

Sustainability Teachers' Academy Lesson Plan

How to Analyze Sustainability Problems: Food Deserts

Topics Covered

Sustainability
Problem Analysis and
Solving
Unintended Conse-
quences

Grades

6-8

Duration

55 Minutes

Sustainability Competencies

Systems Thinking
Collaborative Thinking

Online Resources

[Chain Reaction
Magazine](#)

Key Questions

What is a sustainability problem? What factors contribute to sustainability problems? How do you evaluate if a proposed sustainability solution addresses the problem effectively? What are “unintended consequences” and why are they important to consider when solving sustainability problems?

Overview

Students will read about a difficult sustainability problem and some possible solutions. They will use a “fishbone” diagram to describe the nature of the problem, identify the economic, societal, environmental, and technological factors contributing to it, and discuss whether and how different possible solutions might solve the problem. This lesson will focus on the problem of food deserts in the United States.

Objectives

Students will be able to:

- Read and interpret informational text
- Construct a graphical representation of a sustainability problem and its contributing economic, social, environmental, and technological factors
- Evaluate a potential solution to a sustainability problem for effectiveness
- Communicate information about sustainability problems and their solutions

Materials

Per student

- 1 copy of “Cultivating the Food Desert” article

Per working group

- 1 copy of the Sustainability Solution Narrative assigned to the group
- Flip chart paper, whiteboard, or other materials for diagramming/drawing
- Markers, pens, or pencils

Technology

- Projector and screen
- “How to Analyze Complex Problems” Video

Teacher Preparation

Students should be familiar with basic concepts in sustainability science, such as the Three Pillars of Sustainability. It may also be useful for students to view and take notes on the “How to Analyze Sustainability Problems” video.

Organize students into 5 working groups. All groups will read and analyze the Cultivating the Food Desert article. However, each group will work with a different Solution Narrative. Be sure to make the appropriate copies of these narratives for each group.

Background Information

Sustainability science attempts to solve complex problems caused by numerous, interrelated economic, social and environmental (and other) factors. In addition to complexity, these problems are urgent, potentially dangerous, and change overtime. They require long-term, flexible interventions from diverse stakeholders. Whether, and how, to solve sustainability problems is often controversial, as the impact and importance of the problem may vary depending on geographic location. For example, in the United States, sea level rise due to global climate change is a problem that may not directly impact a farming community in the Midwest, while cities on the east coast experience increased, and more severe seasonal flooding. The capacity of stakeholders to cope with the problem further compounds their controversy, as some communities adapt easily to the problem, while others struggle to acclimate. For instance, when a region’s municipal water supply has been contaminated, different socioeconomic groups are impacted to different degrees. Communities that can afford and have access to filtered or bottled water easily adapt to the crisis, while poorer communities cannot. For these reasons, simple approaches to sustainability problems often result in failure.

Designing a successful solution to a sustainability problem involves careful analysis of the factors contributing to the problem, and developing a targeted plan of action aimed at addressing these factors. Sustainability scientists must also be attentive to the problem of unintended consequences. These arise, often unexpectedly, when a solution to a complex problem is implemented. As a result sustainability problems must be continually monitored, evaluated, and adjusted as unintended consequences are identified.

A “fishbone” diagram is a visual representation of a complex problem. The “head” of the diagram represents the central problem, with “bones” of the diagram illustrating factors that contribute to the cause of the central problem. For these examples, contributing factors are grouped as belonging to either Economy, Society, Environment, or Technology.

Recommended Procedures

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

If students were assigned the “How to Analyze Complex Problems” video for homework, give students time to share their notes and discuss how a fishbone diagram is used to analyze a problem.

2. Exploration: A student-led activity with guidance

Organize students into 5 working groups. Each group will need a copy of the Cultivating the Food Desert article and a solution narrative for each student. Students should read and discuss

the problem article, identifying what factors contribute to the problem. Their discussion should focus on environmental, social, economic, and technology factors that contribute to the problem of food deserts in the United States.

3. Explanation: Students discuss their understanding of the concept

On a piece of flip chart paper, students should then create a fishbone diagram of the sustainability problem they evaluated. The diagram should include the relevant factors that combine to cause the problem from their article. Be sure that each student group identifies factors from the economy, society, environment, and technology.

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

Students should read and discuss the solutions narrative, and identify which factor(s) contributing to the problem or food deserts are addressed by the solution. Have students sketch, draw, or diagram how the solution attempts to solve the problem on their flip chart.

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

Students should share their solution narrative with the class and explain

- Which contributing factors to the problem are addressed by their solution
- Whether they think their assigned solution will be effective and why

Extensions

Students can discuss/debate which of the 5 possible solutions should be implemented, or suggest novel solutions to the problem of food deserts. Additional pairs of articles featuring sustainability problems and possible solutions are organized by topic in

Topic	Problem Article Link	Solution Article Link
Indoor Air Pollution	<u>The deadliest environmental problem today is indoor air pollution--Killing 4 million a year</u>	<u>Improved stoves replace indoor cooking fires. "silent killer" of women</u>
Clean Drinking Water	<u>Rural and Urban Water Issues in Africa</u>	<u>Can entrepreneurship in Africa make clean water more accessible</u>
Chemical Runoff	<u>Chemicals in farm runoff rattle states on the mississippi</u>	<u>Wetlands clean water the natural way</u>
The Urban Heat Island Effect	<u>What is the urban heat island effect?</u>	<u>Phoenix takes successful steps to lower city temperatures</u>

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Next Generation Science Standards

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Obtaining, evaluating, and communicating information	ESS2.A Earth materials and system	Cause and effect: Mechanism and explanation
Asking questions (for science) and defining problems (for engineering)	ESS3.A Natural Resources	Systems and system models
Constructing explanations (for science) and designing solutions (for engineering)	ESS3.C Human impacts on Earth systems	

Common Core English Language Arts

Reading: Informational Text	Writing	Speaking & Listening	Language
RI.6.2, RI.6.7, RI.7.2, RI.7.7, RI.8.2, RI.8.7	W.6.1, W.6.2, W.6.3, W.7.1, W.7.2, W.7.3, W.8.1, W.8.2, W.8.3	SL.6.1, SL.6.4, SL.7.1, SL.7.4, SL.8.1, SL.8.4	L.6.3, L.7.3, L.8.3

Common Core Mathematics

6 through 8	9 and 10
N/A	N/A

Other Common Core

Science	History/Social Studies
CCSS.ELA-LITERACY.RST.6-8.4, CCSS.ELA-LITERACY.RST.6-8.7	CCSS.ELA-LITERACY.RH.6-8.4, CCSS.ELA-LITERACY.RH.6-8.7