>
<td>1. Develop and/or use models to describe and/or predict phenomena.</td>
<td>1. Develop a diagram or simple physical prototype to convey a proposed object, tool, or process.</td>
<td>1. Develop and/or revise a model to show the relationships among variables, including those that are not observable but predict observable phenomena.</td>
<td>1. Develop, revise, and/or use a model based on evidence to illustrate and/or predict the relationships between systems or between components of a system.</td>
</tr>
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<td>1. Use a model to test cause and effect relationships or interactions.</td>
<td>1. Develop and/or use models to describe phenomena.</td>
<td>1. Develop and/or use a model to predict and/or describe phenomena.</td>
<td>1. Develop and/or use multiple types of models to provide mechanistic accounts and/or predict phenomena, and move flexibly between model</td>
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### 4. Systems and System Models

A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.

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<td>Systems in the natural and designed world have parts that work together.</td>
<td>A system can be described in terms of its components and their interactions.</td>
<td>Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy and matter flows within systems.</td>
<td>When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models.</td>
</tr>
<tr>
<td>Objects and organisms can be described in terms of their parts.</td>
<td>A system is a group of related parts that make up a whole and can carry out functions its individual parts cannot.</td>
<td>Systems may interact with other systems; they may have subsystems and be a part of larger complex systems.</td>
<td>Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales.</td>
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<tr>
<td></td>
<td></td>
<td>Models are limited in that they only represent certain aspects of the system under study.</td>
<td>Models can be used to predict the behavior of a system, but these...</td>
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Endangered Species Research Project

Giving and Receiving Feedback

Feedback Prompts

**Warm feedback** highlights and recognizes the strengths of the work

- This is quality work because...
- Your thinking shows...
- One thing you really did well was...
- When explaining you...
- Your thinking shows...
- I like the way you...
- You have no problem at all with...
- I noticed that you...
- I was impressed by...
- I can tell you worked hard on...
- Your work shows...

**Cool feedback** poses ideas that prompt the creator of the work to think about the content from a different perspective

- I appreciate ____ the next step might be ...
- I noticed ____ but I wonder....
- One thing to improve on...
- You might need more...
- You might need less...
- Your next steps might be...
- One suggestion I have is....
- One point that was not clear to me was...
- Another way to do it might be...
- What if you said it like this...
- What could you do to improve your____?
- Have you thought about____?
- Did you consider____?
- I think you could add...
- Don’t forget to....
Endangered Species Research Project

Giving and Receiving Feedback

Endangered Species Annotated Food Web Diagram Checklist

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Endangered Species Research Project
Giving and Receiving Feedback
Giving and Receiving Feedback

Warm Feedback

I can tell you worked hard on the visuals, good use of color and images.

I liked the different colors you used in your diagram.

Very detail!

I like the way you organized your food web. It is very neat.

I like the way you used arrows and color-coding to demonstrate your understanding of the food web.

I like the way you included drawings to help your reader associate what it is you're talking about.

One thing you really did well was to use arrows to depict the process and the relationships between the species that dwell in the same environment.

Your thinking shows you put a lot of effort into this assignment. Your food web is very organized and detailed. I love the colors you used. It is very easy to follow.

Cool Feedback

Did you consider scanning the book you drew it on to make it more easily maintainable?

One suggestion I have is transferring the annotated food diagram onto white paper to make it more organized.

One suggestion I have is possibly showing the animals hunting habits/strategies.

Your next step might be to go into greater depth on what these arrows represent.

One suggestion that I have might be drawing the diagrams on construction paper

It will be perfect to add a more colorful pituca.

One suggestion I have for you is maybe trying to use a design app, such as canva. It will make your food web look even more impressive!
Revising & Publishing
Annotated Diagram Food Web

What is one revision you need to make to your work based on self-assessment and peer review?

**Self-Assessment Revision**
- I need to add the producer (the sun) to my food web - Yue
- I need to change the orientation to my arrows
- I need to add captions to my arrows for clarification
- I need to incorporate the sun at the top of the food web
- I have the picture of the sun but I need to add details - xin yu lu
- I should make it look less basic
- I need to include the specific relationship between the predator and the prey - GuoQing

**Peer Review Revision**
- The food web is colorful, show everything connects, and it is informational - Xiao Tong Deng
- Need to add decomposers into my food web - Yue
- I think you put the subject in the center and clearly showed how the rest of the ecosystem would fall apart without it
- I need to fix my arrows - xin yu lu
Endangered Species Research Project
Endangered Species Research Project
Endangered Species
Annotated Food Web Diagram

The Bluefin Tuna

The Bluefin Tuna is an enormous saltwater fish that lives in oceans all over the world. Although they are occasionally eaten by sharks and orcas, they are considered a “top predator” and removing them from their food chain would have a devastating effect on any ecosystem they are a part of.

The tuna industry is a multibillion dollar industry that many rely on both for employment and nutrition. Right now companies overwhelmingly fish in non-sustainable amounts. This needs to end.

The Bluefin Tuna (Big Fish)

Krill and Zooplankton (tiny fish/crustaceans)

Herring, Bluefish, Mackerel (medium fish)

Phytoplankton (tiny floating plants)

The Sun (that thing in the sky that makes your eyes hurt)
Session 6
Agriculture, Food Systems, & Consumption
Food, Inc
Big Ideas

What big ideas about agriculture and food systems are surfacing for you in the documentary?

- They have posters of farmers in the supermarket. The food industry doesn’t want people to know where food comes from and they don’t want farmers to say anything about it.

- Corn production is so important that it’s backed by the government.

- Short way to say it: Food is controlled by too few companies, so they can get away with abusing animals, exploiting workers, and providing non-nutritional foods to the world.

- The industry doesn’t care for well-being as long as they make money.

- The foods we eat are no longer a product of nature.

- Cross contamination can be very dangerous and our food is not safe.

- Health is not a big concern for the companies when mass growing food unless it costs them money and backlash.

- Big food industry have the power to keep things hidden if they don’t want anyone to know.

- 4 to 5 companies are controlling huge food systems. They do not concern about the profit, not the quality. Even if we don’t eat fast food still we are consuming unhealthy food in our eating.

- Profit is important than people’s health.

- That corporations are willing to hide things from the consumers and that they would still no fix the problem even after there consumers die.
Food, Inc
Important Vocabulary

What important vocabulary or concepts are you learning about in the documentary?

- Farmers, diseases, feedlot
- Farmers, green grass, and supermarket
- Feedlot, E-coli
- E-coli, Farms, Slaughterhouses
- unnatural foods VS natural foods
- The recorder wants us to build consciousness, whether it is necessary to eat animals.
- factory farming
- Food recalls, bacteria, disease, overconsumption.
- important vocabulary words: bacteria, industry, ecoli
- Farming and green grasses
- diseases, E-coli,
- Farm, Disease
Food, Inc.
Sorting Vocabulary

Noa Castro
Chronologically

Chapter 1: Fastfood to All Food
- Mass Production
- Factory

Chapter 2: A Cornucopia of Choices
- Labor

Vocabulary Sorting

Ways to Sort Key Vocabulary
- Unfamiliar/Familiar Words
- According to Central Ideas
- Positive/Neutral/Negative Words
- Chronologically
- By Subtopic
- By Part of Speech

Well Known
- Mass Production
- Animal Processing

Unknown
- Assembly Lines
**Food, Inc.**

**Sorting Vocabulary**

### Jiaru
- **Unfamiliar**
  - Antibiotics
  - assembly lines
- **Familiar**
  - system
  - conformity
  - quality
  - food chain

### Asma
- **Unfamiliar**
  - Assembly lines
- **Familiar**
  - Processed food
  - Antibiotics
  - Mass production
Sustainable Food Solutions

Global Food Issue #1: Food Waste

Possible Solutions

Solution 1
Solution 2

Pros
Cons

Environmental
(does it affect nature or the environment?)

Social
(does it affect people? is it safe?)

Economic
(does it cost a lot of money?)

Cultural
(does it account for or impact different people’s traditions or behaviors?)

Possible Solutions

Solution 3
Solution 4
Sustainable Food Solutions

Possible Solutions

Solution 1  Solution 2

Global Food Issue #2
Diets

ProS

Cons

Environmental
(does it affect nature or the environment?)

Social
(does it affect people? Is it safe?)

Economic
(does it cost a lot of money?)

Cultural
(does it account for or impact different people's traditions or behaviors?)
Sustainable Food Solutions

Global Food Issue #3
Land Use

Pros

Cons

Environmental
(does it affect nature or the environment?)

Social
(does it affect people? is it safe?)

Economic
(does it cost a lot of money?)

Cultural
(does it account for or impact different people's traditions or behaviors?)
Possible Solutions

Sustainable Food Solutions

Global Food Issue #4
Food Deserts

Pros

Cons

Environmental
(does it affect nature or the environment?)

Social
(does it affect people? Is it safe?)

Economic
(does it cost a lot of money?)

Cultural
(does it account for or impact different people's traditions or behaviors?)

Possible Solutions
Session 7
Population Growth, Production, & Consumption
## Integrating NGSS Standards into Curriculum

### Middle School

<table>
<thead>
<tr>
<th>Life Science</th>
<th>Earth &amp; Space Science</th>
<th>Physical Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middle School Life Science Introduction</td>
<td>Middle School Earth &amp; Space Science</td>
<td>Middle School Physical Science Introduction</td>
</tr>
<tr>
<td>MS. Matter and Energy in Organisms and Ecosystems</td>
<td>MS. History of Earth</td>
<td>MS. Chemical Reactions</td>
</tr>
<tr>
<td>MS. Interdependent Relationships in Ecosystems</td>
<td>MS. Earth's Systems</td>
<td>MS. Forces and Interactions</td>
</tr>
<tr>
<td>MS. Natural Selection and Adaptations</td>
<td>MS. Weather and Climate</td>
<td>MS. Energy</td>
</tr>
<tr>
<td>MS. Growth, Development, and Reproduction of Organisms</td>
<td>MS. Human Impacts</td>
<td>MS. Waves and Electromagnetic Radiation</td>
</tr>
<tr>
<td></td>
<td>Middle School Engineering Design Introduction</td>
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</tbody>
</table>

**Middle School Engineering Design Introduction**

**MS. Engineering Design**
Integrating NGSS Standards into Curriculum: Overpopulation

NGSS Brainstorm

Where can you/do you include the concept of human overpopulation in the NGSS curriculum?

K

1

LS4.D: Biodiversity and Humans: There are many different kinds of living things in any area, and they exist in different places on land and in water. (2-LS4-1)

2

EGG2.D: Plate Tectonics and Large-Scale System Interactions Maps show where things are located. One can map the shapes and kinds of land and water in any area.

LS4.D: Biodiversity and Humans: There are many different kinds of living things in any area, and they exist in different places on land and in water. (2-LS4-1)

The Changes to Land Over Time: SSL.A: Structure and Properties of Matter
Integrating NGSS & Environmental Education Standards into Curriculum

NGSS Brainstorm
Where can you/do you include the concept of human overpopulation in the NGSS curriculum?

L3.4.4D: Biodiversity and Human Populations. Live in a variety of habitats, and change in those habitats affects the organisms living there. (3-LS4-4)

ESS3.C: Human Impacts on Earth Systems. Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, oceans, air, and even outer space. But individuals and communities are doing things to help protect Earth.

Populations live in a variety of habitats, and change in those habitats affects the organisms living there. (3-LS4-4)

Populations live in a variety of habitats; and change in those habitats affects the organisms living there. (3-LS4-4)
### NGSS Brainstorm
Where can you/do you include the concept of human overpopulation in the NGSS curriculum?

<table>
<thead>
<tr>
<th>6</th>
<th>7</th>
<th>8 and highschool</th>
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</thead>
<tbody>
<tr>
<td><strong>ESS3.C:</strong> Human Impacts on Earth Systems</td>
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</tr>
</tbody>
</table>

- Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered.
Integrating Environmental Education Standards into Curriculum

Guidelines for Grades 5-8

STRAND 1
Questioning, Analysis and Interpretation Skills

A. Questioning—Learners develop, refine, and explain questions that help them conduct environmental investigations and learn about the environment.

Learners are able to:
- Develop environmental questions based on experiences, observations and information gathered from newspaper and magazine articles, television and radio news, or videos. For example, generate questions that compare the school's energy or water use to other schools in the district.
- Summarize what is known about an environmental problem or situation to provide context for, or explain the origins of, a specific question. For example, working collaboratively, develop a presentation with maps of all the schools in the district, graphs of each school's water/energy use, and videos and written statements describing their thinking and other students' thinking about water/energy use.
- Pose clear questions and ideas to test. For example, formulate a question that would allow them to investigate the effectiveness of different energy reduction strategies in the school.
- Clarify their own beliefs about the environment and discuss how those beliefs are reflected in the questions they ask. For example, analyze their own beliefs about the effects of reducing food waste at their school and consider how those beliefs might affect their questions.

B. Designing investigations—Learners design environmental investigations to answer specific questions—often their own questions.

Learners are able to:
- Plan and select lines of inquiry appropriate to their questions. For example, working collaboratively, plan an investigation comparing their school's environmental impact to other schools in the district.
- Determine how data related to environmental quality (energy use, recycling rates), health (indoor air quality, water quality), and other environmental issues impact their school.

STRAND 2
Environmental Processes and Systems

2.1 Earth's physical and living systems

A. Earth's physical systems—Learners describe the physical processes that shape Earth, including weather, climate, plate tectonics, and the hydrologic cycle. They explain how matter cycles and energy flows among the abiotic and biotic components of the environment. They describe how humans affect and are affected by Earth's physical systems.

Learners are able to:
- Describe the basic elements of the water cycle including evaporation, transpiration, precipitation, condensation, and the effects on surface features and landforms. Illustrate how human activity has altered the water cycle.
- Construct an evidence-based explanation of how an environmental change in one part of the world can have consequences for other places. For example, develop a map or other visual presentation that shows the effects of air pollution in places distant from the source.
- Explain how atmospheric gases absorb and radiate solar energy. Provide an evidence-based explanation of how humans have changed Earth's atmospheric gases during the last two centuries and the consequences of those changes.
- Examine physical patterns such as climate, areas of geothermal activity, soil types, sea level rise, and arid regions, suggesting reasons for these patterns. Explain these patterns in terms of abrupt forces (such as earthquakes or major storms) and long-term processes (such as erosion and rock formation), as well as those that are human-caused (such as increases in greenhouse gases, suburban development, or agricultural practices).
- Construct a representation of how Earth's major systems (geosphere, hydrosphere, atmosphere, and biosphere) interact with each other. For example, cite evidence that changes in the atmosphere result in changes to ocean chemistry; create a map for the local region that shows how average temperature and rainfall correlate with local forest, grassland, or desert ecosystems; or discuss the process of soil formation in terms of the interaction of climate, geology, and living organisms.
- Identify a local natural hazard (such as soil erosion, flooding, hurricanes, droughts, and tsunamis) and construct an explanation based on evidence for how it has impacted a local ecosystem and human
3.1 Skills for analyzing and investigating environmental issues

A. Identifying and investigating issues—Learners use primary and secondary sources of information and apply research and analytical skills to investigate environmental issues, beginning in their own community and region.

Learners are able to:
- Research the social and economic origins of a selected environmental issue as well as the actions taken to address the issue over the years. Describe the apparent environmental, social, and economic consequences of these actions.
- Compare areas of conflict and agreement for various environmental issues. Determine if the areas of conflict and agreement are associated with particular groups of people across different environmental issues. Use research results to summarize the differing perspectives of those involved.
- Select and use a variety of print and digital sources—both primary and secondary sources—of information to identify relevant evidence that addresses a local environmental issue. Include indigenous and traditional knowledge sources in the analysis.
- Examine how people in other communities have analyzed and understood similar local environmental issues. Identify the approaches and assumptions behind these investigations.

B. Sorting out the consequences of issues—Learners apply their knowledge of ecological and human processes and systems to describe the short- and long-term consequences of selected environmental issues on environmental, social, and economic sustainability.

Learners are able to:
- Describe the effects of human actions on specific environmental processes and systems. For example, identify the major sources of point and non-point water pollution in the local community.
- Analyze how water pollution affects local aquatic life and whether natural processes can purify the pollutants. Discuss ways the community can minimize the pollution and its impacts on the environment.
- Examine the short- and long-term effects of human actions on the environment, including impacts on human health and well-being. For example, create a graph that compares air pollution levels against...
## Integrating Environmental Education Standards into Curriculum

### Environmental Education Guidelines for Excellence Brainstorm

What strands related to human overpopulation can you begin/continue to focus on with your students in your curriculum?

What are learners able to do?

<table>
<thead>
<tr>
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<th>2</th>
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<tbody>
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<td>K</td>
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</tbody>
</table>

#### Strands

- 2.1 Earth’s physical and living systems
  - A. Earth’s living system.
  - B. Earth’s living system.

#### Learners are able to

**2.1 Earth’s physical and living systems**

- Identify patterns in the basic needs between plants and animals, among various plants, and among various animals. Describe examples of patterns such as all living things need water, plants make their own...
- Discuss various ways that changes in a habitat could affect the organisms living there. For example, describe how a city’s expansion might affect the available food sources for animals living in the area.
- Make observations (firsthand or from media) to collect data which can be used to make comparisons. (K.LS.4)
Integrating Environmental Education Standards into Curriculum

<table>
<thead>
<tr>
<th>Strands</th>
<th>Learners are able to</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strand 2.3 Environment and society</td>
<td>Explain how human actions change the environment. For example, list changes that activities such as building houses or stores with parking lots, farming, or damming rivers have produced within their community or region.</td>
</tr>
<tr>
<td>2.3 Environment and society</td>
<td>Compare activities that people can do to reduce the impact they make on the environment.</td>
</tr>
<tr>
<td>3.1 Skills for analyzing and investigating environmental issues</td>
<td>Apply ideas of past, present, and future to a local environmental issue of interest. For example, discuss how a selected environmental issue changes over time, describing what has changed, is changing, and could change in the future.</td>
</tr>
<tr>
<td>LS2.4: Interdependent Relationships in Ecosystems</td>
<td>Understand that a healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem.</td>
</tr>
</tbody>
</table>
Human Population Growth Padlet

Population Growth Data Analysis, Interpretation, & Scientific Argumentation

1) Pick 1 graph to analyze and interpret on the Our World in Data website.

2) Create your own column on this padlet. Write your name and question associated with the graph(s) on the top of your column.

3) Write down what you notice about the graph(s).

4) Write down what you wonder about the graphs(s).

Our World in Data

Science Standards

Example: Brian

How is the global population distributed across the world?

Notice:

Wonder:

Story/Going On:

Scientific Argument:

*Claim:

*Evidence:

*Reasoning (if possible):

Environmental Issues as a result of human population growth and
How is the global population distributed across the world?

One way to understand the distribution of people across the world is to reform the world map, not based on area but according to population.

This is shown here in a population cartogram: a geographical presentation of the world where the size of the countries are not drawn according to the distribution of land, but according to the distribution of people. The cartogram shows where in the world the global population was at home in 2018.

The cartogram is made up of squares, each of which represents half a million people of a country’s population. The 11.5 million Belgians are represented by 23 squares; the 49.5 million Colombians are represented by 99 squares; the 1,415 billion people in China are represented by 2830 squares; and the entire world population of 7.633 billion people in 2018 is represented by the total sum of 15,266 squares.

As the size of the population rather than the size of the territory is shown in this map you can see some big differences when you compare it to the standard geographical map we’re most familiar with. Small countries with a high population density increase in size in this cartogram relative to the world maps we are used to – look at Bangladesh, Taiwan, or the Netherlands. Large countries

Example: Brian

How is the global population distributed across the world?

Notice:

Wonder:

Story/Going On:

Scientific Argument:

*Claim:

*Evidence:

*Reasoning (if possible):

Environmental Issues as a result of human population growth and
Sessions 8 & 9
Environmental Justice
Systemic Racism & Health Disparities
It's easy to make your own map. Just follow these steps:

1. **Choose an area.**
   - Pan and zoom the map to an area or search by its name or address.

2. **Decide what to show.**
   - Choose a Basemap then Add layers on top of it.

3. **Add more to your map.**
   - Add map notes to draw features on the map.
   - Display descriptive text, images, and charts for map features in a pop-up.

4. **Save and share your map.**
   - Give your map a name and description then share it with other people.
ArcGIS Digital Mapping

Legend

ACS Poverty Status Variables - Boundaries - Tract

Percent of Population whose income in the past 12 months is below poverty level

- > 26%
- 13% - national figure
- < 1%
- No Value
ArcGIS Digital Mapping
Social Determinants of Health (SDOH)
Environmental Justice Research Project
The EJAtlas is a work in progress. Newly documented cases and information are continuously added to the platform. However, many are still undocumented and new ones arise. Please note that the absence of data does not indicate the absence of conflict. You can help us improve the coverage: register here.

Conflictos y daños en los proyectos de Pan American Silver en América Latina / Conflict and Harm at Pan American Silver’s Projects in Latin America
Este mapa revela los daños provocados por ocho proyectos mineros de la empresa Pan American Silver, desde México hasta Argentina. This map illustrates harms associated with eight mining projects, from Mexico to Argentina owned by Pan American Silver.

Map of Airport-Related Injustice and Resistance
This online interactive map brings together case studies documenting a diversity of injustice related to airport projects across the world. It was developed in collaboration between the Environmental Justice Atlas and Stay Grounded.
Environmental Justice Case Studies

Zoom Out SPOTSylvan A SOLAR ENERGY CENTER

[Image with text and graphics]

[What exactly is going on?]

In January 2012, the Virginia State Corporation Commission (SCC) approved a project to build a solar power facility at Spotsylvania County, Virginia. The project is a 160 MW solar power plant that will involve a 365-acre parcel of land, according to plans. [2]

[What are people’s reactions to this?]

Protests and opposition against the proposed solar farm construction, with residents fearing that the project would lead to more revenue than benefits to the environment and surrounding areas [3].

[The truth behind the “green” solar energy]

1. Deforestation

A solar farm necessitates the use of a large amount of land space, resulting in the loss of trees. This deforestation can also lead to the loss of biodiversity and wildlife habitats.

2. Cadmium

The solar panels used in solar energy production contain cadmium, a highly toxic metal. This metal can leach into the soil and water, posing a significant threat to the environment.

3. Property values drop

Housing prices in the neighborhood will likely decrease due to the potential negative effects of solar panels, making the area less desirable to potential buyers and investors.

4. Dust Emission

Solar panels can increase dust emissions, which can contribute to air pollution and respiratory issues.

5. Sol eration

[“Green” energy is not truly “green.”]

The materials used to make solar panels are not as sustainable as they are marketed to be. The production process involves the use of hazardous chemicals and energy-intensive processes, which can contribute to climate change and environmental degradation.

Biomass and Land Conflict

Biomass is renewable energy that comes from plants and animals. Biomass can be burned directly for heat, gas, and fuel.

The building of renewable energy projects such as the Gemini solar power plant was approved by the state because it promises to reduce carbon emissions by at least 80%. This may seem like a positive impact, but it really is not the case.

[Image with text and graphics]

Endangered

Due to the construction of the project, large areas of the land are taken away. The wildlife living in this area is endangered. Some of the endangered species might include desert plant species and tortoises.

Gemini Solar Project can be an environmental justice issue

1. Endangering animals and plants

2. Climate change

Industries use biomass to make energy which makes them chop off more trees. The loss of trees will affect wildlife, ecosystems, and weather patterns.

Air Pollution: The Silent Killer

Air pollution is the presence in the air of gases or other substances that can affect the health of humans, animals, or plants. Air pollution can be caused by human activities, such as burning fossil fuels for electricity or transportation.

[Image with text and graphics]

DID YOU KNOW?

7 billion trees are cut down every year. Eventually, we will run out of trees. We still have 50-120 years of trees.

Why we should care about air pollution?

Air pollution in the air is important for human health and wellbeing. Poor air quality can harm human health and plant life, leading to respiratory issues, heart disease, and other health problems.

EPA recommends not using air conditioners, using air purifiers, and reducing your exposure to areas with high pollution.
Sessions 10 & 11
Building an Anti-Racist Science Curriculum and Classroom
Save the Last Word for Me Protocol

**Directions**

Your group has 30 minutes to complete the steps below using a text from the padlet. If you have time, select a second text and repeat the steps.

1. **Step 1:** Pick a text to research with your breakout group (podcast, video, TED Talk, Article).
2. **Step 2:** Choose the group order for the Save the Last Word for ME Protocol.
3. **Step 3:** Conduct anti-racist research with your text. If your text is long, find a stopping point.

**Podcasts**

- NPR: Short Wave Anti-Racist Science Education
  - [npr.org](http://npr.org)
  - Anti-Racist Science Education: Short Wave

**Videos**

  - [YouTube](http://www.youtube.com)
- Heinemann: Dismantling Racism in Education
  - [Heinemann.com](http://www.heinemann.com)
- Aspen Ideas Festival: How to Be an Anti-Racist w/ Dr. Ibram Kendi
  - [blog.heinemann.com](http://www.blog.heinemann.com)

**Ted Talks**

- TEDx: The Future of STEM Education with Dr. Roni Ellington
  - [YouTube](http://www.youtube.com)
- TEDx: A Tale of Two Teachers with Dr. Melissa Crum
  - [TEDx](http://www.tedx.com)

**Articles/Websites**

- [theatlantic.com](http://www.theatlantic.com)
- [ascd.org](http://www.ascd.org)

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*Building an Anti-Racist Science Curriculum and Classroom*
Save the Last Word for Me Protocol

Save the Last Word for ME
Developed by Patricia Averett.

Purpose
To clarify and deepen our thinking about a text

Roles
Timekeeper/facilitator, who both participates and keeps the process moving

Time
Approximately 30 minutes

Process
- The process is designed to build on each other’s thinking, not to enter into a dialogue.
- Participants may decide to have an open dialogue about the text at the end of the 30 minutes.
- Timing is important; each round should last approximately 7 minutes.

1. Create a group of 4 participants. Choose a timekeeper (who also participates) who has a watch.

2. Each participant silently identifies what she/he considers to be the most significant idea addressed in the article, and highlights that passage.

3. When the group is ready, a volunteer member identifies the part of the article that she/he found to be most significant and reads it out loud to the group. This person (the presenter) says nothing about why she/he chose that particular passage.

4. The group should pause for a moment to consider the passage before moving to the next step.

5. The other 3 participants each have 1 minute to respond to the passage — saying what it makes them think about, what questions it raises for them, etc.

6. The first participant then has 3 minutes to state why she/he chose that part of the article and to respond to — or build on — what she/he heard from her/his colleagues.

7. The same pattern is followed until all 4 members of the group have had a chance to be the presenter and to have the “last word.”

8. Optional open dialogue about the text and the ideas and questions raised during the first part of the protocol.

9. Debrief the experience. How was this a useful way to explore the ideas in the text and to explore your own thinking?

Protocols are most powerful and effective when used within an ongoing professional learning community and facilitated by a skilled facilitator. To learn more about professional learning communities and seminars for facilitation, please visit the School Reform Initiative website at www.schoolreforminitiative.org.
Breakout Room 1
Text 1 Name: What Would a Super School Look Like? with Chris Emdin
Save the Last Word for Me Protocol-Significant Ideas

One significant idea I learned from the video is that African Americans view education differently because it relates to past events in America's history (slavery and racism). For example, at the beginning of...

I learned that what makes a super school are educators. Even if they do not have a certificate, a good educator can be of great help to students. The important thing is to provide students with the same...
Minorities and POC are seen as "special" for exceeding in STEM related subjects. -Vicky

Students will not succeed unless they are given the opportunity to be challenged. -Joey

Teachers must be agents of change in order to thrive as STEM educators. Being progressive aids inclusivity and boosts motivation and success in the STEM field. -Anna T

The curriculum would treat students differently based on their skills and their backgrounds and give some students better opportunities. -John
Focus on students, not the content. Content is purposeless when you lose the student.

Teachers are agents of change. Teachers are more than just content feeding machines.

To make a difference, teachers should be able to relate to students, experiencing the same things that they experience.

Teachers need to be an agent of change. It’s not about what we teach to students, it’s about how we teach students so that they can adopt the idea to learn better. Kantu
Anti-Racist Research
Save the Last Word for Me Protocol

Breakout Room 4
Text 1 Name: TED: The difference between being “not racist” and antiracist
Save the Last Word for Me Protocol-Significant Ideas

- people who keep bringing up that are not racist are the racist ones because they know what they are saying has an underlying racist tone.

- TED: The difference between being “not racist” and antiracist

- Admit Racism then Build Anti Racist

- People who said they are not racist are racist in denial. Anti-racist are people who are willing to admit the racist thought they have at times, and are willing to challenge these inequalities. - yue
Anti-Racist Research
Commitments to our Practice

Whole Group Discussion
How can we create an anti-racist science classroom?

- White supremacy must be spoken about openly to deal with it appropriately.
- Building a strong classroom community for students and having them reflect on topics within an nonjudgmental perspective.
- More representation! Always think “who is being left behind?”
- Make sure to include all your students in the learning. Do not leave any groups behind, do not leave them out. Get to know your students and bring in that representation into the classroom at all times.
- Create a comfortable environment in your classroom. Read diverse books with your students, and be willing to speak/teach about true history.
- Explicitly and repeatedly remind students how capable they are.
Sessions 12 & 13
Climate Change
Selecting Climate Change Topics

Selecting Climate Change Podcast Episode Topics
Place your name under the topic of your choice!

- **The Greenhouse Effect**
  - Jason M Gonzalez

- **Global Warming**
  - Francis

- **Sea Level Rise**
  - Nusrat Alom
    - Frances Harrigan

- **Solar Energy**
  - Jason Rose
  - Jun

- **Wind Energy**
  - Zelie Durnhake

- **Extreme Weather Events**
  - Keasly Young
  - Sheflu Azaz
  - Coryne Hardy

- **Melting Ice**
  - Eric Manlies
Podcast Mentors

Mentor Podcast Directions

1) Listen to 1 or 2 podcasts.
2) Complete the chart in your digital notebook for 1 of the podcasts.
3) Create a podcast rubric checklist on the next page of your digital notebook.

Brains On Podcast

Do your kiddies have a burning question? Perfect! Send 'em in! Brains On! finds a different expert for each episode who will address tots' curiosity. Anything from animal farts (yuck) to narwhals have been covered!

Tumble Podcast

Have a budding scientist on your hands? Then Tumble is an absolute must. Experts in the field stop by to discuss their own work, uncover phenomenons and make your kids fall in love with the subject in the process.

Smash Boom Best Podcast

Smash Boom Best is a debate show for kids and families from the makers of the award-winning podcast, Brains On! Every episode takes two cool things, smashes them together and lets you decide which is best. Cats versus Dogs, Pizza versus Tacos, Super Speed versus Super Strength. Who will be crowned the Smash Boom Best? Our debaters use facts and passion to make their case.

Forever Ago Podcast

Brains On presents Forever Ago, a history show for the whole family! Every episode explores the origin of just one thing — like sandwiches, video games, clocks and more — while teaching listeners to think critically about history.
## Climate Change Unit
### Research Padlets

<table>
<thead>
<tr>
<th>Research Topic</th>
<th>Research Padlet Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Greenhouse Effect</td>
<td><a href="https://padlet.com/scienceforjustice/greenhouseeffectresearchpadlet">https://padlet.com/scienceforjustice/greenhouseeffectresearchpadlet</a></td>
</tr>
<tr>
<td>Global Warming</td>
<td><a href="https://padlet.com/scienceforjustice/globalwarmingsresearchpadlet">https://padlet.com/scienceforjustice/globalwarmingsresearchpadlet</a></td>
</tr>
<tr>
<td>Extreme Weather Events</td>
<td><a href="https://padlet.com/scienceforjustice/extremeweatherresearchpadlet">https://padlet.com/scienceforjustice/extremeweatherresearchpadlet</a></td>
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<tr>
<td>Melting Ice</td>
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<tr>
<td>Sea Level Rise</td>
<td><a href="https://padlet.com/scienceforjustice/sealevelrisereresearchpadlet">https://padlet.com/scienceforjustice/sealevelrisereresearchpadlet</a></td>
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<td>Alternative Energy</td>
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<td>Podcasting</td>
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<td>Mentor Podcasts</td>
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<tr>
<td>Climate Justice</td>
<td><a href="https://padlet.com/scienceforjustice/climatejusticeresourcepadlet">https://padlet.com/scienceforjustice/climatejusticeresourcepadlet</a></td>
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</table>
## Climate Change Podcast Episode Checklist

<table>
<thead>
<tr>
<th>Organization, Production, &amp; Delivery</th>
<th>Yes!</th>
<th>Starting To</th>
<th>Not Yet</th>
</tr>
</thead>
<tbody>
<tr>
<td>We provide a <em>catchy and clever</em> introduction. Our information is relevant and establishes a clear purpose that engages our audience.</td>
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<tr>
<td>We provide a <em>conclusion</em> that clearly summarizes key information for our audience.</td>
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<tr>
<td>We recorded our talk in a <em>quiet environment</em> without background noise and distractions.</td>
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<tr>
<td>We have <em>transitions</em> that are smooth and the <em>volume</em> of our voices, music and effects enhance the talk.</td>
<td></td>
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</tr>
<tr>
<td>We produce a <em>podcast length</em> that keeps our audience focused and interested in our talk.</td>
<td></td>
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</tr>
<tr>
<td>We spoke about our topic with <em>passion and enthusiasm</em>, engaging our audience and inspiring them to care.</td>
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<td></td>
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<tr>
<td>We showed evidence of <em>rehearsal and reflection</em> in our talk, leading to fluent conversation.</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Research Skills</th>
<th>Yes!</th>
<th>Starting To</th>
<th>Not Yet</th>
</tr>
</thead>
<tbody>
<tr>
<td>We <em>synthesized information</em> from our research, organizing it into big ideas, and linking details to support these ideas/claims.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>We used <em>visuals</em> (<em>synthesis page, infographic, annotated diagram, scientific explanations</em>) and/or compelling examples to make our talk more compelling.</td>
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</tr>
<tr>
<td>We used <em>academic vocabulary</em> that is significant to this topic, and explained it as needed.</td>
<td></td>
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</tr>
<tr>
<td>We acknowledged important <em>sources</em> by referring to authors or texts inside of the talk.</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
## Climate Change Podcast Episode Checklist

<table>
<thead>
<tr>
<th>Climate Change Science</th>
<th>Yes!</th>
<th>Starting To</th>
<th>Not Yet</th>
</tr>
</thead>
<tbody>
<tr>
<td>We explain the significance of the <strong>greenhouse effect</strong>.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We make <strong>claims</strong> that respond to our research questions and are scientifically correct.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We <strong>include evidence</strong> to support our claims. Our <strong>scientific evidence</strong> is appropriate, accurate, and sufficient.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We made links between our evidence and claims with <strong>scientific reasoning</strong>. Our reasoning includes <strong>scientific ideas</strong> that describe <strong>why</strong> our evidence supports our claims.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We demonstrate a <strong>conceptual understanding of our climate change subtopic</strong>, including its causes, effects, solutions, and significance.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>We work towards <strong>ethical stances</strong> on how climate change affects peoples, groups, and places-paid attention to <strong>climate and environmental justice</strong>.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Publishing a Climate Change Podcast Series

Soundtrap
Soundtrap Set-Up
Adding Loops & Editing

So this is the IS 209 podcast series on climate change, where we’re going to be looking at the cause of causes of climate change, the effects of climate change, and what are some potential solutions for dealing with the climate change crisis.
Climate Change Podcast Series

Published Climate Change Podcast Series
Here is the published climate change podcast series by class!

Climate Change Podcast Series on Weebly

601 Climate Change Podcast Series on Soundtrap

602 Climate Change Podcast Series on Soundtrap

603 Climate Change Podcast Series on Soundtrap

Greenhouse Effect
by Lennan, Isabela

Global Warming

Greenhouse Effect
by Michael, Mark

Greenhouse Effect
by Jessica, Taylor, Val
Climate Change Podcast Series
Publishing Celebration

Episode 1: The Greenhouse Effect
Episode 2: Global Warming
Episode 3: Melting Ice
Episode 4: Sea Level Rise
Episode 5: Hydro-electric Energy
Episode 6: Solar Energy
Episode 7: Solar Energy
Session 14
Environmental UbD Unit Planning
UbD Unit Planning Padlet

Environmental UbD Unit Planning, Assessment, & Lesson Planning

- Environmental UbD Unit Planning Project
- Understanding by Design (UbD) Unit Plan
- Assessment & Assessment Plan
- Lesson Plan
- UbD Resources

Example UbD Unit Plan
- Example Assessment Plan
- Example Lesson Plan

UbD Unit Plan Template
- Assessment Plan
- Lesson Plan Template
- UbD Template Explanation
# Climate Change UbD Unit Plan

**Brian Gordon**  
**6th Gr. Science @ IS289**  
**2019-2020**

## Stage 1 Desired Results

<table>
<thead>
<tr>
<th>Transfer</th>
<th>Meaning</th>
<th>Essential Questions</th>
</tr>
</thead>
</table>
| Students will be able to independently use their learning to... make claims supported by quantitative and qualitative evidence that is connected through reasoning which includes scientific ideas describing why the evidence supports the claims. | Students will understand that... | - How are people causing Earth’s climate to change?  
- How does climate change affect human society and the natural world?  
- What can we do to address climate change? |
| - Scientific evidence supports the claim that global climate change is happening and is being caused by human activities.  
- Climate change has a disproportionate impact on specific groups of people.  
- It is essential to take action to create positive environmental and social change. |  |

## Acquisition

<table>
<thead>
<tr>
<th>Students will know...</th>
<th>Students will be skilled at...</th>
</tr>
</thead>
</table>
| - The Greenhouse Effect  
  - Human activities  
  - Natural processes  
  - Four Key Pieces of Climate Change Evidence  
  - Global Warming  
  - Extreme Weather  
  - Melting Ice  
  - Sea Level Rise  
  - Three Key Climate Change Solutions  
  - Renewable Energy  
    - Solar  
    - Wind | - Organizing and selecting texts with purpose, moving from easy and background to harder and more specific  
- Researching across texts on a climate change subtopic and synthesizing their research  
- Utilizing effective note-taking strategies to capture information based on text structures  
- Analyzing and interpreting data in order to argue from evidence |
<table>
<thead>
<tr>
<th>#</th>
<th>Assessments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part 1: Immersion Research &amp; Communicating through Infographics</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Immersion Research Notes</td>
</tr>
<tr>
<td>2</td>
<td>Synthesis Page</td>
</tr>
<tr>
<td>3</td>
<td>Infographic</td>
</tr>
<tr>
<td>Part 2: The Greenhouse Effect Research &amp; Developing Annotated Diagram Models</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Annotated Greenhouse Effect Diagram</td>
</tr>
<tr>
<td>Part 3: Climate Change Evidence Research &amp; Constructing Scientific Arguments</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Climate Change Evidence Research Notes</td>
</tr>
<tr>
<td>6</td>
<td>Crafting and Critiquing Scientific Arguments</td>
</tr>
<tr>
<td>Part 4: Climate Change Podcasting on Soundtrap</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Climate Change Podcast Episode</td>
</tr>
<tr>
<td>8</td>
<td>Essential Questions Writing</td>
</tr>
</tbody>
</table>
Lesson Plan

**Chasing Ice Video Immersion Unit Launch**

**Teacher:**

**Course:**

**Date:**

**Objective/Teaching Point:**

Today I want to teach you that as you immerse yourself in the topic of climate change, it is important to first build an understanding of the subtopics, important ideas, and new terms or concepts that are associated with the subject of climate change. Today you will take meaningful notes while watching a documentary called Chasing Ice. While you capture notes each day of the documentary, you will also focus on specific nonfiction reading skills throughout the video immersion.

**NGSS Standards**

**Topic:** MS-ESS3-5, Earth and Human Activity

**Performance Expectation:** Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century. ([Clarification Statement: Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities. Emphasis is on the major role that human activities play in causing the rise in global temperatures.]

<table>
<thead>
<tr>
<th>Science &amp; Engineering Practice</th>
<th>Disciplinary Core Idea</th>
<th>Cross-Cutting Concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obtaining, Evaluating, and Communicating Information</td>
<td><strong>MS-ESS3.5:</strong> Global Climate Change</td>
<td><strong>Cause &amp; Effect</strong></td>
</tr>
<tr>
<td>Critically read scientific texts adapted for classroom use to determine the central ideas and/or obtain scientific and/or technical information to describe patterns in and/or evidence about the natural and designed world(s).</td>
<td>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). 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.</td>
<td>Cause and effect relationships may be used to predict phenomena in natural or designed systems. Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.</td>
</tr>
<tr>
<td>Communicate scientific and/or technical information (e.g., about a proposed object, tool, process, system) in writing and/or through oral presentations.</td>
<td><strong>Stability and Change</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Classroom Connection</strong></td>
<td><strong>Students identify scientific arguments (claims, evidence, and reasoning) while doing the video immersion.</strong></td>
<td><strong>Students begin to understand why the greenhouse effect is the primary cause for the increase in global temperature (global warming).</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Students capture information about climate change in their research notebook using a two-column note-taking strategy.</strong></td>
<td><strong>Students observe the melting of glaciers in the documentary and begin to understand how these changes are accelerating as a result of global warming.</strong></td>
</tr>
</tbody>
</table>
UbD Unit Plan Padlet

GSCI.7050T Environmental Science UbD Unit Plan
1st Grade Science Structure, Function and Information Processing

UbD Unit Plan
Lesson Plan
Assessment
Lesson's 1 - 14
Science Scope and Sequence

Lesson 1: Humans Copy Animals and Plants

Lesson 1 cont.

http://ubd.wix.com/ubd