M&M INTERESTING

INTRODUCTION

Purpose: During this lesson students use the economic concepts of trade-offs and opportunity cost to decide between savings accounts with simple interest and those with compound interest.

Background: Depositing funds in savings accounts and other interest bearing accounts is a common financial decision. Basically there are two types of savings accounts: simple interest accounts and compound interest accounts. With a simple interest account, the interest earned is paid periodically to the depositor who can use the funds for current consumption or some other purpose. With a compound interest account, the interest earned is left on deposit to earn interest. The practice of leaving interest on deposit to earn interest is referred to as compounding, and the interest earned is referred to as compound interest.

The essential trade-off between simple interest and compound interest is current consumption versus relatively greater future consumption due to savings growth. The opportunity cost of using a compound interest account is the lost benefits of current consumption made possible by simple interest. The opportunity cost of using a simple interest account is the lost benefits that can be obtained from the next best alternative; i.e., compounding. Explicit use of opportunity cost considerations allow the decision maker to think carefully about these two types of interest.

If interest is withdrawn as it is earned, the balance in the account at any time will be the sum of all deposits into the account (less withdrawals, if any).   If interest is left on deposit, the balance in the account at any point would be the sum of all deposits plus interest accumulations (less withdrawals, if any). Note that interest accumulations would include interest earned and retained in the savings account and interest earned on those interest deposits.

CONCEPTS

Compounding
Compound Interest
Interest
Interest Rate
Opportunity Cost
Simple Interest
Trade-offs

OBJECTIVES

♦ Calculate interest earned on account balances.
♦ Use the concepts of trade-offs and opportunity cost to make a decision.

LESSON DESCRIPTION

This lesson requires students, working in groups, to calculate interest over six deposit cycles. Each of six groups will have the same deposit pattern, but three will have a simple interest account, and three will have a compound interest account. After each cycle, each group will receive its next deposit and its interest for that cycle. At the end of the six cycles, all groups will compare their calculations with other groups in the class. A class discussion will follow that applies the information from the calculations and the concepts of trade-offs and opportunity cost to the task of making a decision among savings account choices.

To make this exercise come to life for students it is recommended that they receive deposits and interest in some tangible form. Candies such as M&Ms or small, wrapped Tootsie Rolls would work well. Cheerios or pretzel sticks might be a healthier alternative. Each group will have an account envelope to hold its "funds." The simple interest groups should receive their interest as it is earned (eat their interest) and place all deposits in an account envelope. For the compound interest groups, all deposits and interest earnings should be placed in the groups' account envelopes.

TIME REQUIRED

♦ One fifty-minute class period

LESSON FOUR

MATERIALS

Calculators, if available (at least one for each group)

An account envelope (9" x 12" recommended) for each group

Overhead projector and pens

Copy of Activities 14, 15, and 16 for each student

Approximately 900 candies or pretzels

Transparency of Activities 15 and 16

Thirty-six plastic deposit bags (Sandwich bags would work. Each should be filled in advance with ten candies, pretzels, or other payment.)

One copy of Activity 17 or 18 for each group

Transparency of Activities 17 and 18 Answers

One copy of Activity 19 for each student

One copy of Activity 20 for each student (optional)

PROCEDURE

1. Explain that this lesson is designed to teach students how to decide among types of savings accounts. Ask the students if they have savings accounts. Ask them to define "interest" in their own words. Briefly discuss their definitions.

2. Distribute Activity 14 to each student. The students can use it to reinforce the definitions covered below.

    A. Define the term interest as the price paid for using someone else's money. Explain that when students deposit money in a bank or other financial institution they are, in effect, lending the bank the money. In return for making the loan to the bank they receive interest. Thus, the interest the bank pays on a savings account is the price it must pay to use the saver's money.

    B. Define interest rate as the price one must pay to use someone else's money stated as a percentage.

    C. Define simple interest as interest that is earned and paid out to the depositor. Explain that with simple interest, the interest payments are available to the depositor to spend.

    D. Define compound interest as interest earned when previously earned interest is left on deposit to earn additional interest. Explain that with compound interest, the interest is not paid out to the saver, but is instead held in the savings account where it can earn further interest.

    E. Define compounding as the practice of leaving interest earned on deposit so that it too may earn interest. Reinforce the point that with compounding, interest remains in the account and is not available to spend, but instead earns interest.

3. Review how to change a percentage into a decimal. Go through several examples. For instance,

    10% = 0.10 or just 0.1
    20% = 0.20 or just 0.2
    30% = 0.30 or just 0.3
    40% = 0.40 or just 0.4

4. Explain that students will work in groups to calculate how much interest they will earn on their savings using an interest rate of 30 percent. Explain that 30 percent is much higher than a bank would pay, but it will make the differences between simple and compound interest more obvious.

5. Display a transparency of Activity 15 and distribute a copy of Activity 15 to each student. Explain that it outlines how to calculate interest and account balances for a simple interest account over time. Explain the steps:

    A. Add columns one and two for deposit cycle one and record the answer in column three.

B. Multiply column three by the decimal equivalent of 30% and record in column five. Explain that the example you are using is simple interest so the money would be paid to the depositor who could then spend it.

C. Explain that since the interest is paid out to the depositor the balance at the end is the same figure as in column three and should be recorded in column six as an ending balance. Also, record this balance in column one of deposit cycle two as a beginning balance.

D. Continue completing the table as a class.

6. Display a transparency of Activity 16 and distribute a copy of Activity 16 to each student. Explain that it outlines how to calculate interest and account balances for a compound interest account over time. Explain the steps:

A. Add columns one and two of deposit cycle one and record the answer in column three.

B. Multiply column three by the decimal equivalent of 30% and record in column five. Explain that the example you are using is a compound interest situation; thus, the interest stays in the account.

C. Now add columns three and five and record in column six as an ending balance. Also record this number in column one of deposit cycle two as a beginning balance.

D. Continue completing the table as a class.

7. Divide the class into six nearly equal groups: three for simple interest and three for compound interest. Each group should have a copy of Activity 17 or 18, and a calculator, if available.

8. Explain that the teacher or a student will act as the banker, keeping an account envelope for each group and paying interest out to the groups or depositing it in the account envelope as appropriate.

9. Give the groups six plastic deposit bags.

10. Remind students they can refer to Activity 15 or 16 to review the appropriate calculations.

11. Begin by having a representative of each group bring one plastic deposit bag to place in its account envelope.

12. Give the groups time to do their calculations for each cycle and record their results on the activity sheet. (They should round results to the nearest whole number. If 1.5, 2.5, etc., round down.)

13. As each cycle is calculated and recorded on the activity sheet a member of each group should come to the bank to collect the group's interest or have the interest deposited. While at the bank, the group member should also make the group's deposit and get a plastic bag for the next deposit cycle. Simple interest groups should consume (eat) their interest at the end of each cycle. Compound interest groups should have their interest put into their account envelope. Check to see that the groups are correctly calculating and recording the information on their worksheets.

14. Continue to distribute or deposit interest to each group until all six cycles have been completed. All DEPOSITS should go into the groups' account envelopes.

15. After groups have completed all six cycles and have recorded their results on their activity sheet, distribute the account envelopes to the appropriate groups. Instruct students to open their account envelopes and count their group's candy.

16. Ask the simple interest groups to explain why they only have sixty items in their account envelope even though they earned an additional 63 items in interest. Ask how their account envelope amount might have differed had they not consumed their interest. (They should see they would have had 123 candies had they not eaten their interest). Ask the compound interest groups to explain why they have 166 items in their account envelope. (They should see that they not only have their interest, but that their interest earned interest.)

17. Show the Answer overhead transparencies for Activities 17 and 18 so that all can see the results. Discuss the generalizations that can be derived:

    A. For compound interest groups, previously earned interest is added into the amount on which interest will be calculated the next time.

    B. Interest income becomes larger as the total amount on which the interest is calculated gets larger. This is especially beneficial for compound interest groups that earn interest on interest.

18. Define the concept of opportunity cost as the highest forgone alternative when a decision is made.

19. Ask students to identify the opportunity cost of using a simple interest account. (the benefits of the compound interest account)

20. Ask the students to identify the opportunity cost of using a compound interest account. (the benefits enjoyed from spending interest as it is earned)

21. Explain that identifying the opportunity cost of a decision allows a reconsideration of whether the alternative chosen was truly the best.

22. Ask the compound interest groups and simple interest groups if they would do things differently now that they know the opportunity cost of the way they used the interest earned.

23. Define the concept of trade-offs as giving up some of one thing to get some of another. Ask the class to describe the trade-off involved in deciding between a simple interest account and a compound interest account. (The trade-off is between being able to spend interest as it is earned versus earning interest on their interest and having more to spend in the future.)

CLOSURE

Explain that the exercise and calculations they completed using candy yielded information required to make a decision.
Explain that the economic concepts of opportunity cost and trade-offs give them ways to think about the information so that they can arrive at the decision that is best for them.

EVALUATION

1. Distribute a copy of Activity 19 to each student. Instruct students to write or discuss responses as requested on the activity sheet.

2. (Optional) Distribute a copy of Activity 20 to each student. Use it to test the students' understanding of calculating compound interest.

SUGGESTIONS FOR FURTHER ENHANCEMENT

1. Have the students graph the savings balances over time for the simple interest and compound interest examples used in this lesson. Ask them to discuss how seeing the results visually might add to their understanding of the trade-offs and opportunity cost of simple versus compound interest.

2. Have students write a letter to a friend describing compound interest and its importance in building savings balances. The letter should

include a description of the opportunity cost and trade-offs of simple versus compound interest.

PARENTAL INVOLVEMENT

♦ Ask several parents to visit class on the day of this lesson to help groups with their calculations. Have the parents discuss ways that they use compound interest in their financial planning and what they see as important trade-offs between simple and compound interest.

♦ Have students ask their parents about situations where they have used simple interest instead of compound interest. Have the students explain to their parents the opportunity cost of using simple interest. The student should then ask the parent for reasons why using simple interest was the best choice given the opportunity cost involved.

RESOURCES

The Savings Zone, 1993, Part 1 - 22 minutes, Part 2 - 50 minutes, VHS. For price and ordering information, contact: National Institute for Consumer Education, Eastern Michigan University, 207 Rackham Building, Ypsilanti, MI 48197 (313-487-2292). In Part 1, three teenage consumers address the problem of obtaining funds for a car. In Part 2, a panel of bankers and high school students comments on the attitudes and behaviors presented in the three scenarios. Kit includes background information, activity sheets, glossary, and a resource list.

Gimme, The Debt Monster. For price and ordering information, contact: CCCS of the Black Hills, P.O. Box 14, Rapid City, SD 57709-0014 (605-348-4550). Scripts for K-6th grade include five topics: wants and needs, savings, spending, responsibility, dealing with peer pressure.

Financial Responsibility Educational Materials. For price and ordering information, contact: Office of Public Responsibility, American Express, 200 Vesey Street, New York, NY

10285-4850 (FAX to 212-640-4443). Program offers a wide variety of materials to help students learn about budgeting, saving, making major purchases, the wise use of credit, and making financial responsibility a habit.

From *Personal Finance Economics, 6-8: Money in the Middle*, © National Council on Economic Education, New York, NY

ACTIVITY 14
DEFINITIONS

INTEREST	Interest is the price paid for using someone else's money. People who deposit funds with a financial institution such as a bank are lending money to the bank. Those people receive interest.
INTEREST RATE	An interest rate is the price paid for using someone else's money, stated as a percentage.
SIMPLE INTEREST	Simple interest is the interest earned and paid out to the depositor.
COMPOUND INTEREST	Compound interest is the interest earned by leaving interest earned on deposit to earn additional interest.
COMPOUNDING	Compounding is the practice of leaving interest earned on deposit so that it too earns interest.

ACTIVITY 15
SIMPLE INTEREST

Deposit Cycle	1 Beginning Balance	2 Plus Deposited Amount	3 Equals Balance to Earn Interest (**1** + **2**)	4 Times the Rate of Interest	5 Equals Interest Earned and Paid Out During Cycle	6 Ending Balance (**3***)
1	0	10	10	30%	3	10
2	10	10		30%		
3		10		30%		
4		10		30%		
5		10		30%		
6		10		30%		
Total	n/a		n/a	n/a		n/a

*Since interest is paid out, it is not added to the balance.

ACTIVITY 16
COMPOUND INTEREST

Deposit Cycle	**1** Beginning Balance	**2** Plus Deposited Amount	**3** Equals Balance to Earn Interest (**1** + **2**)	**4** Times the Rate of Interest	**5** Equals Interest Added to the Account During the Cycle	**6** Ending Balance (**3** + **5**)
1	0	10	10	30%	3	13
2	13	10		30%		
3		10		30%		
4		10		30%		
5		10		30%		
6		10		30%		
Total	n/a			n/a		n/a

ACTIVITY 17
CALCULATION HANDOUT
SIMPLE INTEREST GROUPS

Calculation Grid - 30 Percent Simple Interest

Deposit Cycle	1 Beginning Balance	2 Plus Deposited Amount	3 Equals Balance to Earn Interest (**1** + **2**)	4 Times the Rate of Interest	5 Equals Interest Earned and Paid Out During Cycle	6 Ending Balance (**3***)
1	0	10		30%		
2		10		30%		
3		10		30%		
4		10		30%		
5		10		30%		
6		10		30%		
Total	n/a		n/a	n/a		n/a

*Since interest is paid out, it is not added to the balance.

ACTIVITY 17 (Answers)
CALCULATION HANDOUT
SIMPLE INTEREST GROUPS

Calculation Grid - 30 Percent Simple Interest (Answers)

Deposit Cycle	1 Beginning Balance	2 Plus Deposited Amount	3 Equals Balance to Earn Interest (**1** + **2**)	4 Times the Rate of Interest	5 Equals Interest Earned and Paid Out During Cycle	6 Ending Balance (**3***)
1	0	10	10	30%	3	10
2	10	10	20	30%	6	20
3	20	10	30	30%	9	30
4	30	10	40	30%	12	40
5	40	10	50	30%	15	50
6	50	10	60	30%	18	60
Total	n/a	60	n/a	n/a	63	n/a

*Since interest is paid out, it is not added to the balance.

ACTIVITY 18
CALCULATION HANDOUT
COMPOUND INTEREST GROUPS

Calculation Grid - 30 Percent Compound Interest

	1	2	3	4	5	6
Deposit Cycle	Beginning Balance	Plus Deposited Amount	Equals Balance to Earn Interest (**1** + **2**)	Times the Rate of Interest	Equals Interest Added to the Account During the Cycle	Ending Balance (**3** + **5**)
1	0	10		30%		
2		10		30%		
3		10		30%		
4		10		30%		
5		10		30%		
6		10		30%		
Total	n/a		n/a	n/a		n/a

ACTIVITY 18 (Answers)
CALCULATION HANDOUT
COMPOUND INTEREST GROUPS

Calculation Grid - 30 Percent Compound Interest (Answers)

Deposit Cycle	1 Beginning Balance	2 Plus Deposited Amount	3 Equals Balance to Earn Interest (**1** + **2**)	4 Times the Rate of Interest	5 Equals Interest Added to the Account During the Cycle	6 Ending Balance (**3** + **5**)
1	0	10	10	30%	3	13
2	13	10	23	30%	7	30
3	30	10	40	30%	12	52
4	52	10	62	30%	19	81
5	81	10	91	30%	27	118
6	118	10	128	30%	38	166
Total	n/a	60	n/a	n/a	106	n/a

ACTIVITY 19
EVALUATION EXERCISE

This is the story of the Johnson triplets: BARRY, TERI, and JERRY. They each receive an allowance of $10 per month. It is January, and their family is planning a vacation in August during which they could use a little extra spending money. Their grandmother has agreed to pay each of them 20 percent per month interest on their allowances if they will give their allowances to her for safe keeping until the trip. Once they begin the plan, they will not have any access to the money their grandmother holds. The grandmother has left it up to them as to what to do with the interest. All three kids want to take advantage of their grandmother's offer. However, each will approach it in a slightly different way.

BARRY is thinking of having his grandmother give him his interest each month so that he can have a little spending money until August. He will spend $72 between now and August and would have $80 saved to spend on the trip.

TERI is thinking of having her grandmother give her the interest each month just in case she needs it for something. She really doesn't plan to spend the interest and will put it in her dresser drawer. Assuming she does not spend the interest she would have $152 to spend on the trip ($80 from deposits and $72 from the money stashed in her dresser drawer).

JERRY is planning to have his grandmother keep his interest as well as his allowance. He figures that way he will have $199 for the trip ($80 from deposits and $119 from interest).

1. Which of the Johnson triplets is practicing compounding and which is using simple interest?

2. TERI is the most undecided of the three. What is her trade-off and opportunity cost if she does as she plans versus opting to do things like BARRY?

3. What is TERI's trade-off and opportunity cost if she does as she plans versus opting to do things like JERRY?

ACTIVITY 19 (Answers)
EVALUATION EXERCISE

1. Which of the Johnson triplets is practicing compounding, and which is using simple interest?

Only JERRY is practicing compounding. He is leaving his interest on deposit so that his interest will earn interest. Although TERI is not planning to spend her interest, she is not leaving it on deposit to earn interest. So, she is not practicing compounding.

2. TERI is the most undecided of the three. What is her trade-off and opportunity cost if she does as she plans versus opting to do things like BARRY?

The trade-off involved in deciding between her plan and BARRY's is the $72 she could spend between January and August versus having an additional $72 to spend on the trip. Thus, if TERI opts for her plan versus BARRY's plan, her opportunity cost will be enjoyment from the things she might spend the $72 on before going on the trip.

3. What is her trade-off and opportunity cost if she does as she plans versus opting to do things like JERRY?

The trade-off involved in deciding between her plan and JERRY's is having an additional $47 for the trip versus having some funds available to spend, if desired, between January and August. Thus, if TERI opts for her plan versus JERRY's, her opportunity cost will be the enjoyment from the things she might spend the additional $47 on during the trip.

ACTIVITY 20
OPTIONAL EVALUATION EXERCISE

Calculation Grid - 10 Percent Compound Interest

Deposit Cycle	1 Beginning Balance	2 Plus Deposited Amount	3 Equals Balance to Earn Interest $(1 + 2)$	4 Times the Rate of Interest	5 Equals Interest Added to the Account During the Cycle	6 Ending Balance $(3 + 5)$
1	0	30		10%		
2		30		10%		
3		30		10%		
4		30		10%		
5		30		10%		
6		30		10%		
Total	n/a		n/a	n/a		n/a

ACTIVITY 20 (Answers)
OPTIONAL EVALUATION EXERCISE

Calculation Grid - 10 Percent Compound Interest

Deposit Cycle	1 Beginning Balance	2 Plus Deposited Amount	3 Equals Balance to Earn Interest (**1** + **2**)	4 Times the Rate of Interest	5 Equals Interest Added to the Account During the Cycle	6 Ending Balance (**3** + **5**)
1	0	30	30	10%	3	33
2	33	30	63	10%	6	69
3	69	30	99	10%	10	109
4	109	30	139	10%	14	153
5	153	30	183	10%	18	201
6	201	30	231	10%	23	254
Total	n/a	180	n/a	n/a	74	n/a