What's the Cost of Spending and Saving?

LESSON DESCRIPTION AND BACKGROUND

This lesson examines the benefits and costs of spending and saving. The students learn how compound interest makes savings grow. Compounding provides an incentive to save and invest early. The benefits of saving and investing when you are young can increase substantially over time when funds are allowed to compound.

ECONOMIC AND PERSONAL FINANCE CONCEPTS

- Interest
- Opportunity cost
- Risk and Return
- Saving

NATIONAL STANDARDS FOR FINANCIAL LITERACY

- **Standard 3 Saving, Grade 12, Benchmark 1** – People choose between immediate spending and saving for future consumption. Some people have a tendency to be impatient, choosing immediate spending over saving for the future.

COMMON CORE STATE STANDARDS

- **CCSS.MATH.Content.HSF.LE.A.1** – Distinguish between situations that can be modeled with linear functions and with exponential functions.
- **CCSS.MATH.Content.HSF.LE.B.5** – Interpret the parameters in a linear or exponential function in terms of a context.
- **CCSS.ELA-Literacy.CCRA.R.10** – Read and comprehend complex literary and informational texts independently and proficiently.
- **CCSS.ELA-Literacy.W.9-10.9, CCSS.ELA-Literacy.W.11-12.9** – Draw evidence from literary or informational texts to support analysis, reflection, and research.

- **CCSS.ELA-Literacy.L.9-10.6; CCSS.ELA-Literacy.L.11-12.6** – Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
- **CCSS.ELA-Literacy.RH.9-10.4** – Determine the meaning of words and phrases as they are used in a text, including vocabulary describing political, social, or economic aspects of history/social science.

OBJECTIVES

The student will

- identify the costs and the benefits of spending and saving.
- calculate investment accumulations for various interest rates and investment time periods.
- compare the benefits and costs of saving and investment strategies that vary over one's life cycle.
- analyze and explain the impact of amount saved, time, and rate of return on financial accumulations.

TIME REQUIRED

Two 45-minute class periods

MATERIALS

- **Slides 20.1–20.2**
- **Exercise 20.1: The Benefits and Costs of Spending and Saving**, one copy per student
- **Exercise 20.2: A Tale of Two Savers**, one copy per student

- **Exercise 20.3: Why It Pays To Save Early and Often**, one copy per student
- one or two rolls of pennies

ADDITIONAL RESOURCES

Visit https://www.econedlink.org/resources/collection/fffl-9-12/ to find presentations, interactives and other great technology tools to enhance your teaching of this lesson.

PROCEDURE

1. Introduce the lesson by pointing out that Warren Buffett once said, "Do not save what is left after spending, but spend what is left after saving." Everybody says it is a good idea to save money, but many people—even some who earn good incomes—save very little over their lifetimes. Ask students, why might that be? **(Discuss responses briefly.)** Explain that this lesson focuses on decisions that are involved in saving. Although many people don't think about it in this way, it is important to decide how much of your income you want to spend and how much of it you want to save. The decision is not an easy one, because spending and saving each involve benefits and costs. Review the definition of opportunity cost—the next-best alternative that is forgone when a decision is made.

2. Give each student a copy of **Exercise 20.1: The Benefits and Costs of Spending and Saving**. Ask the students to read the exercise and answer the questions. Discuss the answers as a class.

a. What are the benefits and the opportunity cost of spending your income today? **(The main benefit is that spending today enables you to consume goods and services immediately. The opportunity cost is that you have less money to use for consuming goods and services in the future.)**

b. What are the benefits and the opportunity cost of saving some of your income? **(The benefit is that saving will enable you to consume more goods and services later. The opportunity cost is that you will enjoy fewer goods and services today.)**

3. Give each student a copy of **Exercise 20.2: A Tale of Two Savers**, **Part I**. Do not distribute the table at the end of the exercise (Part II). Tell the students to read Part I of the exercise. Ask: Which person do you believe had more money in savings at the end of his or her 65th year? Call for a show of hands to see how many students picked Ana and how many picked Shawn. Call on some students to explain why they answered the question in the way they did.

4. Tell the students that they will see who guessed right. Give each student Part II, including the table. They should study the table and use the information it provides to answer the questions in Part II of **Exercise 20.2**. Discuss these answers in class.

a. How much money had Ana put into savings by age 65? **($24,000)**

b. How much money had Shawn put into savings by age 65? **($64,000)**

c. How much total savings (wealth) did Ana have at the end of her 65th year? **($993,306.59)**

d. How much total savings (wealth) did Shawn have at the end of his 65th year? **($442,503.09)**

e. In money terms, what was the opportunity cost of Ana's savings decision? What was the benefit? **(Ana gave up the immediate uses she might have had for $24,000, but she benefitted by acquiring $993,306.59 at age 66.)**

f. In money terms, what was the opportunity cost of Shawn's savings decision? What was the benefit? **(Shawn gave up the uses he might have had for $64,000 between ages 32 and 65, but he acquired $442,503.09 at age 66.)**

g. In trying to build wealth, the amount saved is obviously important. What other factors are important? Why? **(Other important factors include the amount of time that savings are allowed to accumulate and the interest rate or rate of return at which these savings are invested. These factors will help determine a person's wealth. Even a small amount of money saved will grow if it is left to compound over a long period of time at a reasonably high rate of interest.)**

h. What are the incentives for saving early in life? **(Getting an early start on saving will have a large positive effect on the wealth produced by your savings. Compounding of interest really works for people who begin saving early.)**

i. What was Ana's opportunity cost of saving early? **(Ana gave up buying a nicer car in order to save more.)**

j. What conclusions can you draw from this activity? **(The earlier people begin saving, and the longer they hold their savings in an interest-bearing account, the more wealth their savings will generate. It is better to save early and put your savings to work than to save later and try to catch up. Although Ana saved only $24,000, her accumulation was much greater than those of Shawn, who saved $64,000.)**

5. Display **Slide 20.1**. Ask the students if, given a choice, they would take $10,000 in cold cash OR the amount resulting from the penny in the corner doubled on the next square, and that amount doubled on the next square, and so on, repeatedly, until each square has been used. Use pennies to do the first few squares so the students get the idea (2, 4, 8, 16, 32, 64, etc.). Ask the students to explain their choices.

6. Then ask the students to use calculators to continue calculating the amounts that would accumulate on the chessboard according to the doubling procedure. On basic calculators, they would enter 2 x .01 = .02 for the second square and then keep on multiplying by 2 for each successive square.

7. Display the amounts for students to see. Express the amounts in pennies so that students will see the visual effects of compounding. Before long, you will run out of space as the quantity of pennies increases geometrically. By the 21st square, the amount will equal $10,485.76, demonstrating that the students should have chosen to take the result of the compounding exercise

instead of $10,000. Most basic calculators will display an error E in the upper millions in square 34. A scientific calculator will take you all the way to the end (the 64th square) and display the result in scientific notation—9.2E18, or 9.2 times 10 to the 18th power. You may wish to write this quantity on the board as 9,200,000,000,000,000,000 (92 followed by 17 zeros!). This is 9.2 quintillion pennies (or 92 quadrillion dollars)—more money than the world has ever known.

8. Tell the students that the continual process of multiplying that turned this penny into hundreds, then thousands, then millions, billions, trillions, quadrillions and quintillions is called compounding. Explain that compounding is important to savers. For each dollar saved in a savings account, the bank pays interest. This interest is added to the principal, the amount originally saved; then additional interest is paid on the principal and the interest. This compounding of interest makes money grow much faster. Eventually, money saved will double, as pennies did on this chessboard. The time it takes for money to double depends on the interest rate. In the example of doubling with each square, we have assumed a 100% interest rate. This is, of course, unrealistic. But it helps students visualize what can happen with compounding.

9. Give each student a copy of **Exercise 20.3: Why It Pays To Save Early and Often** and ask the students to read the first three paragraphs. Be sure to explain the Rule of 72. Some students may ask where the number 72 comes from. You can explain that it derives from a mathematical calculation of how long it takes for something to double in size when it is continually compounded. The number 72 is approximately equal to the number produced by this calculation. And the number 72 is easy to use because there are many whole numbers (possible interest rates) that go evenly into 72.

10. Ask the students to fill in the answers in the right hand column of the table. Review the answers.

Answers to Exercise 20.3

Investments	Interest or rate of return	Years to double
Passbook savings	3%	**24 years**
Money market account	4%	**18 years**
U.S. Treasury bond	6%	**12 years**
Stock market	9%	**8 years**

11. Display **Slide 20.2** and explain the factors that influence how much wealth a person can accumulate. Conclude by pointing out that this activity is one more illustration of why it is vital for the students to make a commitment to saving and investing wisely when they are young.

12. Discuss the question at the end of **Exercise 20.3.** One key point in the economic way of thinking is that people respond to incentives. What is the incentive for saving early and often? *(The incentive is substantial wealth accumulation over time.)*

CLOSURE

1. Review the following questions with the class.

• What is one opportunity cost of saving early, such as what Ana did? *(You may need to give up immediate uses of the money, such as buying new things like a car or a house.)*

• What does the Rule of 72 demonstrate? *(The Rule of 72 shows how long it takes for your money to double given various interest rates.)*

• What would be your advice to a recent college graduate regarding investing in their retirement? *(The more you are able to save now will help you build substantial wealth in the long-term.)*

ASSESSMENT

Divide the class into 4 groups and explain that each group is responsible for developing a 60-second radio advertisement. The ad should be targeted to high school students and young adults.

Group #1: Explain how time affects the growth of savings and the principle of compounding.

Group #2: Explain how the amount of savings affects the growth of savings and what opportunity cost is.

Group #3: Explain how the rate of interest affects the growth of savings and the Rule of 72.

Group #4: Explain how inflation rates impact the cost of living, cost of loans and value of savings.

Give the groups time to prepare their ads; then have each group present its ad to the class.
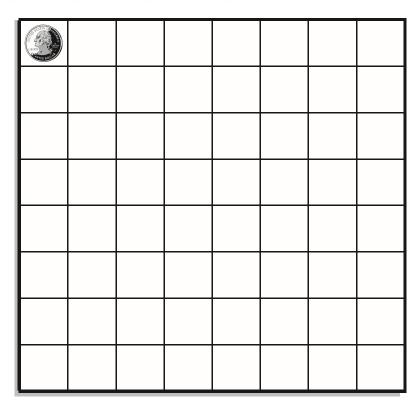
Evaluate the ads using these criteria.

• How well they explained the concepts of interest, opportunity cost, risk and return, Rule of 72 and saving.

• How well they used creativity to enhance the appeal of the ad.

SLIDE 20.1

SLIDE 20.2

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Save Early and Often

These factors affect the growth of savings:

• Time
The earlier or longer you save, the more total savings (wealth) you will have.

• Investment Size
The more you save each year from your income, the more total savings (wealth) you will have.

• Rate of Return
The higher the interest rate or rate of return, the more total savings (wealth) you will have.
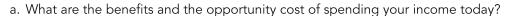
What's the Cost of Spending and Saving?

The Benefits and Costs of Spending and Saving

A person's income represents some of his or her financial resources. Because of limited financial resources, every decision about the use of resources involves an opportunity cost. The opportunity cost is what you give up when you make a choice. It is the most-valued option that you refused because you chose something else. It is your next-best option.

One important choice that everyone faces is whether to consume goods and services today or to consume goods and services later. Spending today brings immediate benefits or gratification. The opportunity cost of spending today is that your spending will leave you with less money to buy goods and services in the future. Saving builds wealth, enabling you to buy goods and services in the future—perhaps a car, a college education, a house, a vacation. The opportunity cost of saving is that saving leaves you with less money to use for buying goods and services today.

Questions

a. What are the benefits and the opportunity cost of spending your income today?

b. What are the benefits and opportunity cost of saving some of your income?

A Tale of Two Savers

Part I: Ana and Shawn

The following case study is about two people who saved money. Both of them earned 10 percent interest on the money they saved. (Of course, in the real world, the interest or rate of return on savings can differ greatly from year to year and from one savings institution to another.)

Ana Gutierrez started saving when she was 22 years old, right out of college. Saving involves an opportunity cost—the next-best alternative given up. It wasn't easy for Ana to save $2,000 a year then, considering her car loan, the expenses of operating her car, and rent payments. But Ana was determined to save because her grandmother always said it isn't what you make, but what you save, that determines your wealth. So, reluctantly, Ana gave up buying that new car and renting a really nice apartment, and she saved $2,000 a year. After 12 years, she got tired of the sacrifice, yearning for a brand-new red sports car and other luxuries. She didn't touch the money she had already saved because she wanted to be sure she would have money for retirement, which she planned to do at the end of her 65th year. But she quit saving and hit the stores.

Shawn Wright didn't start saving until he was 34 years old. He also graduated from college at 22, but he had done without many things in college, and once he found a job that gave him a decent income, he wanted to have some of those things he had done without. He bought a new car, a very nice wardrobe, and he took some wonderful trips. But spending his income involved an opportunity cost. By the time he was 34, Shawn was married; he had many responsibilities, and he decided he'd better start saving and planning for his financial future. He also had heard that it isn't what you have earned, but what you have saved, that determines your wealth. He figured he had 25 to 30 productive years left in his career. So, with new determination, Shawn saved $2,000 a year for the next 32 years until he retired at the end of his 65th year.

Which person do you believe had more savings at the end of his or her 65th year? Ana or Shawn?

Part II: The Growth of Ana's and Shawn's Savings

Now let's see what really happened. Use the information from the table on the next page to answer the questions below.

Questions

a. How much money had Ana put into savings by age 65?

b. How much money had Shawn put into savings by age 65?

c. How much in total savings (wealth) did Ana have at the end of her 65th year?

d. How much in total savings (wealth) did Shawn have at the end of his 65th year?

e. In money terms, what was the opportunity cost of Ana's savings decision? What was the benefit?

f. In money terms, what was the opportunity cost of Shawn's savings decision? What was the benefit?

g. In trying to build wealth, the amount saved is obviously important. What other factors are important? Why?

h. What are the incentives for saving early in life?

i. What was Ana's opportunity cost of saving early?

j. What conclusions can you draw from this activity?

		Ana Gutierrez			Shawn Wright		
Age	Interest rate	Saved	Interest Earned	Total saved at the end of the year	Saved	Interest Earned	Total saved at the end of the year
21	10%	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
22	10%	$2,000.00	$200.00	$2,200.00	$0.00	$0.00	$0.00
23	10%	$2,000.00	$420.00	$4,620.00	$0.00	$0.00	$0.00
24	10%	$2,000.00	$662.00	$7,282.00	$0.00	$0.00	$0.00
25	10%	$2,000.00	$928.20	$10,210.20	$0.00	$0.00	$0.00
26	10%	$2,000.00	$1,221.02	$13,431.22	$0.00	$0.00	$0.00
27	10%	$2,000.00	$1,543.12	$16,974.34	$0.00	$0.00	$0.00
28	10%	$2,000.00	$1,897.43	$20,871.78	$0.00	$0.00	$0.00
29	10%	$2,000.00	$2,287.18	$25,158.95	$0.00	$0.00	$0.00
30	10%	$2,000.00	$2,715.90	$29,874.85	$0.00	$0.00	$0.00
31	10%	$2,000.00	$3,187.48	$35,062.33	$0.00	$0.00	$0.00
32	10%	$2,000.00	$3,706.23	$40,768.57	$0.00	$0.00	$0.00
33	10%	$2,000.00	$4,276.86	$47,045.42	$0.00	$0.00	$0.00
34	10%	$0.00	$4,704.54	$51,749.97	$2,000.00	$200.00	$2,200.00
35	10%	$0.00	$5,175.00	$56,924.96	$2,000.00	$420.00	$4,620.00
36	10%	$0.00	$5,692.50	$62,617.46	$2,000.00	$662.00	$7,282.00
37	10%	$0.00	$6,261.75	$68,879.21	$2,000.00	$928.20	$10,210.20
38	10%	$0.00	$6,887.92	$75,767.18	$2,000.00	$1,221.02	$13,431.22
39	10%	$0.00	$7,576.71	$83,343.84	$2,000.00	$1,543.12	$16,974.34
40	10%	$0.00	$8,334.38	$91,678.22	$2,000.00	$1,897.43	$20,871.78
41	10%	$0.00	$9,167.82	$100,846.05	$2,000.00	$2,287.18	$25,158.95
42	10%	$0.00	$10,084.60	$110,930.65	$2,000.00	$2,715.90	$29,874.85
43	10%	$0.00	$11,093.06	$122,023.71	$2,000.00	$3,187.48	$35,062.33
44	10%	$0.00	$12,202.37	$134,226.09	$2,000.00	$3,706.23	$40,768.57
45	10%	$0.00	$13,422.61	$147,648.69	$2,000.00	$4,276.86	$47,045.42
46	10%	$0.00	$14,764.87	$162,413.56	$2,000.00	$4,904.54	$53,949.97
47	10%	$0.00	$16,241.36	$178,654.92	$2,000.00	$5,595.00	$61,544.96
48	10%	$0.00	$17,865.49	$196,520.41	$2,000.00	$6,254.50	$69,899.46
49	10%	$0.00	$19,652.04	$216,172.45	$2,000.00	$7,189.95	$79,089.41
50	10%	$0.00	$21,617.25	$237,789.70	$2,000.00	$8,108.94	$89,198.35
51	10%	$0.00	$23,778.97	$261,568.67	$2,000.00	$9,119.83	$100,318.18
52	10%	$0.00	$26,156.87	$287,725.54	$2,000.00	$10,231.82	$112,550.00
53	10%	$0.00	$28,772.55	$316,498.09	$2,000.00	$11,455.00	$126,005.00
54	10%	$0.00	$31,649.81	$348,147.90	$2,000.00	$12,800.50	$140,805.50
55	10%	$0.00	$34,814.79	$382,962.69	$2,000.00	$14,280.55	$157,086.05
56	10%	$0.00	$38,296.27	$421,258.96	$2,000.00	$15,908.60	$174,994.65
57	10%	$0.00	$42,125.90	$463,384.85	$2,000.00	$17,699.47	$194,694.12
58	10%	$0.00	$46,338.49	$509,723.34	$2,000.00	$19,669.41	$216,363.53
59	10%	$0.00	$50,972.33	$560,695.67	$2,000.00	$21,836.35	$240,199.88
60	10%	$0.00	$56,069.57	$616,765.24	$2,000.00	$24,219.99	$266,419.87
61	10%	$0.00	$61,676.52	$678,441.76	$2,000.00	$26,841.99	$295,261.86
62	10%	$0.00	$67,844.18	$746,285.94	$2,000.00	$29,726.19	$326,988.05
63	10%	$0.00	$74,628.59	$820,914.53	$2,000.00	$32,898.80	$361,886.85
64	10%	$0.00	$82,091.45	$903,005.99	$2,000.00	$36,388.68	$400,275.53
65	10%	$0.00	$90,300.60	$993,306.59	$2,000.00	$40,227.55	$442,503.09

Why It Pays to Save Early and Often

Suppose you put $1,000 into an investment that earns 10 percent interest. You leave the $1,000 there for 10 years. You might expect to have earnings of $1,000 or a total of $2,000 in your account ($1,000 x .1 x 10 = $1,000). Adding the $1,000 in earnings to your original $1,000, you would end up with $2,000, right?

Wrong! You would have more than that. The return would be much higher because you would earn interest not only on the original $1,000 but also on the interest earned along the way over the 10 years. This sort of interest is called compound interest. Here's how compounding works. Let's assume that 10 percent interest is compounded annually. This first year you earn $100 in interest. Now you have $1,100. The second year you earn interest on $1,100 ($1,100 x .1 = $110), and that amount is added on to your principal.

As interest compounds, savings grow. How long would it take for the savings of our hypothetical saver to double if he didn't spend any of those savings? You can find out, approximately, by dividing 72 by the interest rate (expressed in percentage form). This is called the Rule of 72. For example, at 10 percent interest, money will double in about 7.2 years if the interest is compounded (72 ÷ 10 = 7.2 years).

Let's see how long it will take money to double in other cases. Do the calculations and fill in the answers in the right-hand column below.

Investments	Interest or rate of return	Years to double
Passbook savings	3%	
Money market account	4%	
U.S. Treasury bond	6%	
Stock market	9%	

Because of compounding, it pays to save early and often. These are the factors that affect the growth of savings.

• The earlier or longer you save, the more savings you will have.

• The more income you save each year, the more savings you will have.

• The higher the interest rate or rate of return, the more savings you will have.

• One key point in the economic way of thinking is that people respond to incentives. What is the incentive for saving early and often?