

WE Are Innovators

Elementary Resource

Module 3: Food Waste

AN INITIATIVE OF



MADE POSSIBLE BY








Welcome Educators

In partnership with Dow, WE is committed to empowering young people to change the world through innovation. When young people are encouraged to use an innovative mindset, they can put their creativity, observation, critical thinking and problem-solving skills to work and design a new solution to issues that challenge our local and global communities.

The WE Are Innovators steps:

- Introduce the module options and select one or more based on student interest and potential links to current classroom program or extracurricular groups
- Use the resources to explore the issue related to the module topic
- Learn about innovative scientific work being done and related career case studies
- Work as innovators to create a new idea for the issue
- Submit one idea per class or group for a chance to win a financial grant for your school and join on a ME to WE Service Trip!

Module	Students will explore
<p>Sustainable Innovation </p> <p>Guiding Questions</p> <p><i>How can science combined with critical thinking and creative problem-solving skills work together to solve social issues?</i></p> <p><i>How can science be used safely while still meeting the needs of the world's population?</i></p>	<ul style="list-style-type: none"> • What is an innovative mindset? • What types of skill sets, problem-solving styles and knowledge support an innovative mindset? • What makes a solution sustainable? • How do scientists work safely? • What does work look like in this area? How do Dow scientists approach problems?
<p>Circular Economy and Nature </p> <p>Guiding Questions</p> <p><i>How do human behavior, attitudes and mindsets about consumption contribute to a sustainable planet?</i></p> <p><i>How can science create opportunities beyond the original "reduce, reuse and recycle" approach?</i></p> <p><i>How can innovative designers contribute?</i></p> <p><i>How can nature lead us to a more sustainable world?</i></p>	<ul style="list-style-type: none"> • What is "responsible consumerism?" • How can an innovative mindset impact product development or change a related behavior? • What does work look like in this career area?

Module	Students will explore
<p>Food Waste </p> <p>Guiding Questions</p> <p><i>How does food waste impact our ability to eradicate hunger?</i></p> <p><i>How can science create ways to keep food fresher longer?</i></p> <p><i>How will food preservation ultimately save resources?</i></p>	<ul style="list-style-type: none"> • What is meant by food waste and what are the statistics? • How does innovation in packaging and refrigeration keep food fresh? • How can technology support human behavior to prevent food waste? • What does work look like in this career area?
<p>Energy and Housing </p> <p>Guiding Questions</p> <p><i>How can choices about how we build and maintain homes and buildings create efficiency?</i></p> <p><i>How does energy efficiency affect the environment?</i></p>	<ul style="list-style-type: none"> • What makes a home energy efficient? • How exactly do building materials and products save energy? • What opportunities are there in homes and buildings that will create energy efficiency? • What does work look like in this career area?
<p>Transportation Solutions </p> <p>Guiding Questions</p> <p><i>How can transportation options be accessible for all?</i></p> <p><i>How can transportation solutions be safe for both people and the planet?</i></p>	<ul style="list-style-type: none"> • What are the physical and economic barriers to transportation in urban and rural areas? • How do conventional transportation options impact the environment? • How can science and technology support the development of sustainable transportation? • What does work look like in this area?

Visit www.WE.org/we-schools/program/campaigns/we-are-innovators to download the application.

Our Learning Skills Legend



Argument formation



Information literacy



Leadership skills



Organization



Action planning



Research and writing



Critical thinking



Reflection

Word Bank	Materials
Food Waste—The decrease of food in subsequent stages of the food supply chain intended for human consumption.	<ul style="list-style-type: none"> • Chart paper • Tape • Colored markers • A computer with Internet access • Speakers • Appendix 1: Working Toward Sustainable Innovation • WE Are Innovators – Educator Planning Form • Innovators Today Challenge – Student Planning Form • Blackline Master 1: Food Waste Mind Map • Blackline Master 2: Food Waste Facts
Harvest—To gather or collect a crop.	
Innovate—Make changes in something established, especially by introducing new methods, ideas or products.	
Innovator—A person who introduces new methods, ideas or products.	

Sources: www.oxforddictionaries.com, www.fao.org/food-loss-and-food-waste/en

Module 3:

Food Waste



Overview:

This module is designed to help students understand how food waste contributes to social, economic and environmental issues, both locally and globally. Students will explore how wasting edible, nutritious food contributes to the depletion of natural resources and global food insecurity.

Through this module, students will be introduced to innovative people and organizations that are designing alternative products and services to address local and global problems.

Students will then use their creativity and imagination to develop their own original, innovative and sustainable idea that will help to reduce food waste locally or globally.

One idea from each group or class can be submitted to the **WE Are Innovators Challenge!**

How to Use This Module :

The five parts of this module are designed to develop student understanding of the issues around food waste and how innovation and creativity can be used to develop solutions for the future.

1. Exploring the Issue

Engage students in learning about social, economic and environmental issues affecting both local and global communities.

2. Thinking Outside the Box

Introduce students to people and organizations that are developing new and innovative solutions to help address local and global issues.

3. Become an Innovator

Challenge students to use their creativity and innovation skills to develop an idea that will address the environmental issues they care most about.

4. Share and Reflect

Students will be given opportunities to share their ideas within the school and potentially their local community. Students will reflect on what they have learned about themselves as innovators and their power to shape the future.

5. WE Are Innovators Challenge

Encourage students to submit their ideas to the WE Are Innovators Challenge!

Use the Educator Planning Form to personalize the module to fit the needs of your students. The recommended module timeline is designed to be flexible enough to adapt to your current unit plans.

The module can be used as part of an existing Science unit or as part of an integrated unit that combines Science, Social Studies and English Language Arts.

The culminating activity of creating an innovative solution offers assessment and evaluation opportunities as students apply their science knowledge and skills to a real-world context. It is important to note that Internet access will be required to access videos and articles used in this module. Make sure to review your school or district's Internet-use policy before you begin.

Exploring the Issue:

Educator's Note: Based on discussions and case studies presented in this module, students will explore how innovators use creativity, observation, critical thinking and problem-solving skills to identify and understand problems or issues, and how they develop unique and effective ways of seeking solutions. They will learn how innovators often see large and complex problems as challenges and focus on possibilities first and the obstacles second. Students will see how resilience and reflection help innovators overcome obstacles and adjust until their idea is the best it can be. Albert Einstein once said, "We cannot solve a problem by using the same kind of thinking we used when we created them."

1. Create a large space in the classroom and divide in half by placing a strip of tape down the center. Label one side of the space A and the other side B.

Educator's Note: This simulation activity is designed to help students understand the issue of global food waste. Students will be asked to move around the classroom to represent different food waste statistics. If space is a concern, an alternative would be to have students remain in their seats and stand to represent the statistic.

2. Ask all students to stand on the A side of the space to begin the activity. Follow the steps below to guide students through the simulation.
 - a) Inform students that as a group, they represent the world's population of 7.6 billion people.
 - b) Explain that around the world there are many people who go to bed every night with an empty stomach. In fact, 815 million people do not get enough food to eat. That represents roughly 1/9 of the world's population.
 - c) Ask 1/9 of the group of students to move to the B side of the space. For example: if you have a class of 27 students, ask three students to move to the B side. If the group cannot be divided equally, make as close an approximation as possible.
 - d) Ask students where they think the people on the B side, representing people who experience hunger, currently live.
 - e) Once students have made their predictions, explain that, while over 11 million people who experience hunger live in developed countries like the United States and Canada, the majority live in developing countries like Yemen, Sierra Leone and the Central African Republic.
 - f) Have all students return to the A side.
 - g) Inform students that they now represent all the food produced in the world. At the moment, many believe we produce more than enough food to feed everyone in the world.
 - h) Pose the question: How is it possible for us to produce enough food and still have people who are hungry? Ask students to share their ideas with the person closest to them.

- i) Explain to students that while many factors contribute to the issue of hunger, one of them is food waste. This is when nutritious food is not eaten or discarded.
- j) Ask students to predict what percentage of all the food produced is wasted.
- k) Ask 1/3 of the group of students move to the B side of the space. Inform students that students on the B side now represent the 1.3 billion tons of food that is wasted every year: 1/3 of the total amount of food produced.
- l) Ask students to consider that 1/3 of food that is wasted (represented on the B side) and pose the question: What percentage of food is wasted by developed countries and what percentage is wasted by developing countries?
- m) Once students have made their predictions, inform them that developed and developing countries lose or waste almost the same amount of food, but for different reasons.
- n) Have students to return to their seats to explore those reasons.

Sources:

- www.fao.org/save-food/resources/keyfindings/en
- www.huffingtonpost.com/eric-holt-gimenez/world-hunger_b_1463429.html
- www1.wfp.org/zero-hunger
- www.worldhunger.org/2015-world-hunger-and-poverty-facts-and-statistics

Educator's Note: As students share their predictions, post them on the front board or on a piece of chart paper.

3. Ask students to return to their seats and debrief the activity using the following discussion questions:
 - What surprised you most about those statistics?
 - How did that experience make you feel?
 - What do you know now about food waste that you didn't before?
4. Explain to students that in developing countries food is wasted during production or harvesting because it is often not packaged, stored or transported properly. In developed countries, food is wasted by consumers or retailers because food that is not purchased or eaten is thrown away.
5. Show students "Food Wastage Footprint," www.youtube.com/watch?v=loCVrkcaH6Q (3:15) to explore this idea further.
6. Give each student a copy of **Blackline Master 1: Food Waste Mind Map** and have them write or draw what they have learned about how and why food is wasted and what effect it has on people and the environment.

Thinking Outside the Box:

1. On the front board or on a piece of chart paper, create a T-chart and label one column *True* and the other *False*.
2. Print one copy of **Blackline Master 2: Food Waste Facts** and cut them into individual facts.
3. Read each fact to the students and ask them to identify whether they believe it to be true or false. Place the fact on the side of the T-chart that corresponds to the students' response.
4. Discuss each fact and ask students to justify their thinking. Confirm whether the fact is true or false and move it to the correct place on the T-chart. Continue until all the facts are in the correct place.

Educator's Note: The correct answers to the activity are: 1. True; 2. False—sub-Saharan Africa; 3. True; 4. False—300 million people; 5. True.

5. Explain to students that innovators around the world are working to find ways to address the different causes of food waste.

An innovative idea is a new or creative idea that changes the way we think about a problem. At first, innovative ideas may seem impossible or unrealistic, but the innovators who create them use their imagination and perseverance to bring these ideas to life.

Source: www.oxforddictionaries.com

Educator's Note: Post the definition of *innovative idea* on the board for students to refer to throughout the module.

6. Use one or more of the following options and the guiding question, to explore how innovative people and organizations around the world are trying to put an end to global food waste.

Option 1: Innovative Packaging

Dow is a leader in sustainable innovation. Their 2025 Sustainability Goals are designed to support the United Nations Sustainable Development Goals and to advance the well-being of humanity by helping lead the transition to sustainable planet and society. To learn more about Dow's 2025 Sustainability goals, check out www.dow.com/en-us/science-and-sustainability/2025-sustainability-goals.

- Haley Lowry is the Global Marketing Director for Value Chain and Pack Studios at Dow. She and her team work to create innovate packaging solutions to help extend the shelf-life of food and reduce food waste. To learn more about Haley and her work, check out **Appendix 1: Working Toward Sustainable Innovation**.
- Oge Anazia is a Senior Product Stewardship Specialist for packaging and specialty plastics at Dow. She works to ensure the laminating adhesives used in food packaging are safe for people and the environment. To learn more about Oge and her work, check out **Appendix 1: Working Toward Sustainable Innovation**.

Guiding Questions:

- a) Why is Dow committed to reducing global food waste?
- b) What skills or knowledge in science and technology do Dow employees like Haley and Oge use in their work?
- c) What positive impact does their work have on people and the environment?
- d) How does their work represent sustainable innovation?

Option 2: Rethinking Refrigeration

In developing countries, electricity is often not available or inconsistent. Food is wasted because of a lack of access to refrigeration. Explore the links below to see how innovators are developing new ways to bring refrigeration technology to areas that do not have access to it.

- "Canadian Students Have Invented a Fridge That Runs Without Electricity," www.businessinsider.com/windchill-the-powerless-refrigerator-2015-11 (1:45)
- "No Electricity? A Low-Tech System Keeps Things Chilled," news.nationalgeographic.com/2016/12/mohammed-bah-abba-explorer-moments-cooling-technology-helping-Africans/
- "Say NO to Food Wastage – Class 12 Student Dikshita Khullar Develops a Fridge Which Does Not Require Electricity," www.beaninspirer.com/say-no-to-food-wastage-class-12-student-dikshita-khullar-develops-a-fridge-which-does-not-require-electricity

Guiding Questions:

- a) How, specifically, does this technology have the potential to reduce food waste?
- b) What positive impact does this idea have on people and the environment?
- c) Could all farmers use this technology? What challenges or problems could they have if they choose to do so?
- d) Why are these innovative ideas?



Extension: Around the world, innovators are using software technology to develop apps that help to address the issue of food waste. Check out the links below to explore the apps that are helping to eliminate food waste.

- "Food Cloud," www.food.cloud
- "Food Cowboy," www.foodcowboy.com
- "Cheetah," www.cheetahdevelopment.org

Guiding Questions:

- How are these apps helping to end food waste?
- What positive impact does this idea have on people and the environment?
- Why are these innovative ideas? How does it change the way we think about food waste? (Refer to the definition of *innovative idea*.)
- Are there other apps that are trying to address the problem of food waste?



Extension: Challenge students to find ways to monitor and reduce the food wasted at school. As a class, develop an action plan for how students could create a initiative like "Waste-Free Lunch Week" to raise awareness and encourage other students and lunch workers to reduce food waste as well. This experience will help students to deepen their learning in preparation for creating their own innovative idea.



Enrichment: To help students understand more about how their local community is addressing food waste, encourage them to investigate and get involved with groups or initiatives that are finding innovative and sustainable way to reduce food waste.

Become an Innovator:

- Divide students into small groups and challenge them to design their own innovative idea that can help address the issue of food waste. Remind students that designing an innovative idea will draw from their imagination and creativity. Challenge them to consider ideas that have never been tried before.
- Provide each student or group with a copy of the **Student Planning Form** to support their work.

Educator's Note: Explain to students that innovators and scientists must also think about their own safety and the safety of those around them. They must always consider hazards or safety risks while they are working or developing their ideas. Discuss each group's ideas and identify any health or safety risks they might present. For example: If students will need tools to develop their ideas, they must consider what safety equipment will be required to use those tools.

- Inform students that once they have designed their idea, it will be presented to the class. Advise students on the presentation format they should use, or allow students to choose a presentation method that best suits their idea.

Share and Reflect:

- Ask each group to present their idea to receive feedback. The process of answering questions, clarifying ideas and justifying their thinking will encourage students to continue to develop their innovative mindset and will allow them to return to their idea and make any adjustments or revisions they think are necessary.

Educator's Note: If this presentation will be used to assess students' knowledge and skills based on curricular expectations, it's important to first establish research and/or presentation criteria with students so they are clear about what is expected.

- As innovative ideas are completed, create an opportunity for students to present their ideas to other classes in the school, to parents or to other community members. This will not only allow students to celebrate their achievements, but also to take action and raise awareness for issues around food waste in their local and global communities. Consider using one of the following options:
 - Host an "Innovation Fair" where students can display and present their ideas at different stations in the school library or a large meeting area and present them to other classes, parents or community members.
 - Ask each group to create a short presentation and record it using video recording software. Share the video on the school website or other social media platforms. Make sure to refer to the school or district Internet-use policy before posting anything online.
- Collect all **Student Planning Forms** and presentation materials and conclude the module by asking students to write a reflection in response to one of the following questions:
 - What have you learned about the importance of an innovative mindset and approach?
 - How can innovation in science create positive change in local and global communities?
 - To what extent do you see yourself as an innovator?
 - What skills or attitudes do you still need to develop?
 - How has this experience changed the way you feel about the power of science to solve problems and challenges in the world?

4. Encourage students to make connections to the United Nations Sustainable Development Goals. Introduce students to the United Nations Sustainable Development Goals by showing them "The World's Largest Lesson 2016," www.vimeo.com/178464378. Examine the purpose of the goals and what each of the 17 goals are by visiting www.un.org/sustainabledevelopment/sustainable-development-goals. Challenge students to justify how their innovation idea supports one or more of the sustainable development goals. Investigate how to contact the United Nations and ask each group to compose a letter to send that outlines what their idea is and how it would contribute to achieving the goal(s) by the UN's 2030 deadline.

WE Are Innovators Challenge:

1. Challenge students to submit their idea to the WE Are Innovators challenge.
2. Students will need to describe the idea and its potential impact on the issue. Take photos of any prototypes or models students created.
3. To submit an idea, download the application form from www.WE.org/we-schools/program/campaigns/we-are-innovators.

Appendix 1: Working Toward Sustainable Innovation

Haley Lowry

What is your role at Dow?

I am the Global Marketing Director for Value Chain and Pack Studios at Dow. My job is to bring together people from different parts of the industry to work together to help innovate and improve packaging.

What is your educational background?

I attended Clemson University and earned my bachelor of science in marketing and economics. I then went on to complete my masters of business administration at University of Texas at Austin.

What brought you to Dow?

I was hired into Dow's Commercial Development Program. The program gave me an opportunity to learn more about the company in a unique way by working on a variety of projects in sales, marketing and customer service.

What do you like most about your job?

I've always challenged myself to think beyond what I know, and in my time at Dow, I have gained a deeper appreciation for the critical role packaging plays in marketing and innovation. Not to mention that the people in this industry are extremely intelligent and amazing to learn from. It's these people and the opportunity for global roles and global impact that continues to make working in the industry and at Dow so appealing.

What does being an innovator mean to you?

I've grown to embrace the things we learn from failure. The more I'm able to do this, the more my teams feel comfortable taking risks. This is how we create change. Imagine if Dow, or anyone else in the industry, feared failure. I don't believe we'd be creating breakthrough innovations like we are now.

How can science, critical thinking and creative problem-solving work to solve social issues?

The TED Talk, "Don't Quit Your Job, Use It for Good," was a big influence on my opinion regarding this. It was a pivotal point for me. I realized I didn't have to be a doctor, teacher or leader of an NGO to make an impact. I've spent every day in this industry taking advantage of opportunities to make an impact on the world.

How do jobs in fields like science, engineering and manufacturing contribute to innovation?

There are many opportunities to contribute to innovation, but many are not possible without collaboration. Dow's Pack Studios initiative is a great example of this. By working together with a global network of packaging specialists, along with world-class equipment, we are able to develop innovative packaging that helps extend the shelf life of food.



Appendix 1: Working Toward Sustainable Innovation

Oge Anazia

What is your role at Dow?

As a Senior Product Stewardship Specialist for packaging and specialty plastics, I work on product safety of laminating adhesives used in food packaging.

What is your educational background?

I have a bachelor's degree in industrial chemistry and a master's degree in chemistry from Western Kentucky University.

What brought you to Dow?

I love the idea of being part of a company that cares deeply about helping the community. I love to educate people and I was happy to know that Dow was looking to hire someone like me who is passionate about safety.

What do you like most about your job?

I love that my job allows me to ensure the safety of our adhesive products. I'm happy knowing that I have done my due diligence to ensure that our adhesives are made, used and recycled in a safe manner and that they will not have any adverse effects on our health and environment. I also enjoy working to keep our products and company compliant with all the food regulations and laws of our country and of other countries where our products are used.

What does being an innovator mean to you?

An innovator is someone who makes changes or introduces new methods and processes for making things. An innovator is someone who turns problems and challenges into opportunities that will bring positive change.



WE Are Innovators - Educator Planning Form

Lesson	Length (# of days)	Start Date	End Date
Exploring the Issue			
Thinking Outside the Box			
Becoming an Innovator			
Share and Reflect			
WE Are Innovators Challenge			

Learning Goals

Personalize to fit within your school district context and long-range program goals.

-
-
-

Curricular Expectations and/or Outcomes to Be Assessed:

How will I connect this to my existing curricular expectations?

-
-
-

Grouping

- Small groups
- Whole class
- Other: _____
- _____

Integrated unit: Yes No

Subject areas:

Opportunities for Cross-curricular Planning:

What connections or links can I make to other subject areas?

- English Language Arts: _____
- Communications/Technology: _____
- Social Studies (History/Geography): _____
- Science: _____
- The Arts (visual or performing arts): _____
- Other: _____

Options for Summative Assessment:

- Presentation
- Product: _____
- Reflection
- Other: _____

Planning Considerations:

What resources will I need to help students create and present their ideas? Who will I need to consult?

Options for Extension/Enrichment:

How can the class or individual students go beyond the WE Are Innovators Challenge?

WE Are Innovators Challenge - Student Planning Form

<p>What area of innovation will I focus on?</p> <p><input type="checkbox"/> Sustainable Innovation</p> <p><input type="checkbox"/> Environmental Protection</p> <p><input type="checkbox"/> Food Waste</p> <p><input type="checkbox"/> Energy and Housing</p> <p><input type="checkbox"/> Transportation Solutions</p>	<p>What are my key dates?</p> <p>Draft due:</p> <p>Final version due:</p> <p>Presentation:</p>
<p>What problem am I trying to solve?</p> <p>Why is it important to me?</p>	
<p>Guiding Questions</p> <ul style="list-style-type: none"> • How does this problem effect people, animals or the environment? • In which region, country or city does this problem occur most? • What information do I still need to find out? 	<p>What do I already know about the problem?</p>
<p>Guiding Questions</p> <ul style="list-style-type: none"> • How will these ideas help to solve the problem? • Which idea do I think will work best? • How will it have a positive impact on people and the environment? 	<p>What ideas could help to solve this problem?</p> <p>List all your ideas, even those that seem impossible!</p>

Blackline Master 1: Food Waste Mind Map



Blackline Master 2: Food Waste Facts

1. Fruits and vegetables, have the highest wastage rates of any food.

2. Every year, consumers in rich countries waste almost as much food as all the food produced in China.

3. North America wastes more fish and seafood than any other area of the world.

4. The food currently lost in Africa could feed a million people.

5. In stores and supermarkets, large quantities of food are wasted because they don't look the way consumers want.

Source: www.fao.org/save-food/resources/keyfindings/en