

# Seas, Trees, and Economies

## Lesson 4: Waste Not, Want a Lot

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### Standards and Benchmarks (see page 4.8)

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### Lesson Description

Students play the role of producers, deciding what and how to produce in response to various incentives.

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### Grade Level

6-8

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### Economic Concepts

Incentives  
Natural resources  
Production  
Waste

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### Objectives

Students will be able to

- define production, incentives, waste, and natural resources;
  - explain that people respond to incentives;
  - predict a change in people’s behavior based on a change in an incentive; and
  - define waste in physical and economic terms.
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### Compelling Question

How can incentives influence our use of natural resources?

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## Time Required

50 minutes

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## Materials

- A copy of Handout 4-1 for each student
  - A pencil, scissors, a ruler, a circle template (2" diameter), and four sheets of 8" x 10" paper for each student (NOTE: Trim 8 ½" x 11" paper before giving it to students.)
  - Prizes for each production round (optional)
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## Procedure

1. Explain that students are going to participate in a production activity. **Production** is the process of using resources and intermediate goods to make goods and provide services. In this production activity, students will work in teams. There will be two production rounds. Each round will last five minutes. The team that earns the most points in a round wins that round.
2. Explain that the activity requires some drawing and cutting skills, so teams must carefully consider what to produce. Teams will earn points by producing 2" x 2" paper squares or circles (the size of the circle template provided). Each student will receive only one piece of paper with which to work. Students may produce all squares, all circles, or any combination of squares and circles to earn the most points for their teams. Only one square or circle may be cut at a time; that is, no paper stacking is allowed. Only completed squares and circles will count. To be counted, squares must be 2" x 2", and the circles must look like the template.
3. Point out that at the beginning of each production round, students will be told the point value for circles and squares. Then, team members will have two minutes to discuss the best strategy for production. No production may take place during the strategy discussion.
4. Divide the class into groups of equal size with three to five students in each group. Distribute a pencil, scissors, a ruler, a circle template, and two sheets of paper to each student.

### Round 1

5. Announce that each square produced is worth one point and each circle produced is worth one point. Allow two minutes for the team to discuss production strategy.
  6. After two minutes have passed, announce that students may begin production. Allow five minutes for production. Tell the class when only one minute remains and again when only 15 seconds remain.
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7. At the end of five minutes, instruct students to stop producing. Tell teams to count their completed squares and circles and report the number of points earned. (Award the winning team or teams a prize if desired.) Have the winning team(s) share strategy with the class. *(In this round, the best strategy is to draw a grid of 2" x 2" squares on the paper and cut along the lines to produce 20 squares. This minimizes drawing and cutting time and maximizes the points per sheet of paper. The winning team will probably have used this strategy. Keep a sheet of paper that has been partially cut by the winning team for use in Step 14 below.)*
8. Have teams describe their strategies. Ask why some team strategies were more successful than others. *(They were able to earn more points because they focused on producing squares. Even though squares and circles were worth the same number of points, it took more time to draw and cut out circles than to draw and cut out squares.)* If all teams employed the same strategy, ask why that strategy was chosen.

### Round 2

9. Announce that in Round 2 each square is worth one point and each circle is worth four points. Distribute two sheets of paper to each student. Allow two minutes for teams to discuss production strategy.
10. Repeat Steps 6 and 7 above. *(In this round, the best strategy is to produce as many circles as possible. It still requires more time to draw and cut circles; however, the value of circles has increased. Producing five circles provides as many points as producing 20 squares. Changing the points awarded for circles changes the incentive for producing circles. Keep a sheet of paper that has been partially cut by the winning team for use in Step 14 below.)*
11. Have teams describe their strategies. Discuss the following:
  - Why were some team strategies more successful than others? *(They chose to produce as many circles as possible. Although circles were time-consuming to draw and cut, they were more valuable in this round. As a result, six circles provided more points than 20 squares.)*
  - Why was the strategy for winning in Round 1 different from the strategy for winning in Round 2? *(The points assigned to a circle were different in Round 1 than in Round 2.)*
12. Remind students that in both rounds the same things were used for production—students, paper, scissors, pencils, templates, and rulers. Each round produced different results because the incentives were different. **Incentives** are actions, awards, and rewards that determine the choices people make. In this production activity, points were incentives.
13. Point out that in the first round, the incentive to produce circles was one point and the incentive to produce squares was one point. In the second round, the incentive to produce

circles changed. As a result, producers' behavior changed. They were willing to produce more circles in Round 2 because they received more points for each circle compared with the points they received for each square.

14. Hold up a partially cut sheet of squares from Round 1 and a partially cut sheet of circles from Round 2. Define **waste** as the unavoidable material that remains after production and consumption. Discuss the following:
  - Give an example of waste in this production activity. (*Paper that remains when all possible circles and squares have been cut out*)
  - In terms of using all paper, which production is less wasteful—circles or squares? (*Cutting squares is less wasteful because there are no gaps or wasted sections of paper between the squares. When you cut 20 squares from the page, all paper is used. When cutting circles, there is unused paper around the circles and thus wasted paper.*)
15. Ask students if this means it would be better not to produce circles. (*Answers will vary.*) Point out that in Round 1 it was better to produce squares because circles and squares had the same value and less paper was wasted when squares were produced.
16. Point out that in the second round, only 40 points were possible from producing squares, but at least 160 points were possible when producing circles (by cutting a 2" circle in the equivalent space of one square). There was less physical waste of paper from producing squares in both rounds. However, in Round 2, producing squares meant wasting (giving up) the value of the circles that could have been produced.
17. Note that in Round 2, if 40 squares are produced, no paper is wasted. However, the value of 40 squares is only 40 points. By using paper to produce squares, the additional 120 points (value) that could have been earned by producing circles are given up.
18. Explain that the economic goal of production is to obtain the most value or satisfaction from a resource. In the first round, the most value is obtained from the paper by producing squares. In the second round, the most value is obtained from the paper by producing circles. The additional value of the circles outweighs the additional cost of the paper wasted.
19. Ask students the following question: "If a cave man were asked to carve wheels from a slab of stone, which would have more value—carving round wheels and wasting some of the slab or carving square wheels and wasting none of the slab?" (*Round wheels are more useful and have more value than square wheels. The additional value of the round wheels offsets the additional cost in terms of wasted slab.*)

20. Look around the classroom and ask students if they notice any of the mess created by the production of circles and squares. Point out that the mess is very unattractive and that it will be difficult to work until the classroom is cleaned.
21. Remind students that in creating circles, more value was gained from the paper. However, the waste created by the production of circles leads to loss of satisfaction because of the mess. Discuss the following:
  - How could the waste/mess that remains from the production of circles be reduced? *(Answers will vary. However, guide students to recognize that a change in incentives could change production behavior.)*
  - Predict what would happen if teams received one point for squares, four points for circles, and lost two points for every square inch of waste paper. *(Fewer circles would be produced.)*
  - Why would fewer circles be produced? *(This occurs because of the change in the incentive. Loss of points for waste would be an incentive to create less waste and, therefore, produce fewer circles.)*
22. Explain that just as incentives determined what was produced from the paper, incentives determine how we use our natural resources to produce goods and services in the economy. Price is an incentive for producers. When the price of a good increases, producers will produce more of it. If the price decreases, producers will produce less of it.
23. Define **natural resources** as things provided by nature or the natural environment; that is, things that occur naturally in or on the earth. Natural resources are used to produce goods and services. Ask the students for examples of natural resources. *(Land, oil, coal, water, minerals)* Discuss the following:
  - What is the incentive for producers to make a good or service? *(The price received for the good or service)*
  - Does our society produce physical waste when goods and services are produced? *(Yes) Give some examples. (Dirty water from producing foods, medicines, and chemicals; air pollution from producing energy; sawdust from wood construction; tailings or waste rock from mining; wood pulp from making paper)*
24. Explain that the waste resulting from production affects the environment, reduces people's enjoyment of the environment, and, as a result, reduces the real value of the goods produced.
25. Remind students that when the incentive for producing circles changed, the number of circles produced changed. Point out that changing incentives can change the way people use natural resources in the economy and the amount of waste produced, which affects the environment.

For example, if we make chemical producers pay for each pound of waste they produce, they will produce less waste. If, at the end of each year, we determined how many miles a car has been driven and charged the owner an air pollution fee for each mile, people would drive fewer miles and create less air pollution.

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## Closure

26. Review the main points of the lesson with the following questions:

- What are natural resources? (*Things that occur naturally in and on the earth that are used to produce goods and services*)
  - What is production? (*The process of using resources and intermediate goods to make goods and provide services*)
  - What are incentives? (*Actions, awards, and rewards that determine the choices people make*)
  - Are there any rewards that influence your behavior in the classroom? (*Prizes for reading or homework passes for good behavior*)
  - Are there any penalties that influence your behavior in the classroom? (*Staying in from recess for talking during class*)
  - What is the incentive that encourages producers to produce more or less of something? (*Price*)
  - How can incentives be used to change our use of natural resources? (*Establishing the right incentives—rewards or penalties—can cause us to use less of a natural resource.*)
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## Assessment

27. Distribute a copy of *Handout 4-1: Assessment* to each student. Read the directions with the students and instruct them to complete the work. Use the answer key below to review the answers.

- 1a. *The waste is the food and food wrappings all over the ground.*
  - 1b. *Students who throw food wouldn't be allowed to eat outside the next day. Students could be given additional minutes outside if they don't throw food.*
  - 2a. *The waste is the sales receipts and cookie crumbs on the floor and the noise.*
  - 2b. *Students could be fined for littering the floor and for the noise.*
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## Standards and Benchmarks

### Voluntary National Content Standards in Economics

#### Standard 1: Scarcity

- **Benchmarks: Grade 4**

1. People make choices because they can't have everything they want.
3. People's choices about what goods and services to buy and consume determine how resources will be used.
4. Whenever a choice is made, something is given up because resources are limited.
5. The opportunity cost of an activity is the value of the best alternative that would have been chosen instead. It includes what would have been done with the money spent and the time and other resources used in undertaking the activity.
7. Natural resources such as land are "gifts of nature"; they are present without human intervention.

#### Standard 2: Decision Making

- **Benchmarks: Grade 4**

1. Choices involve getting more of one thing by giving up something else.
2. A cost is what you give up when you decide to do something. A benefit is what satisfies your wants.

- **Benchmark: Grade 8**

1. To determine the best level of consumption of a product, people must compare the additional benefits with the additional costs of consuming a little more or a little less.