INNOVATIONS FROM FARM TO COMMUNITY

Overview: In this lesson, students will research the emergence and evolution of dairy as an industry in the United States. After recording their notes in an organizer, they will examine ways that the dairy industry has promoted animal care, remained sustainable, and increased product efficiency. Students will investigate how dairy farmers are environmentally conscious and are working toward a zero-carbon footprint future. Finally, students will use the engineering design process to use an innovation from the dairy industry to inspire change in their community.

Suggested Time: Three 45-minute classroom sessions

Grade Levels: 5–8

Objectives

- Students will research the evolution of the dairy industry and record research notes.
- Students will examine the ways that the dairy industry has promoted animal care, remained sustainable, and increased efficiency.
- Students will use the engineering design process to use innovations from the dairy industry to inspire change in their community.

Standards

Next Generation Science Standards

MS-ESS3-3—Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

MS-ETS1-1—Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

MS-ETS1-2—Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

Common Core ELA Standards

R.I.1—Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

W.7.—Conduct short research projects to answer a question, drawing on several sources and refocusing the inquiry when appropriate.

W.6.8—Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information.

CCSS.ELA—LITERACY.SL.6.1- Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.

CCSS.ELA—LITERACY.SL.1.A- Come to discussions prepared, having read or studied required material; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.

CCSS.ELA—LITERACY.SL.1.C- Pose and respond to specific questions with elaboration and detail by making comments that contribute to the topic, text, or issue under discussion.

Materials

- Computer with the ability to project
- Sticky notes
- Computers or devices, one per student
- Research Notes Handouts, one per student
- Innovations from Farm to Community Handout, one scenario per student group
- Engineering Design Process Handout, double-sided, one per group of four students
- Everyday recycled materials for engineering challenge. Examples include cardboard, masking tape, paper towel rolls, pipe cleaners, rubber bands

Procedure

Class 1

Before class begins, hang the Agree/Disagree signs on the walls of the opposite side of the room.

1. Before class, take a few minutes to record the following words on the white board or interactive board: farming, engineering design process, innovation, sustainable, animal care, efficient, dairy.

2. Ask students to read the words on the board and make predictions about what the class will be learning over the next few days, then record some notes in their notebooks.

3. Call on students to share their ideas. Explain to students that, over the next few days, they will be investigating the history of the dairy industry in the United States and how the industry has strived to promote animal care, remain sustainable, and increase product efficiency. They will also read articles of how farmers all over the country work with communities to accelerate our progress towards common sustainability goals.

Finally, students will be asked to use the engineering design process to assist the dairy industry to further our progress toward a zero-carbon footprint future.

4. Distribute the **Research Notes Handouts** and explain that students will be spending some time establishing background knowledge regarding the dairy industry using three different sources.

5. Write the following sources on the board, project using interactive board, or post onto class website:

   a. https://www.nal.usda.gov/exhibits/speccoll/exhibits/show/the-american-dairy-industry

   b. https://www.usdairy.com/news-articles/innovation-leads-to-better-life-for-cows-farmers

   c. https://www.usdairy.com/news-articles/cooperative-effort-diverts-food-waste

6. Model the use of the Research Notes Handout using the first source or read through the handout with students to ensure that the directions are clear. This includes recording the source information for each research document at the top of the page.

7. Allow students the remainder of the class period to read and take notes on source 1.

8. Wrap up the lesson by asking students to record one thing they learned on a sticky note and place it on the board. Take a moment to share 3–4 of the sticky notes before dismissal.

Day 2

1. Before students enter the room, write the following instructions on the board: "As you walk in, open your notebook and draw a quick picture summarizing what you learned during yesterday's class."

2. Ask 2–3 students to share their drawings or choose drawings at random to project on the board.

3. Explain to students that today they will be continuing their research on the dairy industry using three credible sources. Review the note-taking process with students, making sure that they record the source information at the top of each note-taking page.

4. Allow the remainder of the period for students to finish their research.

5. At the end of class, ask students to turn to a partner and share one thing they learned during today's research. Call on partners to report out to the class.

Day 3

1. Explain to students that now that they have a preliminary understanding of the dairy industry, and how farming has changed over time, they have been chosen for an important job. Inform students that they have been asked by farmers to think about how they can use innovations from the dairy industry to inspire change in their community.

2. Arrange students into groups of four and distribute one scenario from the **Innovations from Farm to Community Handout** to each group. Several groups may have the same scenario. Invite students to read their scenario and provide time for students to ask any clarifying questions. Students should use the story on the scenario card to brainstorm how they can use that same approach to solve a problem in their school or community.

   A link to a full article is provided with their scenario if students want to learn more about the innovation.

3. Distribute the **Engineering Design Process Handout**. Allow students 10 minutes to answer the first two rows of the handout ("Ask, Identify," and "Imagine"). Monitor student progress and answer any questions that arise.

4. Then, explain to students that they will move onto the "Plan" steps. Provide 10 minutes for students to complete these steps.

5. Ask each group to share their early ideas with the class and gather feedback from peers. Organize presentations so students with the same scenario can compare and contrast their concepts. And make sure each group shares how they were inspired by their scenario!

6. If time allows, students may progress to the "Create" and "Test" steps using the feedback they received from their peers. They can build a prototype using consumable classroom materials to visualize their innovation in 3D.
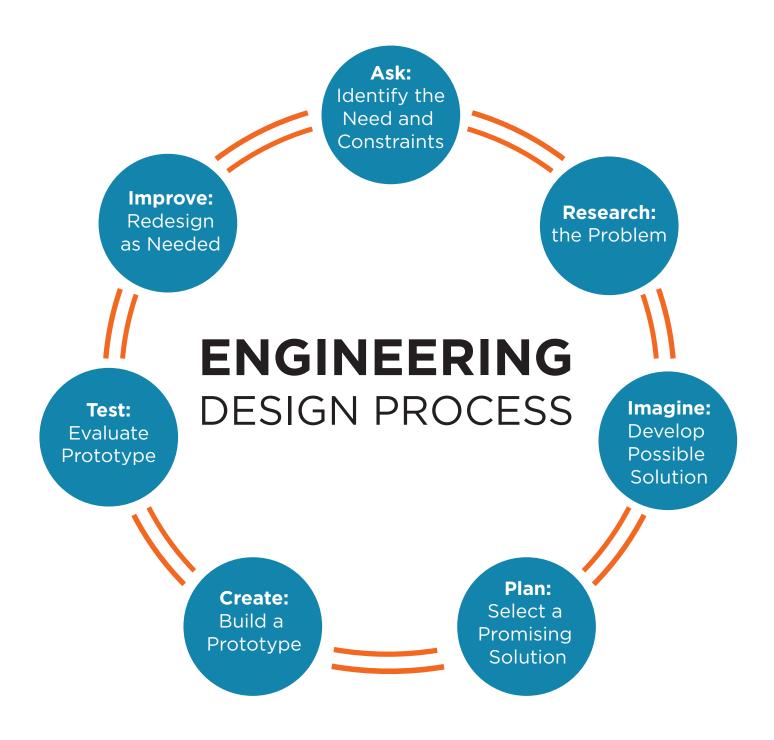
Take Action!

We learned that farmers work with communities to collaborate and accelerate progress towards common sustainability goals. Encourage students to share ways they are fueling their good as it relates to their body, their community, and the planet by visiting **https://www.fuelyourgood.com/** and using #fuelyourgood #contest to share your story! Get started finding the action you want to take to promote healthy eating and to get active using our **Fuel Up to Play 60 Playbook**.

ENGINEERING
DESIGN PROCESS

- **Ask:** Identify the Need and Constraints
- **Research:** the Problem
- **Imagine:** Develop Possible Solution
- **Plan:** Select a Promising Solution
- **Create:** Build a Prototype
- **Test:** Evaluate Prototype
- **Improve:** Redesign as Needed

Source: teachengineering.org

ENGINEERING DESIGN PROCESS HANDOUT

Part II: Designing Your Solution

Scenario: Use the engineering design process and the following graphic organizer to plan your project with your group.

Process Step	Notes/Sketches
ASK: Define the problem/ scenario	
IDENTIFY: Constraints (money, time, materials)	
IMAGINE: Brainstorm 2–3 possible ideas/solutions	
PLAN: Select top idea	
PLAN: Draw prototype	
CREATE: Test/evaluate prototype *if time permits, some teachers may choose to omit this step	
TEST and **IMPROVE:** Improve prototype *if time permits, some teachers may choose to omit this step	
SHARE SUCCESSES (this will be presented to the class)	

RESEARCH NOTES HANDOUT

Source 1

Source Information:

Examples of animal care	Examples of sustainability	Examples of efficiency

Other interesting facts or notes:

RESEARCH NOTES HANDOUT

Source 2

Source Information:

Examples of animal care	Examples of sustainability	Examples of efficiency

Other interesting facts or notes:

RESEARCH NOTES HANDOUT

Source 3

Source Information:

Examples of animal care	Examples of sustainability	Examples of efficiency

Other interesting facts or notes:

INNOVATIONS FROM FARM TO COMMUNITY HANDOUT

Wastewater	Bill Rowell's dairy farm in Vermont accepts water from a local ice cream factory that flushes their ice cream lines every time it has a flavor change. This flavored wastewater finds a second life on their farm's methane digester to produce energy for their farm. What are ways your community could use wastewater from a local business? Learn more: **https://www.usdairy.com/news-articles/ice-cream-helps-dairy-farm-put-energy-on-the-grid**
Food Waste	Celebrating holidays and special events can lead to food leftovers and maybe even food waste. What are ways you can encourage your peers to get creative with leftover food at lunch? Get inspired: **https://www.usdairy.com/news-articles/3-ways-restaurants-tackle-food-waste**
Sustainable Energy	Doug and Jane Popp, Minnesota dairy farmers, harness solar and wind power to handle about half of their farm's energy needs. Is there a windy part of your community or school grounds that would be a great spot for a windmill? Or a really sunny area for solar panels? What could it power? Energize your community: **https://www.usdairy.com/news-articles/how-a-focus-on-sustainability-energizes-this-minnesota-dairy**