

Sustainability Teachers' Academy Lesson Plan

Food Systems are Dynamic

Topics Covered

Sustainability
Agriculture
Systems
Cascading Effects
Trade-offs

Grades

6-8

Duration

55 Minutes

Sustainability Competencies

Systems Thinking

Online Resources

[Defining sustainable food systems](#)

[Teaching the food system](#)

Key Questions

- How does change in one sector (e.g. farming practices) influence other sectors of the food system?
- How do economic, social, and environmental components of our food system interact and influence one another?
- Why is it helpful to understand systems dynamics and interconnectedness?

Overview

Through this activity, students will experience the dynamic and interconnected nature of systems. To illustrate relationships among components in the system students simulate system dynamics by moving around in an open space while maintaining an equal distance between themselves and two other people (food system components). Students will explain how their component relates to the others and predict system responses to various “disturbances”—such as drought.

Objectives

Students will be able to:

- Explain the characteristics of a system including structure, behavior, interconnectivity, and functionality
- Identify major components of our food system
- Explain how a change in one component can positively or negatively affect change in another component (cascading effects)
- Analyze how their individual food purchasing decisions impact the broader food system

Materials

Per student

- One card that lists a primary concept with 2 interconnected concepts OR a “Disturbance” card
- One name tag per student (used to write primary concept as ‘name’)

Teacher Preparation

You will need 8-12 students per group, depending on how you decide to incorporate the “Disturbances.” Print out each student card, cut out the two sides of each card and laminate if possible. Each student card should have the primary concept on the front, and two

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interconnected concepts on the back.

Background Information

Our food system is complex with multiple inputs/outputs and far reaching implications. It is constantly subject to change and patterns of systems dynamics. Thus individual people from diverse sectors are responsible for influencing the system in multiple ways. The system is closely tied to the environment and issues of social equity.

Recommended Procedures

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

Ask the students to define a “system”. What are some defining features of a system? What happens if you change/add/remove a part of that system? For example think about a computer system—the mouse, key board, monitor, & CPU—what happens if you remove the mouse or the monitor? Are there parts that you as the user of a computer directly use/touch versus indirectly use/touch?

So now that we have established that a system is made of interconnected parts, what are the interconnected parts of a food system? What things do you need to grow, ship, package, or eat food? What about people, where do they fit into the system? Explain to the students that they are going to do an exercise to help them understand the dynamic nature of the food system.

2. Exploration: A student-led activity with guidance

Hand each student a card with one primary food concept on the front, and two other interconnected food concepts that relate to two other students’ cards on the back. During this activity, students should hold their cards so that everyone can clearly see the primary food concept, and each individual student can view the interconnected food concepts on their own card.

Each student will stand up and share their primary food concept but not the two they are connected to. The students should keep note of the people they are interconnected to without sharing it out-loud. The students will be tasked with following the two people that are holding the two interconnected food concepts written on their card.

For example: Student A has a card that has Industrial Agriculture as its primary concept and Water Quality and Synthetic Fertilizers as the interconnected concepts. Student A writes Industrial Agriculture on his/her nametag and is tasked with staying an equal distance between the student with the Synthetic Fertilizer concept card and the Water Quality concept card.

Instructions for how to interact with the two other people you are connected to: Move so as to keep equal distance between you and each of these 2 people at all times. This does not simply mean remaining at the midpoint between them.

To pursue the objective, students begin to circulate, each movement triggering many others in an active, interdependent fashion.

The facilitator (or additional students) can be “Disturbances” in the system. You can choose to do as many or as few of these disturbances as you see fit:

- Drought: move the person holding the Water Quantity Allocated for Agriculture card,

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- Organic Food Market Triples: move the person holding the Organic Agriculture card,
- Mexico increases national minimum wage: move the person holding the Farm Workers card,
- Chipotle agrees to purchase certified humane meat: move the person holding the card Meat/livestock Production.

After each “Disturbance” has played its role, let the activity continue without intrusion for another minute then introduce the next disturbance. When you move the person/card directly associated with the disturbance, make sure you move them a significant distance so that each person feels the movement.

Once the participants have reacted to the disturbance and the movement has slowed, ask them to give 2 thumbs up if they were positively impacted by the disturbance or 2 thumbs down if they were negatively impacted by the disturbance (note: you can do this for one, some, or all of the disturbances).

3. Explanation: Students discuss their understanding of the concept

Once movement has slowed, stop the movement and while the students are still standing in the places they ended the activity in, have them share the concept they are connected to.

Ask the students to raise their hand if they moved when there was a disturbance (all students should raise their hands). How many of those students were directly connected to: 1. Water Quantity Allocated for Agriculture, 2. Organic Agriculture, 3. Farm workers, or 4. Meat/livestock Production. The goal of this is to demonstrate that even those students that were not directly connected to the concepts moved during the “Disturbances” were impacted by the movement (hence showing that they are all interconnected).

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

Return to the classroom or continue onto the Extension (see Extension section below).

Ask and discuss with the students:

- Where was your attention focused during the activity? On the concepts you were directly connected to or on the concepts you were indirectly connected to (they were probably focused on the two concepts they were directly connected to, with the exception of the disturbances)? How does this focus relate to the real-world and why could that be a challenge for sustainability?
- How did one “Disturbance” impact the entire system? Introduce the term cascading effect here. Also discuss how the “Disturbance” created large movement for a brief period after the initial disruption and then returned to relative stability (slower, less severe movements), indicating that the system can adjust (for better or worse) to change.
- Why is it helpful to understand system dynamics and interconnectedness? How might this be helpful in debating trade-offs and in thinking about the future? What might implications be for making a positive change to the system (note: one positive change can impact the entire system)?

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

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Provide each student with a copy of the Exit Ticket for this lesson. Students should complete the Exit Ticket and return to you before leaving your class. Use the answers that students provide to assess their understanding of this lesson. Redirect in the next class if necessary.

Extensions

Have the students stand in a circle. Each student is asked to share how their concept is connected to another concept. Once they have made a connection verbally, they make it physically by holding onto the end of a ball of yarn and passing the yarn to the person/concept they are connected to.

Note: it is not enough to say they are connected, the student must describe the nature of the relationship. Continue this until all concepts are connected

Pull hard on the yarn while all students are still holding on & ask who felt it.

Ask if there are any volunteers willing to connect their concept to all concepts in the circle.

Vocabulary

Food system: a network of actors and activities that comprise the inputs, distribution, production, marketing, and processing involved in making and delivering food to consumers

Direct effects: in a system, the events caused strictly by one component on another

Indirect effects: in a system, the events caused by one component on another through the actions of one or more intermediary components

Cascading effects: a sequence of events in which each event produces the circumstances necessary for the next

Feedback: the process by which a system is modified by the product/output it creates

Dynamic: characterized by constant change or activity

Organic agriculture: farming practices that rely on crop rotation, green manure, compost, and biological pest control

Industrial agriculture: A type of intensive farming that relies on high use of artificial pesticides and fertilizers to maximize crop yield

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Next Generation Science Standards

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Asking questions (for science) and defining problems (for engineering)	ESS3.A Natural resources	Cause and effect: Mechanism and explanation
Developing and using models	ESS3.C Human impacts on Earth systems	Systems and system models
Obtaining, evaluating, and communicating information	LS2.A Interdependent relationships in ecosystems	Stability and change.

Common Core English Language Arts

Reading: Informational Text	Writing	Speaking & Listening	Language
N/A	N/A	SL.6.1, SL.6.2, SL.6.4, SL.7.1, SL.7.2, SL.7.4 SL.8.1, SL.8.2, SL.8.4	N/A

Common Core Mathematics

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

Other Common Core

Science	History/Social Studies
N/A	N/A