SUSTAINABILITY TEACHERS' ACADEMY LESSON PLAN

LCA of a Chicken Nugget

Topics Covered
Sustainability
Food Systems
Life Cycle Analysis

Grades
5-10

Duration
60 Minutes

Sustainability Competencies
Systems Thinking
Collaborative Thinking

Online Resources
Sustainability Illustrated
The Natural Step

Acknowledgments
The Report of the World Commission on the Environment and Development: Our Common Future

Key Questions
What are the key phases involved in producing a chicken nugget? What activities are involved in the production, distribution, use and disposal of this food item? How does consumption of this food item impact the environment, society and economy? How do our food decisions impact the lives of other people? What is a typical day like for a person that works in the global food system?

Overview
In this activity students will use prior knowledge, online research and discussion to examine the production, distribution, use and disposal of a familiar food item, the chicken nugget. Students will consider the sustainability impacts of this product and imagine "a day in the life" of one of the many people whose job includes a part of this lifecycle.

Objectives
Students will be able to:

- Analyze the stages of the life cycle of a chicken nugget
- Identify human activities involved in the production, distribution, use, and disposal of a chicken nugget
- Discuss how consumption of this food item impacts the environment, society and economy
- Provide a description of the different jobs and working conditions of employees within the food system
- Describe how humans are involved in the complex process of producing a chicken nugget

Materials
1-2 Life Cycle Images per student

Technology
Projector/Computer
LCA of a Chicken Nugget Slides

Teacher Preparation
Print and cut out Life Cycle Cards. Project LCA of a Chicken Nugget Slides for students.

LCA of a Chicken Nugget

Background Information

A product's life cycle begins with its raw materials and then moves on to its production, manufacture, distribution, use, and finally its disposal. A life cycle analysis evaluates the environmental impacts of a product through its entire life cycle, from cradle to grave. Many companies are incorporating these types of assessments to optimize the environmental performance of their products.

Recommended Procedures

1. **Engagement: This activity will focus students on the topic**

   Begin by distributing 1-2 LCA cards per student. As a large group, students will work together to arrange cards into a complete LCA on the wall of a classroom, poster, floor or whiteboard.

2. **Exploration: A student-led activity with guidance**

   Students will be given a career (or citizen affected) within a phase of the chicken nugget LCA:

   - Production: farmers, factory workers, slaughterhouse workers, migrate farmers
   - Distribution: Truck drivers
   - Use: Fastfood workers, consumers
   - Waste: Garbage collectors

   Next, in groups of 3-4, students will create a narrative describing a day in the life of their worker. As they brainstorm, they should consider how each person's life and work interacts with the Three Pillars of Sustainability: the economic, the environmental, and the social. They should also look for where the pillars interact with each other.

   Farmer Example:

   Economic: Fluctuating crop prices; pressure from larger companies on feed farms and breeders; changing wages.

   Environmental: Fertilizers, pesticides, and chemicals used on crops; Ethical treatment of chickens.

   Social: Migrate workers; working conditions; community involvement.

3. **Explanation: Students discuss their understanding of the concept**

   In the large group, students will share their narratives with the class. Where and how do their narrative cross paths? Introduce the idea of linear vs. circular systems. Discuss with students in what ways LCA of a chicken nugget is linear.

4. **Elaboration: Students apply the idea in a new context**

   Now, have the students rebreak into their small groups to discuss where interventions could be made in the lives of their workers to turn this linear system into a circular one. Students will create a systems diagram expressing the phase, stakeholders, inputs, and ouputs.

5. **Evaluation: Students assess their knowledge, skills, abilities**

   Students will represent their narratives with the interventions incorporated.

   Extension

   Students can further discuss the impact of a chicken nugget LCA on humans by using their understanding about the system to brainstorm and diagram alternative circular systems versus the traditionally linear ones. In addition, students can research how this food system interacts with and effects other systems (i.e. the carbon cycle through truck emissions, water cycle through irrigation and pollutants). From this research students can proceed to create a more complex diagram of the interacting systems and identify the people involved across multiple cycles.

   - What human activities are affected in the interacting systems?
   - How can we alter the systems to be circular vs linear?

Vocabulary

- **Life Cycle Assessment/Analysis:** A systematic approach to assessing the environmental impacts associated with all phases of a products life cycle from cradle to grave.
- **Circular Economy:** is a continuous positive development cycle that preserves and enhances natural capital, optimizes resource yields, and minimizes system risks by managing finite stocks and renewable flows (Ellen Macarthur Foundation, 2015).
- **Eutrophication:** excessive richness of nutrients in a lake or other body of water, frequently due to runoff from the land, which causes a dense growth of plant life and death of animal life from lack of oxygen.
- **Photochemical smog:** is the chemical reaction of sunlight, nitrogen oxides and volatile organic compounds in the atmosphere, which leaves airborne particles and ground-level ozone.
- **Pullet:** a young hen, especially one less than one year old.

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Next Generation Science Standards		
Science and Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Asking Questions and Defining Problems	ESS3.A: Natural Resources	Cause and Effect
Engaging in Argument from Evidence	ESS3.C: Human Impacts on Earth Systems	System and System Models
Developing and using models		

Common Core English Language Arts			
Reading: Informational Text	**Writing**	**Speaking & Listening**	**Language**
		SL.6.1, SL.6.4, SL.7.1, SL.7.4, SL.8.1, SL.8.4	

Common Core Mathematics	
6 through 8	**9 and 10**
N/A	N/A

Other Common Core	
Science	**History/Social Studies**
CCSS.ELA-LITERACY.RST.6-8.1 CCSS.ELA-LITERACY.RST.6-8.4 CCSS.ELA-LITERACY.RST.6-8.7	CCSS.ELA-LITERACY.RH.6-8.1 CCSS.ELA-LITERACY.RH.6-8.4 CCSS.ELA-LITERACY.RH.6-8.7