

THE COST OF A COLLEGE EDUCATION

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Unit Overview

This project-based unit guides students in analyzing the cost of a college education through the use of algebraic and statistical skills. Students first research college investment options and make decisions based on longitudinal data and trends from a scatter plot. Then, students choose an appropriate regression model to analyze their data. The unit concludes as students analyze and share their findings and use these data to make practical financial preparations for college.

Standards Addressed

1. **M.9-12.F.IF.1:** Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x . The graph of f is the graph of the equation $y = f(x)$.
2. **M.9-12.F.IF.2:** Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notations in terms of context.
3. **M.9-12.F.LE.1:** Distinguish between situations that can be modeled with linear functions and with exponential functions.
4. **M.9-12.F.LE.2:** Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).
5. **M.9-12.F.LE.3:** Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.
6. **M.9-12.S.ID.6a-c:** Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
 - a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the content. Emphasize linear, quadratic, and exponential models.
 - b. Informally assess the fit of a function by plotting and analyzing residuals.
 - c. Fit a linear function for a scatter plot that suggests a linear association.
7. **M.9-12.S.ID.7:** Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

8. **M.9-12.S.ID.8:** Compute (using technology) and interpret the correlation coefficient of a linear fit.

Essential Question:

1. How can students predict and prepare for the cost of a college education?

Day One – Introduction

Standards Addressed: 1, 2, 4

1. Begin class by discussing the cost of a college education. Pose the following questions:
 - a. Are you going to college or going to pursue a higher education?
 - b. If so, what college? How much does it cost to attend that school?
2. While students continue the discussion, use a projector to view various school websites.
3. Give each student **The Cost of College Education Project Packet**. Individually, then in small groups, students review the project introduction.
 - a. Throughout the unit, use **The Cost of College Education Teacher Guide** to assist with lessons and problem sets.
4. After students review and discuss the project introduction, as a group discuss the following questions:
 - a. Can we help Grandma Helen plan for Jessica’s college education? If so, how?
 - b. Do you have someone like Grandma Helen who would help pay for your college education?
 - c. Do you know how much your college education will cost? Do the people who will help you pay for college know how much it might cost?
 - d. Do you, or those who will help you, have cash on-hand, savings, investments, or other resources? Are any plans in place?
 - e. What type of financial instruments can you use to help obtain your goal of going to college?
5. Conclude with a review of linear and exponential functions. Use problems and examples to guide understanding.

Day Two – Future Value and Trends

Standards Addressed: 5, 6, 8

1. Students work on *Part One and Two* in **The Cost of College Education Project Packet**. Students collect data from the [*College Board*](#) to complete the problems.

2. After students create a scatter plot, discuss the correlation between the number of years and the cost of college education as seen in the chart.
3. Students complete the rest of the problems in *Part One and Two* and calculate the future value of their investment in a college education.
4. Conclude with discussion of the student's investments, models and solutions.

Day Three – Linear Regression

Standards Addressed: 1, 2, 4, 6, 7

1. Begin with a discussion of prior knowledge about linear functions. Specifically address slope, or constant rate of change, and the initial value, or y-intercept.
2. Then, students complete *Part Three* in **The Cost of College Education Project Packet**.
3. When finished, tell students to compare the total cost obtained by the linear model and the future value of the investment to determine if they have enough money saved in their calculations to cover the cost of a college education.
4. If the savings did not cover costs, ask students to think of other possible ways to ensure they can pay for a college education. Discuss student outcomes and ideas as a large group.

Day Four – Exponential Regression

Standards Addressed: 1, 2, 4, 6

1. Discuss any prior knowledge of exponential functions. Make sure to address how to identify the variable as an exponent of a constant.
2. Students complete *Part Four* in **The Cost of College Education Project Packet**.
3. When *Part Four* is complete, ask students to compare the total cost obtained by the exponential model and the future value of the investment to determine if they have enough money saved in their calculations to cover the cost of a college education.
4. If the savings did not cover costs, ask students to think of other possible ways to ensure they can pay for a college education. Discuss student outcomes and ideas as a large group.

Day Five – Interpretation and Summarization

Standards Addressed: 6

1. As a class, discuss how to find the difference between the observed value and predicted value in the previous model linear and exponential models.
2. Students then complete *Part Five* in **The Cost of College Education Project Packet**, and prepare a residual analysis for both their linear and exponential models.
3. Further, students choose the best model to represent their findings. Make sure students justify their choice mathematically.
4. Once students complete their packet, each student prepares a presentation of their findings and final outcomes.

Day Six – Presentations

Standards Addressed: 3, 4, 5

1. Students present their projects to the class and other stakeholders, such as family members or administrators.
2. After presentations, discuss how this project can help students prepare for the costs of a college education.