

Lesson 4: What are the best approaches to reduce emissions associated with food waste in our school?

Previous Lesson....Where we have been: Students designed and carried out an investigation to understand their school's food system and to see what the food waste situation was.

 This Lesson...What we are doing now: This lesson explores the data that is collected and proposes solutions to mitigate food waste in our school.			
Lesson Question	Phenomena	Lesson Performance Expectation(s)	What We Figure Out (CCCs & DCIs), <i>New Questions</i> and <i>Next Steps</i>
<p>L4: What are the best approaches to reduce emissions associated with food waste in our school?</p> <p>(2-3 Periods)</p>  <p><i>Building toward</i> ↓ <u>NGSS</u> <u>PEs:</u> HS-ESS3-2 HS-ESS3-4 HS-ETS1-3</p>		<p>Design and evaluate solutions based on costs and risks to decrease the food waste in our school's food system.</p> <p>Argue from evidence to discuss the merits and drawbacks of possible solutions to reducing food waste using energy and matter flow, cause and effect, understanding of the system and of scale and quantity to evaluate our potential solutions.</p>	<p>Last class we planned and carried out an investigation to learn more about our school's food system and what the food waste situation was. We worked in groups to collect data on different parts of the system.</p> <p>We analyze that data and present it to the class in the form of a gallery walk.</p> <p>We have a discussion to identify areas we think we could make some improvements to and we work in small groups to develop solutions to the food waste in our school.</p> <p>We review the proposals for each group and offer revisions or suggestions to improve the plans.</p> <p>We have a consensus discussion to determine which plan is the best and thus will be presented to administration.</p> <p>We are wondering who we need to share the plans with and how we should convey this information to people whom make decisions in our school and district.</p> <p>We decide to put together a presentation to share our ideas for solutions to the food waste problem with the necessary adults.</p>

Next Lesson....Where we are going: The next lesson explores generated criteria and provides guidance in creating a presentation for the plans that were developed in the previous lesson. Participants will then practice and refine their presentations before presenting them to the school's administration.



Getting Ready: Materials Preparation

Materials For Each Group (or class)

- Posters
- Markers
- Computers

Preparation of Materials (15 min.)

- Depending on the format you (or your students) chose to present their proposals, they may need computers, posters or markers. You can make this decision ahead of time or have all materials available.



Getting Ready: Teacher Preparation

Background Knowledge for Teacher Only

ESS3 from the FRAMEWORK:

“Thus science and engineering will be essential both to understanding the possible impacts of global climate change and to informing decisions about how to slow its rate and consequences...”

Rate of and region of change matters for understanding climate change. Cities are changing faster because of characteristics of cities - localized amplification because of the nature of cities like black top, resulting in heat islands in cities. However, this is not the entire explanation for climate change. Overall regionally and globally human activities are increasing CO₂ and greenhouse gases, which result in global warming.

ESS3.C from the FRAMEWORK:

By the end of grade 8: Human activities have significantly altered the biosphere sometimes damaging or destroying natural habitats and causing the extinction of many other species. However, changes to earth's environment can have different impacts (negative and positive) for different living things. 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 otherwise.

ESS3.D from the FRAMEWORK:

By the end of grade 8: 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 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 and decisions and activities.

Alternative Student Conceptions

Students may have different ideas for their solutions based on things they have heard or their understanding of the world.

Linking Our Understanding to Scientific Terminology





Learning Plan: What are the best approaches to reduce emissions associated with food waste in our school?

(3 class periods)



Teacher Supports & Notes

1. (5 mins) Begin class with a discussion to reorient students to the storyline.

Suggested Prompts:

- What did we do last class?
- What did we figure out last class?
- What should we do today?

Listen for student responses that mimic the next row of the storyline:

- *We designed and carried out an investigation to see what the food system was like in our school as well as how much food is wasted*
- *We should analyze the results of the investigations.*
- *We should look at the data each group got so that we can learn about parts of the food system that we did not investigate ourselves.*

2. (30 mins) Have students share their results from their investigations (through a gallery walk, presentations, etc.).

3. (10 mins) After all groups have shared their information, guide students through a discussion to summarize spots in the food system that they think would be good places to minimize food waste. Record students' ideas on a poster or the board, grouping them by problem/solution^A.

Suggested Prompts:

- What areas of investigation showed good intervention points?
- Where do you think we could have an impact in our school's food system?
- How could we address the waste generated at different points in the food system?
- What are some ideas you have to reduce the waste in our school's food system?

Allow any applicable student responses.



Classroom Artifact

A: A possible way to organize the ideas during this class discussion. This is just an example; your class should have more ideas.

Food waste in cafeteria	Behaviors/Attitudes about food waste
- composting - separating food, trash, recyclables	- educational campaign - fliers, video, posters around school



4. (1 class period) Now that students have developed some possible solutions, allow them to break into groups based on their interest to work together to develop a plan. Before they begin work though, guide students in an Initial Ideas discussion^B to determine what components should be included in their plan.

Suggested Prompts:

- What should be included in our plans?
- How we will be able to determine if a plan is feasible or not?
- How do we want to share our proposals with each other so that we can pick the best one(s)?

Listen for student responses that will result in high quality plans, such as:

- *Steps for implementation*
- *Costs*
- *Possible problems and their solutions*
- *Materials needed*
- *Potential amounts of greenhouse gas emissions saved*
- *Benefits to our community*
- *We could make a handout, presentation or a poster with our ideas to share with the class.*

5. (15 mins) Once students have had enough time to generate their plans, have them share their plans with the other groups (through a jigsaw, gallery walk, presentation, etc). After students have shared their plans, allow other students to ask questions, provide critiques or complements and, time permitting, allow time for students to revise their plans before voting as a class^C.

6. (5 mins) Guide students through a Consensus Building Discussion to determine which plan or plans they would like to present to administration.

7. (5 min) Ask students to determine the next steps.

Suggested Prompts:

- What should we do next class?

Accept answers that mimic the next row of the storyline:

- *We should put together our presentation for administration!*



Strategies for this Initial Ideas Discussion

B: The goal of this conversation is to have the class come up with the criteria that should be incorporated into the plans. If you think the students are missing a major component, (e.g. they might not come up with costs) ask questions of the students to ensure their plans are thorough.



Additional Guidance

C: The time this step takes will vary based on the format you or your class chose to present their plans.

If it seems like the class could come to a consensus before revisions or there is not enough time, you may skip this last step.



Alignment With Standards

Building Toward Target NGSS PE

- **HS-ESS3-2:** Evaluate competing design solutions for developing, managing and utilizing energy and mineral resources based on cost-benefit ratios
- **HS-ESS3-4:** Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
- **HS-ETS1-3:** Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts

