

## Topics Covered

Sustainability  
Three Pillars  
Decision Making

## Grades

6-8

## Duration

55 min

## Vocabulary

Sustainability  
Society  
Environment  
Economy  
Trade-offs

## National Standards

### Practices

*Asking questions (for science) and defining problems (for engineering)*

*Analyzing and interpreting data*

*Obtaining, evaluating, and communicating information*

### Core Ideas

*ESS3.A Natural recourses*

*ESS3.C Human impacts on Earth systems*

### Crosscutting Concepts

*Scale, proportion, quantity*

*Systems, and system models*

## Student Competencies

Normative Thinking  
Systems Thinking  
Collaborative Thinking

## Choosing a Sustainable Grocery Bag

### Key Questions

How can we make sustainable decisions when purchasing foods or products given the limited information available?

### Overview

During this lesson students will learn about how to best make sustainable decisions. They will use the Three Pillars of Sustainability as a guide to evaluate products based on criterion in each category. Students will work in groups to create graphics that will aide in making sustainable decisions.

### Objectives

Students will be able to:

- Become familiar with trade-offs.
- Draw conclusions.
- Use information to make a balanced decision.
- Rationalize their decisions.
- Understand the perspectives of others.
- Develop criteria and data to quantify their decisions.
- Draw connections to their lives.
- Standardize criteria to evaluate their products.

### Materials

Per student group

- Grocery Bags Narratives

Technology

- Computer and Projector
- Choosing Sustainability Slides

### Teacher Preparation

Organize student materials. Select student groups. This lesson should follow "An Introduction to Sustainability" so that students are already familiar with the definition, scope, and importance of sustainability.

### Background Information

Sustainability is commonly defined as: "Meeting the needs of current generations without compromising the ability of future generations to meet their needs" (Bruntland Report, 1987). In order to determine if something is sustainable, three elements must be considered: environment, society, and economy. These are known as the Three Pillars of Sustainability.

Environmental factors might be (but are not limited to): air quality, water quality, impact on biodiversity, wildlife preservation, nature conservation, carbon emissions, ecological footprint, soil degradation.

Society is affected by factors that include: diversity, equal opportunity, exploitation of labor, impact on people's health and well-being, lifestyle implications, and others.



## Vocabulary

**Sustainability:** “Meeting the needs of current generations without compromising the needs of future generations” (Brundtland Report, 1987).

**Society:** The community in which people live, work, and interact. This includes family, friends, neighbors, and so on.

**Environment:** The combination of external physical conditions that affect and influence the growth, development, behavior, and survival of organisms.

**Economy:** The wealth and resources of a country or region, especially in terms of the production and consumption of goods and services.

**Trade-off:** A balancing of factors all of which are not attainable at the same time

Some economic factors are jobs, work environment, profitability, human hours, prospects for growth, efficiency in supply chain (is there a lot of waste?).

This lesson provides a narrative for each of three types of grocery bag: paper, plastic, or reusable. Each type of bag has an impact on the environment, society, and economics (the Three Pillars of Sustainability). Determining which is the sustainable choice, involves carefully evaluating how the product affects each of the Three Pillars, calculating a Sustainability Score, and creating a Triangle Graph for each product. This allows students to visually compare products to make a decision: the larger the Triangle Graph, the more sustainable the product.

## Recommended Procedures

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

Slide 2: Introduce the students to the term sustainability; ask them if they know what it means. What does it mean if something is sustainable?

Students should already be familiar with the idea that sustainability means being able to meet the needs of current generations without compromising the ability of future generations to meet their needs. They should already know that basic human needs relate to the Three Pillars of Sustainability: the Economy, Environment, and Society.

Slide 3: Introduce the Three Pillars of Sustainability. Discuss the different factors that belong in each of the Three Pillars. Be sure that all students understand each pillar and the ideas associated with it.

Slide 4: Ask students the following question: How do we know if a product is sustainable? Allow students to brainstorm how they might answer this question.

What information would they need to know? How would they find the information they need? Do we always know everything we need to know about the products we buy to make a sustainable choice? How can we make sustainable decisions when purchasing foods or products given the limited information available?

Possible sources for reliable information about sustainability of products and companies can include: product and company literature or websites, news articles, popular science books and articles, etc. Even when resources are readily available, it may still be difficult to decide which products are most sustainable.

Slide 5: Emphasize that any product we choose will have an impact on each of the Three Pillars: the Environment, Society, and the Economy. Some products will have positive impacts. For example, Shade grown coffee attempts to minimize harm to wildlife habitat. Many companies work hard to promote family and diversity. Other products are made in safe factories where people are paid fair wages for their work.

Other products may have negative impacts. Some clothing lines are produced by people who work very long hours and are paid very little.

Cotton is grown with industrial fertilizers and pesticides which pollute air and water, and kill wild plants and animals. Much of the beef consumed in America is raised on pastures that were once forest ecosystems.

Introduce the term Trade-off. Discuss the idea that we often make choices that have benefits in one area, but costs in another. For example, we might buy organic foods which are safer for the environment, but these can be very costly. Similarly, might decide to buy a car that was made by American workers, even if it is less fuel efficient than a car made overseas.

Emphasize that choosing a sustainable product can be difficult, but the most sustainable product is the one that promotes all three pillars.

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

Slide 6: Explain to the students that they will be using two tools to help assess the sustainability of different products.

First, each product will be given a Sustainability Score (left, top) for each of the Three Pillars (Economy, Environment, and Society). For each of the Three Pillars, the lowest score is 0. A score of 0 would represent a product that has the worst possible impact on that Pillar of sustainability. The highest score possible is 6, representing the best possible impact. The vast majority of products will receive scores between 1 and 5 in each pillar.

Once a product has been given a Sustainability Score, these values will be charted on the Sustainability Triangle Graph (left, bottom). The Economy Sustainability score will be charted on the orange line, the Environment Sustainability score on the green line, and the Society Sustainability Score on the blue line.

Slide 7: Ask students to imagine that they are going to evaluate a pair of new shoes for sustainability:

- You do some research about the product and find out that the shoes are inexpensive, but made by workers who are paid minimum wage. You might give it a score of 4 for Economy.
- However, your research shows that some of the parts are made of materials or dyes that can cause air and water pollution when disposed of improperly. So you give it a score of 2 for Environment.
- Finally, the company that produces the shoes, provide an important service for people in need. Plus, the shoes are very popular, and get very good reviews from other customers who are happy with their purchase. You decide to give the shoes a score of 6 for Society.

Now that the shoes have been given a Sustainability score, students can chart these values on the Triangle Graph.

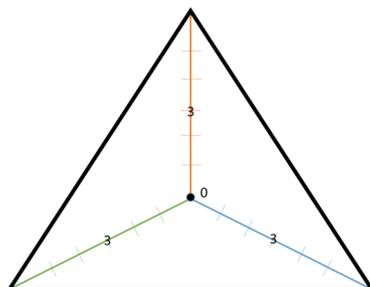
Slide 8: Next, the evaluator connects the dots on each axis of the Triangle Graph to create a triangle. This shape now represents the sustainability of the shoes that were evaluated.

Slide 9: Explain that by comparing the Triangle Graphs of different products, you can visually assess which is the most sustainable choice. The bigger

### Sustainability Score



### Triangle Graph



## References

[Which is more environmentally friendly: Paper or Plastic?](#)

## Acknowledgements

Adapted from the Keystone Science School sustainability curriculum

the Triangle Graph for a product, the more sustainable it is.

Ask students to identify which of the two pairs of shoes is the sustainable choice. The shoes on the left are more sustainable because its Triangle Graph is larger. Perhaps the shoes on the right are made by poorly paid workers overseas. Or they may have received poor customer satisfaction reviews. As a result its scores for Economy and Society are much lower.

Slide 10: Explain that students will now practice using these tools to decide which Grocery Bag is most sustainable. Split the class into small groups of 3 to 5 students. Give each group a copy of the narratives describing each of the three types of grocery bag. In their small groups, students can think about and discuss which bag they think is most sustainable and why.

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

Now, ask students to share their results with the class, and discuss. Which bag is most sustainable? Which bag is least sustainable? Encourage students to support their ideas with evidence from the narratives.

Slide 11: This slide shows an example of how each bag could be rated by someone concerned about making sustainable choices. Ask students think about which Triangle Graph belongs to each type of bag.

Ask students share which grocery bag they think goes with each Triangle Graph, and to explain the reasons they think so with evidence. Because evaluating products can be complicated, and often involves an individual's personal values and preferences, there are likely to be significant differences of opinion. Encourage students to think about their choices through the lens of sustainability, and use reliable evidence to make a reasonable decision.

Slide 12: This slide shows how each bag type was rated by our concerned consumer. Does the class agree or disagree with this person's evaluation? Why might there be differences in how these products are rated by different people?

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

Engage students in discussion about how these tools might be used in everyday life. What other products could be evaluated using Triangle Graphs? Will they always get the right answer? How will they get the information they need to make good choices?

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

Each student should complete the Exit Ticket for this activity. Review the exit tickets for student comprehension, and revisit and redirect as needed.

## Extensions

Ask students to imagine they were in charge of a grocery store and wanted to encourage shoppers to buy and use reusable grocery bags. Allow students to work in small groups to design a campaign they would use in their store. Would they charge for paper or plastic bags? Would they provide a discount for shoppers who bring reusable bags from home? How would they spread their message to shoppers?

## Paper Grocery Bags

Although paper bags are given for free with check out, retailers compensate for the costs of the bags by raising prices on the goods they sell.

Paper production emits more air and water pollution than plastic bags, and consumes up to four times as much energy, and three times as much water. However, Paper bags are made from a renewable resource.

Paper bags are heavy and bulky. When discarded, they take up much more landfill space than plastic bags. Although paper bags are considered biodegradable, they decompose very slowly in landfills, and release methane, a powerful greenhouse gas.

Paper litter quickly degrades in the presence of sunlight and air. It rarely presents a problem for fish or other wildlife. Paper recycling programs readily accept paper bags.

Some people prefer paper bags because they tend to keep their shape, protecting delicate items like bread or eggs from damage. Paper bags can be reused, and are often used in craft or cooking projects before they are ultimately thrown away.



## Sustainability Score



## Plastic Grocery Bags

Plastic bags are cheap, and easy to produce. Although plastic bags are “free” to consumers, the cost of each plastic bag is incorporated into the price of the goods that are bought. For locally owned, small businesses, supplying plastic bags with each purchase can be an economic burden.

The cost of proper disposal a single plastic bag is \$0.17. Although this sounds inexpensive, American use over 100 billion plastic bags per year. Plastic grocery bags are also a significant source of litter in urban areas. Nationwide, cities spend \$11 billion each year cleaning up plastic litter.

Plastic bags do not easily decompose, but they are lighter than paper bags to transport. Plastic bags are easily compacted and take up less landfill space pound for pound.

Most recycling plants do not accept plastic bags, because they can damage recycling machinery. Plastic bags pose a serious threat to wildlife including birds, fish, and sea turtles. Plastics are derived from petroleum, a nonrenewable resource.

Most people prefer plastic bags because they are lightweight and durable. Plastic bags are often reused for other purposes before being thrown away.



## Sustainability Score



## Reusable Grocery Bags

Reusable grocery bags typically cost between \$0.25 and \$3.00 each. Purchasing reusable bags represents a small cost to the consumer, but a significant savings to retailers and local governments. In fact, for every person that switches to reusable bags entirely, a city saves \$250,000 in clean up and disposal costs over the years.

Reusable grocery bags take more energy to produce than either paper or plastic bags. Some are made from cotton, which requires significant water and energy resources to farm. Bags made from post consumer content (recycled materials) are becoming more common, and these use less energy, water, or other resources to produce.

Depending on the type of bag and how it is used, reusable grocery bags can last for years. People like reusable bags because they are stronger than paper or plastic bags. They can hold more items, resulting in fewer trips to load or unload your groceries.



## Sustainability Score



**Exit Ticket**

Name:

*Describe each of the Three Pillars of Sustainability in one or two sentences.*

Economy:

Environment:

Society:

**Exit Ticket**

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