Food Rescuers: STEM Innovations to Reduce Food Waste

ELEMENTARY STUDENT EDITION
Your Mission

Your Day of Design Food Rescuers Mission is to design a new invention that will reduce food waste for your school cafeteria.

Step 1. UNDERSTAND YOUR MISSION

• Have you ever thrown away food at school
  What was it? Why did you throw it away?

• What else could you have done besides throw it in the garbage?

• What could have helped you to NOT throw it in the garbage?

Image 1: When food waste rots or decomposes in landfills, it releases methane, a powerful greenhouse gas that contributes to global warming.

Photo credit: [https://media.phillyvoice.com/media/images/FoodWaste.2e16d0ba.fill-735x490.png](https://media.phillyvoice.com/media/images/FoodWaste.2e16d0ba.fill-735x490.png)

Image 2: An apple throughout the stages of decomposition. The food breaks down and unpleasant odors are produced. A greenhouse gas called methane is released into the air. When it decomposes in the soil, it can be turned into nutrient-rich material that can be used by other plants. When it is thrown away in the garbage and goes to a landfill mixed with other waste than it’s nutrients are NOT returned back to the soil.

Photo credit: FLPA/Angela Hampton
Step 2. DIG INTO THE MISSION

Write or draw your responses to these sentence starters.
One example of how to reduce food waste is....

Some ideas I have to further help reduce food waste is.....
Step 3. BRAINSTORM AND DESIGN

Discuss the following question with your team.
What do you think is the “perfect” invention to help students reduce food waste in your school?
Capture your ideas here:

Choose at least 3 different ideas from your team’s discussion that will help reduce food waste.
Sketch your 3 ideas here:
Step 4. BUILD A PROTOTYPE

With your team, build ONE of your ideas from above using the materials available to you. When deciding on which idea to prototype, discuss the following questions:

- Which do you think will work and which won’t? Why?
- Which one best meets the needs of our cafeteria employees and students?
Extension Activities

Test Your Prototype

Describe how you could or will test your prototype here:

Capture what you learn here:
Refine Your Prototype

Based on what you learned from testing your prototype, try to improve your invention. You can do this once, twice or as many times as possible. Describe or sketch your ideas here

Share Your Invention

Now it’s time to share your invention with your community! Using the resources available to you, create a digital presentation or a short 1-minute video that describes the invention, how it works, and what you have learned through the process.
Food Rescuers: STEM Innovations to Reduce Food Waste

TEACHERS’ GUIDE – ELEMENTARY SCHOOL
Overview

Food Rescuers Design Mission encourages students to create like an innovator by employing creative problem-solving skills and an entrepreneurial mindset while innovating a solution to the problem.

In the Food Rescuers Design Mission, students design a new invention that will reduce food waste for their school’s cafeteria. Teams can tackle this challenge using a wide-range of materials and technology, from everyday materials available in the classroom to design software to 3D printed components. The focus is on the ideas and approaches, not the products.

THROUGH THIS CHALLENGE, STUDENTS WILL:

• Acquire deep understanding of the challenges posed by food waste.
• Build and apply foundational and advanced STEM knowledge and skills, cutting across many disciplines, from biology to math to computer science and engineering.
• Build employability skills such as communication, critical thinking, and teamwork.
• Build important career skills, such as problem-solving, design-thinking, teamwork, entrepreneurship, and communication, and develop a supportive network of peers, educators, and career mentors/advocates.
• Grow in confidence, think creatively and engage deeply with their community and possible careers.
• Translate their new-found strengths into innovation, local impacts and jobs.
Alignment to Standards

The activities that follow can be used for almost any grade from Kindergarten through 5th grade. Skills listed are general and can be focused for specific grade levels as needed for differentiation and grade appropriateness.

COMMON CORE READING

INFORMATIONAL TEXT STANDARD 1
Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers

COMMON CORE WRITING STANDARDS

STANDARD 1
Write opinion pieces on topics or texts, supporting a point of view with reasons.

STANDARD 7
Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations).

SPEAKING AND LISTENING STANDARDS

Participate in collaborative conversations

COMMON CORE STANDARDS OF MATHEMATICAL PRACTICE

MP.1 Make sense of problems and persevere in solving them.

NEXT GENERATION SCIENCE STANDARDS 5-ETS - ENGINEERING DESIGN

PERFORMANCE EXPECTATION 3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

PERFORMANCE EXPECTATION 3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

PERFORMANCE EXPECTATION 3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved
Elementary Food Rescuers Lesson Plan

Time: 1 instructional period (45 min - 1 hour). Pre and post design mission extension activities are included to extend scope of project if you have additional time.

Materials: Paper, pencils, crayons, markers, pipe cleaners, aluminum foil, cardboard boxes, paper towel tubes, construction paper, tape, glue, etc

Preparation: Space should be configured to allow participants to easily work in teams. Each team should consist of no more than 5 students for the most conducive learning environment. Feel free to play upbeat music during all steps while students work, and turn it down to give instruction. Display a widely-visible timer that lets students know how much time they have left during each step

OPTIONAL PRE-MISSION TASKS

This activity can be used in the day(s) prior to launching the design mission. These serve as supplemental materials to support students in their understanding of the topic.

CONDUCT RESEARCH

1. Students can investigate and research the problems of food waste within their own school communities prior to the Day of Design Mission by interviewing a school cafeteria employee. Options could include inviting them to speak to the class with students asking prepared questions. Alternatively, you could send the questions to the employee to respond to and then share with your class.

Sample questions:
- Where does our school food come from?
- How is the food stored?
- Is there food lost in the preparation process?
- Do we separate organics and inorganics into bins?
- Can we recycle food? Is composting available?
- What happens to the uneaten food or food that expires?
- Why do you think food is thrown away?
- What do you think are some possible solutions?
Step 1. UNDERSTAND THE PROBLEM (5 min.)

1. Class Brainstorm
   Ask students, Have you ever thrown away food at school? What was it? Why did you throw it away? What else could you have done besides throw it in the garbage? What could have helped you to NOT throw it in the garbage? (Depending on the grade level, students could write their responses in their handout or this could be a quick oral discussion.)

   Possible Responses:
   • Half of my sandwich. I didn’t like it.
   • Banana. It was rotten. I didn’t eat it soon enough.
   • Half-eaten apple. I could have composted it but we do not have a composting option at school.
   • I threw away my unopened carton of milk. I could have given it to someone else to drink. I don’t know where to put the milk so someone else could drink it.

2. Whole-class Share
   Ask students to share some of their answers. Be sure to get a wide variety of responses as to the type of food and ways that could have prevented the food from landing in the garbage.

3. Introduce Topic
   Share with the students the fact that nearly half of all food that is meant to be eaten gets thrown away in America. Using the images below, explain to students how food decomposes. Explain that it takes a long time for food to rot and and disappear in a landfill. This process of food rotting is called decomposition. Food decomposes more slowly in landfills than it would in nature or via composting. This is because the food in landfills is wrapped in plastic bags and buried under all the other garbage. The food needs oxygen to break down and it doesn’t get much oxygen in landfills. In fact, sometimes the food doesn’t decompose at all! For example, a package of hot dogs that was over 10 years old was found and it still looked good as new! All this food releases a harmful greenhouse gas called methane which is unhealthy for our Earth and contributes to global warming.

   Scientists and engineers are already working on creating new solutions but they need more ideas and that is where you come in.

   Image 1: When food waste rots or decomposes in landfills, it releases methane, a powerful greenhouse gas that contributes to global warming.
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   Image 2: An apple throughout the stages of decomposition. The food breaks down and unpleasant odors are produced. A greenhouse gas called methane is released into the air. When it decomposes in the soil, it can be turned into nutrient-rich material that can be used by other plants. When it is thrown away in the garbage and goes to a landfill mixed with other waste than it’s nutrients are NOT returned back to the soil.
   Photo credit: FLPA/Angela Hampton
**Step 2. DIG INTO THE MISSION (5 min)**
1. Tell students that there are many ways to reduce food waste at school and in our homes.
2. Ask students to share any stories of what they do to reduce food waste at home.
3. Share with students examples of some inventions that have been created.
   - **Compost**: If students are not familiar with composting, this infographic explains the process.
   - **Copia**: App that connects businesses with excess food to nonprofits who need it.
4. Provide time for students to write or sketch ideas in their student handout.
   
One example of how to reduce food waste is......

Some ideas I have to further help reduce food waste is......

5. Share with the class their mission - **The Day of Design Mission** is to design a new invention that will reduce food waste for your school cafeteria.

**Step 3. BRAINSTORM AND DESIGN (10 min)**
1. Say to students, "Talk to your team. What do you think is the "perfect" invention to help students reduce food waste in your school?" Remind students to think like engineers and be willing to use their knowledge in science, math and technology to help them think of ideas.

Guide students to consider the following:
   - What makes food spoil? How could we prevent food from spoiling?
   - What do we do with our leftover food? Could leftover food be turned into something useful?

2. After allowing students to discuss their ideas and capture notes for about 5 minutes. Then ask teams to sketch at least 3 different ideas that they would like to try to design today.

3. While the students are drawing, gather the prototype materials and place in an accessible location.

**Step 4. BUILD A PROTOTYPE (25 min)**
1. Explain to student teams that they can now use the resources you have set out to create a prototype for ONE their inventions. Let them know that it might not match their ideas completely, but it should help bring their ideas to life.

2. If time permits, have teams share their prototypes to one another. This could be done with a gallery walk with one member of the team staying by their prototype and explaining how it works to other teams OR you could have each team present to the entire class.
Extension Activities

Test Your Prototype
1. Discuss with your students how they can test their prototype in the school cafeteria, given the available materials used in the prototype. Have them record their ideas in the extension activities handout.

2. If possible, have students test their prototype and capture what they learned in the extension activities handout. Depending on the readiness of the prototypes, you may only have one team test their prototype or you may have all teams test.

Refine Your Prototype
1. Ask students to describe what they would change on their prototypes.

2. Teams can rebuild prototypes or complete another sketch.

3. If you have the time and resources, students can test the new prototype and continue to improve their invention. You can do this once, twice, or as many times as possible.

Share Your Solution
1. Plan to have students share their inventions with the school cafeteria or nutritional services department of your school district. Or extend this sharing to other local restaurant or grocery store owners.

2. Using the resources available to you, have students create a digital presentation with pictures or a short 1-minute video that describes the invention, how it works, and what students have learned about it. Encourage students to share ideas or designs that didn’t work as well because it’s important to let others know the challenges so that others can make better solutions for the future.