MATHEMATICS & ECONOMICS

CONNECTIONS FOR LIFE • GRADES 6–8

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National Council on Economic Education

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Mary Suiter is the associate director of the Center for Entrepreneurship and Economic Education at the University of Missouri-St. Louis. Ms. Suiter served on the 10-member writing team for K-12 national economics standards. Suiter has authored/co-authored numerous lessons and curriculum units that are used nationally and internationally to teach economics in the K-12 classroom. These include *Zooconomy: Zoo Business*, *Arts Mart*, *Economics and Children's Literature*, *The Voyages of Columbus: An Economic Enterprise*, *Kaleidoscope USA*, *The Economics of Our Diverse Society*, and *Economics: Focus Middle School*, *Financial Fitness for Life: Steps to Financial Fitness* and *Money Math: Lessons for Life.* Suiter developed stories and lessons for Wise Pockets World, a web site for young children. She has conducted economic education workshops nationally and internationally.

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Foreword

This excellent book is aptly named. Bringing mathematics and economics together–connecting them effectively in the minds of our students–will give those young people very important skills they can use in their lives, all their lives.

For more than 50 years, the National Council on Economic Education (NCEE) has been the nation's leader in getting economics into the K–12 curriculum of the nation's schools by teaching teachers and equipping them with outstanding materials.

This publication, however, is part of an exciting new series of publications for NCEE. It is especially written for middle school mathematics teachers. It will have significant reach and impact, in terms of core educational experiences for thousands of young people. We are very grateful to 3M for making this splendid resource for teachers possible. NCEE is proud of this outstanding partnership with 3M–and of the product.

Because understanding economics is so important for success in life, NCEE is constantly seeking ways to ensure that economics is incorporated into teaching and learning in various subject areas, especially the social studies, such as government, history, geography, and now mathematics. This new teaching resource will certainly help to advance economic literacy, because of the central place math has in the curriculum in all schools.

Whether the course is a sixth grade general mathematics class or an eighth grade pre-Algebra class, there are lessons here designed to help reinforce the mathematics concepts and processes taught, by using examples from economics. Using the four basic mathematical manipulations of addition, subtraction, multiplication, and division, students will understand how to construct a price index to compare the costs of goods and wages today with those in the past. They also compare the costs of goods in different countries by looking at exchange rates. Students also learn the basics of supply and demand and how the equilibrium price of a good is determined. This book is especially designed to help mathematics teachers answer the proverbial question asked by students, "Why do I have to learn this? Am I ever going to use it?"

On the other hand, mathematics teachers may ask the question, "Do I need to take a course in economics in order to use this curriculum guide?" The answer is, "No." This book was specifically written for mathematics educators, in consultation with mathematics educators. It provides the needed economics, as well as the answers to problems/questions. However, if you or your students have questions to which you do not know the economics answer, please visit our website www.ncee.net to find the nearest NCEE Council or Center Director–who can certainly help you.

The primary authors of this work, outstanding economic educators, Jody Hoff, Sarapage McCorkle, and Mary Suiter, consulted with three

excellent mathematics educators, James Bettendorf, Lisa Breidenbach, and Pamela Cornwell, and we are most grateful to them. Special thanks also go to John Clow, Director of the Leatherstocking Center for Economic Education in Oneonta, New York, for his work in getting this project launched, and to Elizabeth Volard, former Senior Vice President at NCEE, for her vision for developing curriculum materials for mathematics teachers that reinforce mathematics concepts using examples from economics. NCEE is especially appreciative of the exceptional partnership with the National Council of Teachers of Mathematics (NCTM), which, with the support of 3M, truly made this good work possible.

Robert F. Duvall, Ph.D.
President & Chief Executive Officer
The National Council on Economic Education

Introduction

Mathematics and Economics: Connections for Life, 6-8 is a set of 12 lessons that demonstrate how mathematical processes and concepts may be applied to the study of economics and personal finance. In this volume, mathematics educators will find lessons connecting mathematics instruction to practical problems and issues that students will encounter throughout their lifetimes.

In the study of these problems and issues, economics and mathematics are natural intellectual allies. Economics is the study of people's attempts to make good decisions in an uncertain world endowed with limited resources. The tools that economists use gain power, elegance and visual appeal as they are represented mathematically in models. Indeed, one might think of economics as "first quadrant math" because economic magnitudes only rarely take on a negative sign. Research indicates that students with a strong background in mathematics are more likely than others to succeed in introductory college-level economics classes. However, the lessons presented here are not designed solely for use with students who are college-bound. These lessons are designed to provide economic skills and knowledge that all students will use as savers, investors, consumers, producers, and informed citizens.

Using the Lessons

The minimum level of mathematics students must have for each lesson is noted in the Mathematics Focus section of each lesson. Each lesson begins with a mathematical warm-up activity to introduce the mathematics content of the economics lesson. Activity sheets, answers, visuals for making overhead transparencies and extension activities are provided in each lesson, ready to be copied for use. Each lesson also includes a detailed lesson procedure section with background on the concepts being taught.

These lessons are NOT intended for use in teaching mathematics processes and concepts; rather, they illustrate economic and personal finance applications for the mathematics knowledge and skills students have already acquired in their mathematics classes. As a result, these lessons are well suited for use as culminating activities in mathematics courses, or they may be used between units to offer a change of pace and a meaningful application of mathematics to a real-world problem.

Overview of the Lessons

In Lesson 1 of this volume, students use currency exchange rates to convert the prices of a Big Mac™ in different countries into U. S. dollars. They determine in which country a Big Mac™ is cheapest and most expensive in terms of U. S. dollars. Finally, students calculate the per-

centage of daily income (per capita GDP per day) that is required in each country to purchase a Big Mac™ in terms of the local currency. In Lesson 2, students continue to learn about exchange rates as they listen to the story of an American girl who is planning a trip to Mexico. In this lesson, they compare exchange rates to determine if one currency has appreciated or depreciated against another currency. They analyze how changes in exchange rates affect the prices of goods and services from another country.

In Lesson 3, students analyze data for baby-sitting wages (a price for labor) and the price of movie tickets since 1945. This lesson provides the foundation for lessons on inflation and its impact on purchasing power over time. Lesson 4 introduces students to the Consumer Price Index and the construction of price indexes. They learn how a price index is used to compare incomes and prices from year to year.

Lesson 5 is designed to introduce students to the benefits of competition utilizing proportions to compare different rates. Students will explore the market for cell phones in two activities. In Activity 1, students are asked to solve for the unit rate of several cell phone providers and draw conclusions about the relative costs. In Activity 2, students take on the role of a cell phone service provider and put together a monthly plan to sell to customers. The lesson concludes with students graphing the unit rates for cell phone airtime over several periods and summarizing their findings.

Lesson 6 is designed to reinforce the usefulness of percentages in comparing fractions of unequal size and provide students with practice in using percent to calculate simple interest. Students are introduced to the idea of buying on credit and the additional resources required to service the debt. The concept of costs and benefits will be examined as students compare the additional cost of borrowing money to purchase the bike with the additional benefits of having the bike right now.

Lesson 7 focuses on a topic that is at the heart of economics, that of decision-making. Decision-making from an economic perspective requires individuals to consider both the benefits and costs for each alternative. Human nature however often makes this benefit-cost analysis a forgone conclusion as people emphasize the benefits of what they think they want and ignore or minimize the costs of what they think is the less attractive alternative. Students will apply several important mathematics skills in the process of learning about economic decision-making. In Activity 1, student teams develop selection factors and a weighting scheme to select a particular type of pet. In Activity 2, student teams are given scenarios and are asked to make a pet decision. Student teams will then present their decision solution to the class.

Lesson 8 is designed to acquaint students with the relationship between earnings and education. The data is very clear regarding one's earning potential and educational attainment, that is, the more education

an individual has the greater his or her earning potential. This is an important life lesson for students to explore as they begin forming opinions about the value of school and their own education. Students will utilize their mathematics skills to explore the relationship between earnings and education. The economics involved in the lesson will require students to define earnings and human capital.

Lesson 9 introduces students to the idea that not all skills are valued equally in the marketplace. The students will explore these differences using their mathematics skills to create box and whisker plots. Students will generate their own data on the value of skills by using a bidding activity. Students are given a budget and instructed to purchase the skills needed to survive on a deserted island.

Lessons 10 and 11 focus on identifying where prices come from. In Lesson 10 students will complete a series of activities that represent supply and demand. In the first activity, students are asked to plot points, connect the points through a straight line, and write the equation for the line. The two sets of data represent supply and demand for pizza in the small town of Pizzaville. In Activity 2, students compare and contrast the two linear equations. Finally in the third activity, students combine the supply and demand curves to find the intersection point and identify that point as the market price. The formal terms of supply, demand, and equilibrium are introduced. In Lesson 11 students continue to examine where prices come from, as students apply the concepts of supply, demand, and equilibrium. Students will examine changes within a market for pizza utilizing linear equations as the vehicle for examining shifting supply and demand equations. Transformation of linear equations and calculating the new intersection will provide students with the framework for exploring the dynamics of a market. In Lesson 12 students learn what a budget is. They construct a pie chart to show the distribution of expenses in a budget. They learn about payroll deductions and determine the impact that payroll deductions have on a budget. Finally, they learn that the U.S. federal government uses tax revenue to pay for the goods and services it uses and provides. They construct graphs that represent the federal government's budget of projected income and expenses for 2002.

Correlation of *Mathematics and Economics: Connections for Life*

Mathematics Standards	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5	Lesson 6	Lesson 7	Lesson 8	Lesson 9	Lesson 10	Lesson 11	Lesson 12
1. Number and Operations	X	X		X	X	X	X	X				X
2. Algebra	X			X						X	X	
3. Geometry												
4. Measurement												
5. Data Analysis & Probability			X					X	X			X
6. Problem Solving							X					X
7. Reasoning and Proof												
8. Communication							X					X
9. Connections												X
10. Representation												

Correlation of *Mathematics and Economics: Connections for Life* Lessons with the National Standards for Economics

Economic Standards	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5	Lesson 6	Lesson 7	Lesson 8	Lesson 9	Lesson 10	Lesson 11	Lesson 12
1. Scarcity												
2. Marginal costs/marginal benefits						X	X					
3. Allocation of goods and services												
4. Role of incentives												
5. Gain from trade												
6. Specialization and trade												
7. Markets – price and quantity determination	X	X								X		
8. Role of price in market system												
9. Role of competition					X						X	
10. Role of economic institutions												
11. Role of money	X	X										
12. Role of interest rates												
13. Role of resources in determining income			X					X	X			
14. Profit and the entrepreneur												
15. Growth												
16. Role of government												X
17. Using cost/benefit analysis to evaluate government programs												
18. Macroeconomy-income/employment, prices	X											
19. Unemployment and inflation				X								
20. Monetary and fiscal policy												