



Lesson Plan

Turning Carbon Dioxide into Plastic

Created: 09/2016 by the National FFA Organization

STUDENT LEARNING OBJECTIVES:

After completing these activities, students will...

1. Explain sustainable agriculture.
2. Examine the process of turning carbon dioxide into plastic.

TIME REQUIRED: 30 minutes

RESOURCES:

1. FFA.org
2. Video: "Ford: Turning Carbon Dioxide into Plastic,"
<https://youtu.be/tEkOheG4vnk?list=PLCFM1h5Oz66hkdqgp8t7d4pX-9sAAhphK>

EQUIPMENT AND SUPPLIES NEEDED:

1. A copy of the "Turning Carbon Dioxide into Plastic" worksheet for each student.
2. A copy of the "Exit Ticket: What Did You Learn?" worksheet for each student.
3. A copy of the "Infographic – Rubric" handout for each student.
4. Internet access to play the video in real time or embed it in a PowerPoint ahead of time.

THIS QUICK LESSON PLAN WOULD WORK WELL AS:

1. Part of a unit about sustainable agriculture.
2. Part of a unit in an agricultural mechanics course.

THESE ACTIVITIES ARE ALIGNED TO THE FOLLOWING STANDARDS:

AFNR Performance Element

- CS.01. Analyze how issues, trends, technologies and public policies impact systems in the Agriculture, Food & Natural Resources Career Cluster
- CS.06. Analyze the interaction among AFNR systems in the production, processing and management of food, fiber and fuel and the sustainable use of natural resources.

FFA Precept

- FFA.PL-A.Action: Assume responsibility and take the necessary steps to achieve the desired results, no matter what the goal or task at hand.
- FFA.CS-M.Communication: Effectively interact with others in personal and professional settings.
- FFA.CS-N.Decision Making: Analyze a situation and execute an appropriate course of action.
- FFA.CS-P.Technical/Function Skills in Agriculture: Obtain knowledge and skills needed for a career in agriculture and related industries.

Common Career Technical Core

- AG1 Analyze how issues, trends, technologies and public policies impact systems in the Agriculture, Food & Natural Resources Career Cluster.
- AG2 Evaluate the nature and scope of the Agriculture, Food & Natural Resources Career Cluster and the role of agriculture, food, and natural resources (AFNR) in society and the economy.

NASDCTEc

- AGC10.03 Compare and contrast issues affecting the AFNR industry including biotechnology, employment, safety, environmental and animal welfare to demonstrate an understanding of the trends and issues important to careers in this industry.

AFNR Cluster Skills

- CS.01. Analyze how issues, trends, technologies and public policies impact systems in the Agriculture, Food & Natural Resources Career Cluster.
- CS.02. Evaluate the nature and scope of the Agriculture, Food, and Natural Resources Career Cluster and the role of agriculture, food, and natural resources (AFNR) in society and the economy.
- CS.04. Demonstrate stewardship of natural resources in AFNR activities.
- CS.06. Analyze the interaction among AFNR systems in the production, processing and management of food, fiber

and fuel and the sustainable use of natural resources.

Common Core - Reading: Informational Text

- CCSS.ELA-LITERACY.RI.9-10.1 Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
- CCSS.ELA-LITERACY.RI.9-10.4 Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language of a court opinion differs from that of a newspaper).

Common Core - Writing

- CCSS.ELA-LITERACY.W.9-10.2 Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
- CCSS.ELA-LITERACY.W.9-10.4 Produce clear and coherent writing the development, organization, and style are appropriate to task, purpose, and audience.

Common Core - Speaking and Listening

- CCSS.ELA-LITERACY.SL.9-10.2 Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.
- CCSS.ELA-LITERACY.SL.9-10.4 Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

Common Core - Language

- CCSS.ELA-LITERACY.L.9-10.6 Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Common Core - Literacy in Science & Technical Subjects: Writing

- CCSS.ELA-Literacy.WHST.9.10.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

Common Core - Math Practices

- CCSS.MP1: Make sense of problems and persevere in solving them.
- CCSS.MP2: Reason abstractly and quantitatively.
- CCSS.MP3: Construct viable arguments and critique the reasoning of others.
- CCSS.MP6: Attend to precision.

Green/Sustainability Knowledge and Skill Statements

- AFNR Career Cluster, Statement 3 Communicate the impact of —green and sustainability principles on agriculture, food and natural resource systems.
- AFNR Career Cluster, Statement 6 Use green technologies and sustainability practices to maintain safe and healthful working environments that sustain the natural environment and promote well-being in the AFNR workplaces.
- AFNR Career Cluster, Statement 7 Demonstrate an understanding of green and sustainability trends that are impacting processes and markets in AFNR.

AFNR Career Ready Practices

- CRP.02. Apply appropriate academic and technical skills. Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive.
- CRP.04. Communicate clearly, effectively, and with reason. Career-ready individuals communicate thoughts, ideas and action plans with clarity, whether using written, verbal and/or visual methods.
- CRP.08. Utilize critical thinking to make sense of problems and persevere in solving them. Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem.

Partnership for 21st Century Skills

- Communication
- Critical Thinking and Problem Solving
- Information Literacy
- Initiative and Self-Direction
- Leadership and Responsibility
- Think Creatively

LESSON PLAN:

1. *Introduction:* According to the Food and Agriculture Organization (www.fao.org/sustainability/en), there are five principles of sustainable food and agriculture. The first principle states that improving efficiency in the use of resources is crucial to sustainable agriculture. Ford is one such company that is living out this principle through their products.

Bellwork/Pre-Lesson Activity:

To introduce the students to the lesson for the day, ask this question:

1. What is your definition of sustainability? *According to Merriam-Webster online, "sustainable" is defined as able to be used without being completely used up or destroyed; involving methods that do not completely use up or destroy natural resources; able to last or continue for a long time.*

2. What are two examples of sustainable agriculture practices? *Answers could vary but could include: cover crops, crop rotation, target spraying, usage of drones, etc.*

2. *Activity 1:* Each student needs a copy of the handout, "Turning Carbon Dioxide into Plastic."
 - a. Show the video, "Turning Carbon Dioxide into Plastic." The direct URL is <https://youtu.be/tEkOheG4vnk?list=PLCFM1h5Oz66hkdqgp8t7d4pX-9sAAhphK>.
 - b. Students should complete the worksheet as they follow along with the video.
3. *Follow Up:* At the completion of this lesson, have students complete the following for an exit ticket: (See attached for worksheet)
 - a. Explain three things you learned.
 - b. Explain two things you found interesting.
 - c. Identify one question you still have after the lesson.
4. *Leveling Up:* Have students create an infographic to explain sustainable agriculture. (See attached rubric).

NAME: _____

Turning Carbon Dioxide into Plastic

DIRECTIONS:

Watch the video, "Turning Carbon Dioxide into Plastic." The direct URL is <https://youtu.be/tEkOheG4vnk?list=PLCFM1h5Oz66hkdqgp8t7d4pX-9sAAhphK>.

1) Fill in the boxes:

Step 1 – *What is the first component?*

Step 2

Step 3

Step 4

Step 5

2) How beneficial is this process to our growing world?

Aligned to the following standards: FFA.CS-N; FFA.CS-P; AG1; AG2; CS.06.; CCSS.ELA-RI.9-10.1; CCSS.ELA-RI.9-10.4; CCSS.ELA-SL.9-10.4; CCSS.ELA-WHST.9.10.2; CRP.02.; CRP.04.; CCSS.ELA-W.9-10.; CCSS.ELA-W.9-10.4; AFNR Career Cluster, Statement 3; AFNR Career Cluster, Statement 6; AFNR Career Cluster, Statement 7; CCSS.ELA-L.9-10.6;

Name: _____

KEY - Turning Carbon Dioxide into Plastic

DIRECTIONS:

Watch the video, "Turning Carbon Dioxide into Plastic." The direct URL is <https://youtu.be/tEkOheG4vnk?list=PLCFM1h5Oz66hkdqgp8t7d4pX-9sAAhphK>.

1) Fill in the boxes:

Step 1 – *What is the first component?*

Carbon Dioxide

Step 2

Co2 Molecules

Step 3

Polymers

Step 4

Add additives and have plastic.

Step 5

Inject plastic into the part that is desired.

2) How beneficial is this process to our growing world?

Aligned to the following standards: FFA.CS-N; FFA.CS-P; AG1; AG2; CS.06.; CCSS.ELA-RI.9-10.1; CCSS.ELA- RI.9-10.4; CCSS.ELA-SL.9-10.4; CCSS.ELA-WHST.9.10.2; CRP.02.; CRP.04.; CCSS.ELA-W.9-10.; CCSS.ELA-W.9-10.4; AFNR Career Cluster, Statement 3; AFNR Career Cluster, Statement 6; AFNR Career Cluster, Statement 7; CCSS.ELA- L.9-10.6;

Exit Ticket: What Did You Learn?

DIRECTIONS:

Complete the following to reflect on today’s lesson:

Identify and explain three things you learned:	1. 2. 3.
What are two things you found interesting?	1. 2.
What is one question you still have after the lesson?	1.

Aligned to the following standards: FFA.CS-N; FFA.CS-P; AG1; AG2; CS.06.; CCSS.ELA-RI.9-10.1; CCSS.ELA- RI.9-10.4; CCSS.ELA-SL.9-10.4; CCSS.ELA-WHST.9.10.2; CRP.02.; CRP.04.; CCSS.ELA-W.9-10.; CCSS.ELA-W.9-10.4; AFNR Career Cluster, Statement 3; AFNR Career Cluster, Statement 6; AFNR Career Cluster, Statement 7; CCSS.ELA- L.9-10.6;

Name: _____

Infographic – Rubric

DIRECTIONS:

You will need a blank piece of computer paper for this activity. Create an infographic on the topic of sustainable agriculture. Components that should be included on the infographic are:

- Four examples of sustainable agriculture practices
- Two facts about sustainable agriculture
- Cite your sources
- Color
- Neatness
- Creativity

To aid you in creating this infographic, check out these sites to help you get started:

- Search for examples of infographics on the Internet
- UC Davis Agricultural Sustainability Institute, <http://asi.ucdavis.edu/programs/sarep/about/what-is-sustainable-agriculture>
- USDA National Agricultural Library, <https://www.nal.usda.gov/afsic/sustainable-agriculture-information-access-tools>

Component	Points Available	Points Earned	Notes
In-depth explanation of sustainable agriculture	10		
Color	5		
Neatness			
Creativity			
Four examples of sustainable agriculture			
Cites sources appropriately			
Two facts about sustainable agriculture			
		Total Points:	

Aligned to the following standards: FFA.CS-N; FFA.CS-P; AG1; AG2; CS.06.; CCSS.ELA-RI.9-10.1; CCSS.ELA-RI.9-10.4; CCSS.ELA-SL.9-10.4; CCSS.ELA-WHST.9.10.2; CRP.02.; CRP.04.; CCSS.ELA-W.9-10.; CCSS.ELA-W.9-10.4; AFNR Career Cluster, Statement 3; AFNR Career Cluster, Statement 6; AFNR Career Cluster, Statement 7; CCSS.ELA-L.9-10.6;

