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WHAT ARE SPOTTED OWLS, TIMBER PRODUCTS, AND MAGICAL STONES REALLY WORTH?

INTRODUCTION

What makes a CD player or a spotted owl valuable? Is it something intrinsic in the CD player or the owl, or is the value based somehow on how the product or bird is produced? Generally, economists say “no” to both possibilities. The value of a product is determined by its ability to satisfy the economic wants of those who consume or use it. A product’s economic value is measured by the maximum amount someone is willing and able to pay for it. In this lesson students look at the difference between the value of a product and its market price. They discover that although many products provided by natural resources of the environment have no prices, they still have great economic value.

ECONOMIC CONCEPTS

Value/Economic Value
Demand
Price/Market Price

ENVIRONMENTAL CONCEPTS

Habitat

OBJECTIVES

- Define economic value.
- Explain how economic value is measured.
- Explain why people value products differently.
- Describe the difference between the

value of a product and its market price.

- Explain how a product’s demand curve provides information about the product’s value.
- Explain why even unmarketed, unpriced products (such as those provided directly by the natural resources of the environment) can still have economic value.

LESSON DESCRIPTION

By means of the following activities students reveal their own economic valuations and discover how these are observed and measured. The lesson starts with a familiar commodity, a CD player, and then moves on to analyze the value of a magical stone. The culminating application applies the concepts to the valuation of spotted owls and timber products.

TIME REQUIRED

Two class periods:

Day 1: Steps 1-13

Day 2: Steps 14-closure, plus
Extension Activities

MATERIALS

An unusual stone in an ornate box or small safe

One copy for each student of Activities 1, 2, and 3 (plus Activities 4E and 5E)

PROCEDURE

How valuable is a CD player to you?

1. Tell the students you have a new CD player that you would like to give away to somebody in the class. Ask who would like to have it; call for a show of hands. Count hands and the record the number on the board (it probably will be everyone in the room).
2. Follow up by asking the students why

they want the CD player.
It satisfies a desire for entertainment they probably have.

- Next ask how many students would like the CD player if, in order to get it, they were required to stay an extra hour at school each month. Again record the response.

Who	Number of Students
Conditions Player	Would Take the C
1. No conditions	XX
2. Extra hour at school each month	XX
3. #2 plus no pizza for a month	XX
4. #3 plus no television for a month	XX
5. #4 plus no dates for a month	XX
6. #5 plus a 10-page research paper	XX

- Continue adding conditions and recording the responses as shown below (feel free to add some of your own):

As the conditions increase (notice that they are cumulative), fewer and fewer students will be willing to take the CD player.

Note that economists define the economic value of a commodity by its ability to satisfy the desires of individuals. This is measured by the extent to which an individual is willing to sacrifice other satisfaction-generating products (here: pizza, TV time, dating time, leisure time, etc.) to get it. The more a person is willing to sacrifice, the more valuable the product is said to be to that person.

- Ask: Why isn't everyone willing and able to sacrifice the same amount for a CD player?

People have different economic wants: some might feel they absolutely must have a player to survive, others may not care much for music at all. They also will

view the products being sacrificed differently: for some giving up television may be a very large sacrifice, for others it may not be. Value, like beauty, is in the eyes of the beholder!

Measuring Value in Terms of Money

- Ask each student to write a list of the products or product he or she would buy if somebody suddenly gave him or her \$100 to spend in any way whatsoever.
- Point out that the true economic value to each person of \$100 is the value each would receive from the items on this list. If a person says the maximum amount she is willing and able to pay for a product is \$100, she is really saying that that product is worth as much to her as all the items on her "\$100-list." Thus, instead of measuring value in terms of the actual products sacrificed, economists often use the more convenient monetary measure—the maximum amount the person is willing and able to pay.

Value and the Smart Stone

- Show the students an unusual stone you have brought to class enclosed in an ornate box or small safe (to suggest that the stone is very special in some way).
- Relate the following story about the stone:

"Stones such as this one are found only in a remote part of central Australia. Their geological history is a mystery—perhaps they were part of a meteorite. What is known is that holding a stone of this size tightly in one's hand for an hour will double the holder's IQ for one week. Unfortunately, each of these "smart

stones” can produce this effect only once, and each person can experience this effect only once (that is, even other “unused” stones cannot repeat the effect for a given person). This particular smart stone has yet to be used. Its effect could be very useful to you as a student around finals time or at some other time when you need a little extra boost in your thinking abilities.”

10. Ask each student to secretly write down on a blank sheet of paper the maximum he or she would be willing and able to pay for such a stone if it were available at an auction. Ask all the students to seriously consider how the stone might benefit them if all you have related were in fact true. Remind them that they must not only be willing to pay the amount they write but also able to pay it.
11. Collect the bids, list them from highest to lowest on the board (for example: \$50, \$25, \$20, \$20, \$10, \$5, \$5, \$5, \$0), and then have each student record the bids on Lesson 3, Activity 1. Note that each bid represents someone’s personal economic valuation of a smart stone.
12. Allow students 15 minutes to complete the Activity questions individually or cooperatively. Here are the suggested answers:
 - a. Read values from the “value of stone” column.
 - b. The total value of a given number is the sum of the individual values. For example, the total value of four stones is the sum of the value of the 1st, 2nd, 3rd, and 4th.
 - c. All those which have a higher value than the price given.
 - d. They would have been higher (students would have been more able to pay and probably,

therefore, more willing and able to pay.)

- e. They would have been lower (students would have been less willing to pay since the stone does not meet their need or want for increased intelligence as well as before).
13. Next, discuss their answers and lead discussion to make the following points:
 - a. *The value of each additional unit of a product tends to decline.*
All the stones do not have the same value: the first is more valuable than the tenth which is more valuable than the twentieth (based on question a). This is because as society or an individual gets more of any product, the want or need being satisfied by that product decreases. This may be illustrated by asking students the value to them of the first piece of pizza they eat versus the third or tenth piece (by the time they have eaten nine pieces, their hunger is probably satisfied; the tenth piece thus would do little to provide any extra satisfaction and is not very valuable to them).
 - b. *More of a product generates greater total value.*
The total value of a given number of stones is the sum of the values of each (based on question b). For example, if the first stone has a value of \$50, the second \$20, and the third \$10, the total value of three stones would be \$80.
 - c. *The value of a product is not equal to its price.*
People will buy a stone only if its price is less than (or equal to) the value they personally attribute to it (based on question c). Note the difference between value and price:

value is how much someone is willing and able to pay for something; price is the amount they actually have to pay to get it.

- d. *Changes in people's income or tastes and preferences will change the value they attribute to a product.* Note that changes in income alter a person's *ability* to pay, while changes in preference alter a person's *willingness* to pay (based on questions d and e).

Value and Demand

14. Distribute Activity 2 (or plot the actual information from Activity 1). This activity illustrates the dual role of a demand curve: (1) given a price, this curve shows the quantity of stones that would be purchased (find the price on the vertical axis, read over to the curve and then down to the horizontal axis); or (2) it shows the value of the *n*-th stone (find a particular amount of stones along the horizontal axis such as five, read up to the curve and then over to the vertical axis; the amount given is the value of the fifth stone—in this case, \$4.00). The demand curve may also be used to find the total value of any given number of stones (simply add up the individual values or find the area under the curve up to the quantity in question).
15. Ask the students to answer the questions after discussing the points above. Answers follow:
- 2; 5; 10
 - \$8.00; \$4.00; \$1.50
 - $\$10.00 + \$8.00 + \$6.00 = \24.00
 $\$10.00 + \$8.00 + \$6.00 + \$5.00 + \$4.00 = \33.00
 $\$33.00$ (for the first five) + $\$3.00$
 $+ \$2.50 + \$2.00 = \$40.50$
 - As price rises the quantity demanded falls. You might note that this relationship is often referred to as the “law of demand.”
- e. The value of each additional stone tends to fall (the first units provide more satisfaction than do later units).
- f. Society gets more value as it gets more stones.
- The Case of the Spotted Owl
16. Distribute Lesson 3, Activity 3. Ask the students to read the article. Discuss the competing uses of the forest which generate value (timber harvesting and habitat for the spotted owl).
17. Ask if these are both valuable uses. Yes. Both satisfy the desires of individuals; people enjoy the homes, furniture, and newspapers the timber makes possible and people enjoy viewing owls or just knowing their habitat is being preserved for future generations.
18. Draw two similar demand curves on the board. Put *number of acres devoted to timber harvesting* on the horizontal axis of one and *number of acres devoted to owl habitat* on the other. Note that, because both uses generate value, as in the case of the stones, demand curves like these may be drawn.
19. Ask: How well are the values indicated by these curves reflected in markets? Because timber is traded in markets, its value to users is reflected by the prices they are willing and able to pay. The market for “owl preservation” on the other hand is not well-developed. One may value such a product, but there is no easy place to go or call to express one’s willingness and

ability to pay for it; it is not on the shelf of any store!

20. Given a fixed amount of acres, discuss how the value society receives from these two uses is changed as the number of acres devoted to one of them is increased.

As more acres are devoted to habitat, the value from habitat uses grows while the value from timber uses falls. Similarly, as more acres are devoted to timber uses, the value from habitat use falls and the value from timber uses rises. This is illustrated by showing how the area under each demand curve up to the quantity in question changes as more or fewer acres are devoted to a particular use.

21. Ask students to suggest a rule for deciding how much to devote to each use.

They will likely come up with a rule very much like the rule of allocative efficiency (see Lesson 5). This rule essentially says it is efficient to divide the land between the two uses such that the total value generated from both uses is maximized.

CLOSURE

Note that since many of the products provided by natural resources of the environment are provided directly to people (clean air and water, ultra-violet ray protection, scenic vistas, lakes to swim in, trees for shade and carbon dioxide absorption—see Lesson 1), they do not pass through markets. Thus, they have no prices. But they are still valuable, since they satisfy a want or need that people are willing and able to pay for. In deciding how best to use these

resources, it is therefore important that we concentrate on the value of the products they produce and not the prices.

EXTENSION ACTIVITIES

Math

22. Distribute Activity 4E. Explain that the graph shows the linear relationship between the price of a product and the quantity demanded by consumers. Note the definitions of total expenditures, consumer surplus, and total value as described on the activity sheet.
23. Direct the students to complete the activity. Answers follow:
- TE = $P \times Q$, the area of a rectangle
 CS = $(1/2) \times Q \times (P^* - P)$, the area of a triangle
 TV = $(1/2) \times Q \times (P^* + P)$; or the sum of TE and CS
 - At \$14: TE = \$42, CS = \$9, TV = \$51
 At \$8: TE = \$48, CS = \$36, TV = \$84
 At \$4: TE = \$32, CS = \$64, TV = \$96.

Science

24. Discuss the role of plants in the carbon cycle and why this cycle is valuable to individuals. In particular, discuss theories which link excess carbon dioxide accumulation in the atmosphere to global warming and the potential consequences to society (coastal flooding, desert expansion, etc.).
25. Ask students how much they would be willing and able to pay to avoid these potential damages.

Social Studies

26. Discuss the factors influence how we personally value products. A partial

list might include advertising and the media, your culture, your friends and family, the education and information we receive, etc.

27. Have students give examples of how these factors affect the value they assign to various commodities such as deodorants, whales, CDs, clean air, and broccoli.

Economics

28. Extend your analysis of Activity 2. Tell the class to suppose that the price of a stone is \$5.00. Ask:
- How many stones would be purchased? (4)
 - How much would be spent (total expenditure) on these four stones? ($\$5.00 \times 4 = \20.00)
 - What is the total value received from the four stones?
($\$10.00 + \$8.00 + \$6.00 + \$5.00 = \$29.00$)
- Note that the difference, \$9.00, is consumer surplus, or value received in excess of the amount paid. The \$20.00 may be thought of as “realized” value or value which may be measured by analyzing market transactions. The consumer surplus may similarly be thought of as “unrealized” value, or value which is not being captured in the market transaction. Ask students also to consider other prices and calculate the total expenditures, consumer surplus, and total value (the sum of the first two). Note that the total expenditure on any product in general is less than the value people are receiving from it.

29. Economists define the value of a product by its ability to satisfy the desires of individuals. Ask students working in groups to come up with alternative measures of the value of a

product. Prod their thinking by asking: Should the desires of “other” species be considered? Do some products have some kind of intrinsic value of their own? If so, what is that value based on?

30. Economists often use gross domestic product (GDP) as a measure of the value of a country’s output. Assign students to investigate what GDP measures (the market value or expenditures made on all final goods and services produced) and then ask: is this a good measure of the value we are generating from our resources? A suggested answer follows:

Probably not, since it ignores consumer surplus and all those products which do not have market prices but are clearly valuable—clean air, spotted owls, beautiful sunsets, etc.

Government / Law

31. Show a transparency of Activity 5E. A recent law in the state of Minnesota has set “values” for the state’s fish and game populations as shown on the handout.
32. Prompt students to discuss whether they think the values are too high or too low for the different species.
33. Next ask them to concentrate on the \$4,000 value for a bald eagle. Suppose there were only one pair of bald eagles left in the world. Ask the students if they think \$4,000 is proper restitution for killing one of these eagles.
34. Now suppose eagles were as plentiful as mosquitos in Minnesota. Ask again if \$4,000 sounds like reasonable restitution. Note, as was demonstrated by the activities above, that the value of an eagle (like the value of a stone) depends on which one it is—the first

ACTIVITY 1

THE VALUE OF SMART STONES

Stone	Value of Stone*
1st	_____
2nd	_____
3rd	_____
4th	_____
5th	_____
6th	_____
7th	_____
8th	_____
9th	_____
10th	_____
11th	_____
12th	_____
13th	_____
14th	_____
15th	_____
16th	_____
17th	_____
18th	_____
19th	_____
20th	_____
21st	_____
22nd	_____
23rd	_____
24th	_____
25th	_____
26th	_____
27th	_____
28th	_____
29th	_____
30th	_____
31st	_____
32nd	_____
33rd	_____
34th	_____
35th	_____

- a. What is the economic value of the
 - 1st stone? _____
 - 2nd stone? _____
 - 5th stone? _____
 - 10th stone? _____
 - 15th stone? _____
 - last stone? _____

- b. What is the total value of
 - 2 stones? _____
 - 4 stones? _____
 - 7 stones? _____
 - 10 stones? _____
 - 15 stones? _____

- c. How many stones would be purchased if the price of each stone was
 - \$100.00? _____
 - \$ 25.00? _____
 - \$ 5.00? _____
 - \$ 1.00? _____
 - \$ 0.10? _____

- d. Suppose that at the start of class everyone had been given \$50.00. How would this probably have changed the amount each person wrote down?

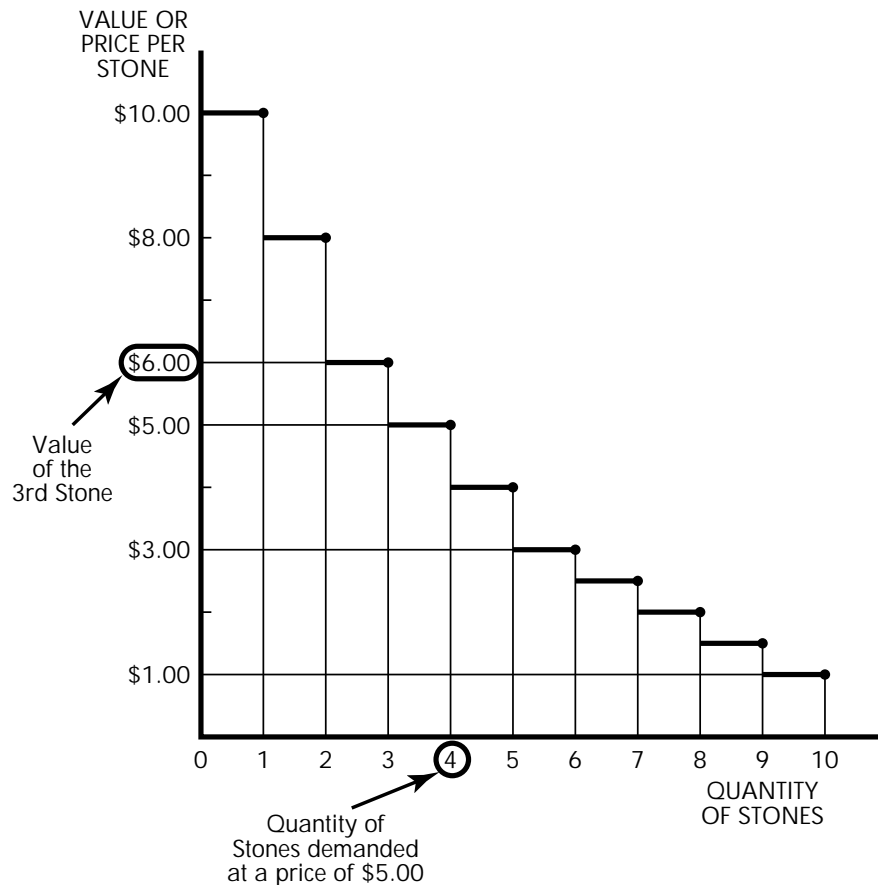
- e. Suppose everyone had been told the stone increases your IQ only by 25%. How would this information probably have changed the amount each person wrote down?

- * Individual responses to: "What is the maximum you would be willing and able to pay for a stone?"

ACTIVITY 2

VALUE AND THE DEMAND CURVE

The curve below is based on plotting bids like those in Activity 1 from the highest to the lowest. This is the demand curve for stones; it shows three things, as illustrated below: (1) the quantity of stones demanded at each price, (2) the value of each additional stone, and (3) the total value of a given number of stones (sum of the value of each of them—shown by the area under the demand curve up to the number given). Based on this, complete the questions below.



- How many stones would be demanded at a price of \$8.00? _____
 ... \$4.00? _____
 ... \$1.00? _____
- What is the value of the 2nd stone?

 ... 5th stone? _____
 ... 9th stone? _____
- What is the total value of 3 stones?

 ... 5 stones? _____
 ... 8 stones? _____
- What general conclusion can you draw from (a)?
- What general conclusion can you draw from (b)?
- What general conclusion can you draw from (c)?

ACTIVITY 3

Endangered Species, Endangered Jobs

PROTECTING spotted owls and logging jobs at the same time is proving difficult.

In the 14 months since the northern spotted owl was placed on the endangered species list, 71 primary manufacturing plants have closed on Oregon, Washington, Idaho and California. These sawmills and plywood and veneer plants employed 6,371 workers. The shutdowns threaten the survival of many towns.

"We haven't seen the end yet," says Paul Ehinger, an industry consultant in Eugene, Ore. His surveys show the vast majority of losses stemmed directly from limitations on federal timber harvests. He says the restraints won't have full effect until 1992, when timber now under contract will have been harvested.

Spotted owls and other rare species are protected for ecological balance and scientific insights. A

federal study found that the remaining spotted owls need at least 8.4 million acres of old-growth habitat to survive.

Most companies rely on public lands for the bulk of their timber supplies. But in the ancient forests of the Pacific Northwest, where a single tree can yield enough wood for four houses, new protection for spotted owls shields millions of acres of spruce, fir, pine and hemlock. In addition, revised Forest Service rules are generally discouraging clear-cut logging practices in more areas, and federal bans on log exports have spread to many state-owned lands.

As a result, volumes of timber under contract are extremely low. In coastal regions of Oregon, Washington and California, for example, the total volume under contract on federal lands is 3.53 billion board feet, down from 10.74 billion in 1986. Willamette Industries, Portland, Ore., now counts on private lands for 62% of its timber, compared with 50% two years ago.

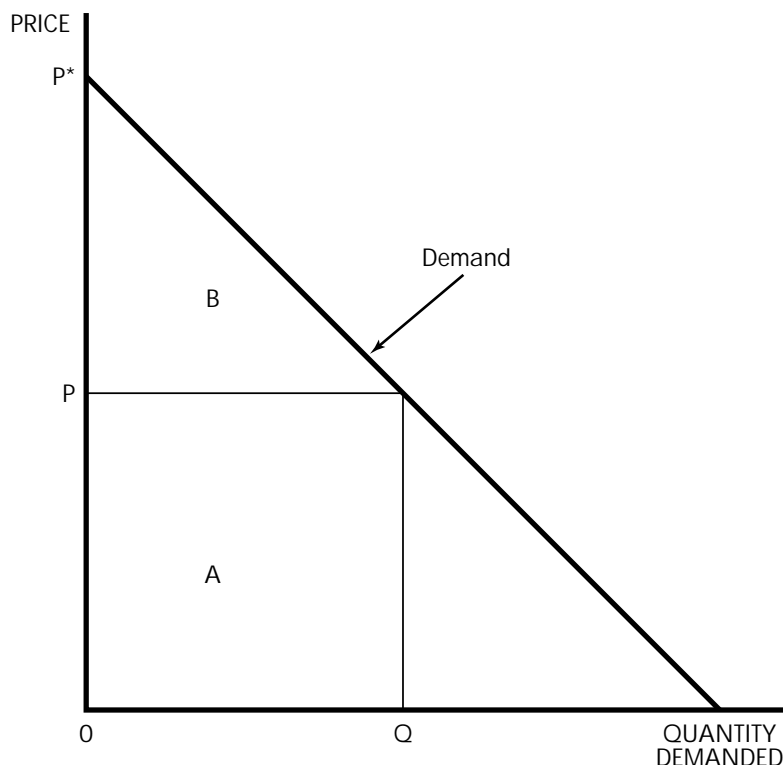
ACTIVITY 4E

TOTAL VALUE = TOTAL EXPENDITURES + CONSUMER

SURPLUS The total value received by consumers from a product is based on the amount they are willing and able to pay for it. This is shown by the demand curve. The amount they actually pay is called the total expenditure (and is based on the price in the market). The difference between the two (what consumers are willing and able to pay and what they actually pay) is called consumer surplus. These are illustrated below. At a price of P consumers buy Q units of this product. Their total expenditures (TE) are shown by area A. The consumer surplus (CS) they receive is shown by area B. The total value (TV) they receive is simply the sum of area A and area B. Given this, do the following:

- Assuming the demand curve is linear, derive algebraic expressions for TE, CS, and TV in terms of P , Q , and P^* .
 TE =
 CS =
 TV =
- Suppose the specific equation of the demand curve shown below is $P = 20 - 2Q$. Find the values of each of the three concepts in (a) for the following prices: \$14, \$8, \$4.

At \$14:	At \$8:	At \$4:
TE =	TE =	TE =
CS =	CS =	CS =
TV =	TV =	TV =



ACTIVITY 5E

SETTING WILDLIFE VALUES

R e s t i t u t i o n

New law sets values for fish and game

People who unlawfully take game and fish should pay more than a fine. They should, in fact, make restitution, which is a payment to restore lost values to the people of Minnesota as opposed to a criminal penalty designed to punish the violator.

A law to this effect was passed by the Minnesota Legislature in 1989. During the past two years the exact details of this law have been studied and agreed upon. In the future, poachers may face not only fines, but restitution payments as well.



\$ 500



\$ 50



\$ 5

Some base values

Crappie	\$5
Perch	5
Rabbit.....	20
Walleye	*30
Northern pike	*30
Mink.....	30
Raccoon	30
Geese	50
Ducks (except canvasback)	50
Grouse	50
Pheasant	50
Partridge	50
Otter.....	100
Canvasback duck	200
Tundra swan	200
Wild turkey.....	400
Black bear	400
Prairie chicken	500
Deer (non-trophy).....	500
Muskies	up to 1,000
Moose	1,000
Trumpeter swan	3,000
Bald eagle	4,000
Endangered birds.....	4,000

*values increase with size

DNR Graphic



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