Virtual Field Trip Educator Guide

Question: What do you get when you combine the unique needs of those in the agriculture industry with the skills of engineers, designers, technicians and specialists from Ford Motor Company?

Answer: A unique Virtual Field Trip (VFT)!

On **November 29 at 1 p.m. EST**, students will go behind-the-scenes of Ford Motor Company in Dearborn, Michigan to learn how the agricultural industry impacts the engineering design process of Ford trucks and how an agricultural background helps employees shape the design, production and testing phases of the manufacturing process.

Learn how Ford uses STEM (science, technology, engineering and math) and advanced technologies like 3-D printing and virtual reality to solve the practical challenges faced by those in agriculture fields, and meet customers who use Ford trucks to maximize their productivity and efficiency in their day-to-day agricultural jobs.

This companion guide has been designed to help educators connect and extend the learning from the VFT to classroom concepts. Activities are flexible enough to be used before or after the VFT.

Students will

- identify authentic problems and solutions that engineering design helps to address.
- define the criteria and constraints of an engineering design challenge, based on customer needs.
- propose, develop and redesign a solution to an engineering design challenge.
- research careers related to engineering design.

Correlating Standards

Next Generation Science Standards (NGSS)

- 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.
- HS ETS1.B: Developing Possible Solutions. When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts

Common Core Standards

- RST.6-8.9 Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
- WHST.6-8.2.b Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.
- RI.6.3 Analyze in detail how a key individual, event, or idea is introduced, illustrated, and elaborated in a text (e.g., through examples or anecdotes).
- W.9-10.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.

Standards for Technological Literacy

- 15: Students will develop an understanding of and be able to select and use agricultural and related biotechnologies.
- 15.K: Agriculture includes a combination of businesses that use a wide arrary of products and systems.

Activity 1: Demand Influences Design

During the Virtual Field Trip, students observed how market researchers and consumers help inspire features and materials used in Ford trucks for agricultural use. In this activity, student teams will work together to simulate the process engineers go through to design and construct a product based on consumer needs.

Materials

- Access to the Internet
- "You Be The Designer" challenge sheet
- Everyday materials in the classroom and/or at home such as paper clips, tape, construction paper, plastic bags

1. Ask student groups to recall from the VFT different ways that consumer needs and market researchers have influenced the design of Ford trucks. They can simply report answers or organize answers into a need/solution table. Example:

Consumer Need/Problem	Solution
Difficult to get into the truck box	Designed an extended running board and a step that extends from the back of the cab. The latter has a handle to make access easier.
Need extra storage	Designed system of hidden storage in the cab.
Visibility is limited from the front seat	Designed drop down window to increase size of glass.

2. Invite groups to report their answers, and draw conclusions about how product designs are often influenced by customer needs.

3. Review the engineering design process with students.

   - Ask: Identify the problem, the need, the criteria and the constraints
   - Research: Learn as much as you can about the problem
   - Imagine: Develop possible solutions
   - Plan: Select a promising solution
   - Create: Build a prototype
   - Test: Test and evaluate the prototype
   - Improve: Redesign as needed

4. Tell student groups that they will have an opportunity to use the engineering design process to design and construct a product, based on consumer needs.

5. Distribute the "Challenge" activity sheet, and review directions with students.

6. Give students ample time to complete their designs and prototypes.

7. Provide time for students to share their proposed solutions to the class. As other groups observe, they should evaluate the concepts based on the criteria and constraints. This can be recorded as a tally or on a Likert scale.

8. After all groups have shared their ideas, encourage students to reflect on how they would modify their designs based on feedback and seeing other designs. Summarize with students why it is important to develop products based on consumer wants and needs.

9. Invite students to make connections between the challenge they just completed and the challenges faced by those who design transportation solutions for those in the agriculture industry.

Activity 2: Careers in Action

Materials

- Access to the Internet
- "Career Profile" Activity Sheet

During the VFT, you met many professionals who are dedicated to helping solve the unique transportation, design and technology needs of those in the agriculture industry. From designers to ergonomic engineers, each career plays a unique role in addressing consumer needs and moving from initial idea to final product.

Several careers were discussed during the VFT, either by name or description, and some of the careers are listed below. Ask students to share what they remember, if anything, about these jobs:

- Autonomous Vehicle Testing Specialist/Automation Technician
- Designer/Graphic Designer
- Electrical Engineer
- Equine Veterinarian
- Geospatial Analytics Scientist
- Hydraulic Technician
- Marketing Manager/Marketing Specialist
- Mechanical Engineer
- Process Engineer
- Production Manager

Challenge students to choose one of the careers listed above to learn more about. They can conduct research for all listed careers at AgExplorer.com. Invite them to record their research on the Career Profile (attached).

Once research is completed, invite students to create groups with at least three different careers represented. Direct students to share what they learned about their careers with other group members. Then, distribute the "Agriculture Careers Similarities and Differences" student activity sheet. Challenge group members to complete the Venn diagram by listing unique descriptions of each career in the outer circles and similarities between the careers where the circles overlap. Finally, invite students to discuss which careers, of the ones they researched, sound most interesting to them, and why.