Pilot Course Of Study Evaluation And Recommendations For Improvement

(End Of First Year Of Implementation)

Title of pilot course: Financial Algebra

School: Ygnacio Valley High School

Department: Mathematics

Education (CTE) Instructor(s): David Swenson

Duration: Semester [ ]   Year [**X**]

Grade level(s):   **11-12**

Prerequisite(s):   **Algebra I**

Proposed credit: **5 per semester**

Target students: **Juniors and seniors who completed Algebra I who want an alternative course to taking Algebra II.**

This course is intended to meet (check all that apply):

[**X**]   high school graduation requirement in

mathematics

[**X**]   A-G university entrance requirement

[   ]   standard elective

[ ]   both graduation and A-G requirement

[   ]   part graduation and/or

A-G requirement, part standard elective

This course is:

[   ]   new/unique

[X   ]   an alternative to **_Personal Finance 006041_**(course title and number)

Based on your data collection, assessment of student progress, student survey data, and classroom observation data, please evaluate and recommend revisions and/or improvements for the curriculum and the assessment

portions of your course as outlined below. Please attach student achievement data and student survey compilation results (Attached students surveys(5), assignment analysis, and grade book summary.)

Summary of the Overall School Year

Financial Algebra is a practical solution to the third year of math for many students at Ygnacio Valley High School. The concepts covered in the curriculum are applicable to real world skills, such as travel expenses, banking services, taxes, and participating in the stock market. The topics that cover student loans, credit card payments, starting a business, patenting an invention, obtaining life insurance are all subjects that allow students to equitably apply advanced algebra skills to real life situations.

The Cengage Financial Algebra textbook and workbook were received as a publisher's gift to pilot the program at Ygnacio Valley High School, and utilized as part of the course pilot.

As the first semester came to an end, students remarked that they enjoyed the subject matter, and were awakened to what interest meant, how to buy a home, how to invest in the stock market, and how to buy a car. They were intrigued by the financial world and how math played a role in their lives—it was applicable.

During the second semester, students continued to be amazed at the complexities of a budget and all that is involved with opening a business.

During the second year of the pilot, students were tasked with focusing more on project based learning and assessments as opposed to working through the textbook and Algebra II skills in a practical manner.

Students had to pick three potential occupations, and define qualifications for the job, beginning salaries, and advancement opportunities. Students explored careers from lawyer to mortician, restaurant owner to professional athlete. The best part of the project based learning was that students truly understand how mathematical concepts affect interest they pay, payments they make, saving for retirement, and managing household expenses.

In summation, though the practical and project based learning was beneficial for all students, the pacing at the end to fully engage students could be worked on further.

Financial Algebra students benefited from taking this course because they will receive a third year UC math credit for taking an equivalent course to Algebra II, students learned about the importance of credit and financial math, especially their FICO scores, and the

math was not unreachable for all students because it was project based on topics of everyday life that was extremely interesting to students. Financial Algebra holds algebraic concepts that are contextually part of the larger financial global world.

Overall, the popularity of the course doubled from year one to year two with 74 students enrolled this year. This course will take over Personal Finance at YVHS and other schools in our district. In fact, there is a need for over 475 textbooks for the 2023-2024 school year.

Expected Student Outcomes, Goals

Students will be able to:

- Use statistics topics like mean, median, mode, normal curve, percentile rank, and etc., to make financial decisions about budget skills and expenses.
- Use exponentials and logarithmic equations, properties, and knowledge to learn about investments, savings, compounding, and etc., within the Banking Services.
- Use Linear, Polynomials, and Exponential equations and properties to teach the knowledge of Consumer Credit with Loans and Credit Cars.
- Use Geometric Topics like circumference, diameter, conditional probability formula, and etc., along with Exponential, Linear, and Quadratic topics like decay, regression, systems, and etc., to learn about automobile ownership and the transactions, probability, depreciation, and data that is involved with it.
- Use Sequences, Piecewise functions, writing equations, and etc., to teach the basics of employment along with rates, commissions, benefits, social security, and medicare.
- Understand tax tables, worksheets, income statements, Forms 1040EZ, and Etc., with using compound inequalities, interval notations, slope, and piecewise functions.
- Use Geometry topics like area, cosine ratio, similar triangles, and etc., along with regression equations to understand Independent Living situations like reading a floor plan, mortgage process, rentals, condominiums, home maintenance, and improvement.
- Understand the basics of the stock market with data, charts, trends, ticker, transactions, splits, and dividend income, with using bar chart, candlestick chart, regressions, percent decrease, and increase.
- Use Systems, roots of a quadratic equation, complex numbers, and completing the square method, to help model a business with inventions, market research, supply and demand, graphs of expense and revenue functions, and etc.
- Understand the necessities with planning for retirement with social security benefits, pensions, savings, insurance, and diversification, with using exponential equations, pie charts, percent, and measures of central tendency.

- Write and plan a budget for utility expenses, cash flow, and etc., with using matrices, charting, piecewise functions, spreadsheets, and inequalities.

Unit 1: Discretionary Expenses

In the discretionary expenses unit students learn the difference between essential and discretionary expenses within the array of expense categories in terms of need to spend expenses versus want to spend expenses upon.

Unit 2: Banking Services

Students learn what interest is and how it compounds. Students learn about the different types of bank accounts and institutions.

Unit 3: Consumer Credit

Students learn the difference between installment debt, revolving debt, and different types of loans. Students learn how interest rates and loan terms greatly affect their payments.

Unit 4: Owning a Car

Students learn about all costs associated with vehicle ownership (including hidden costs, such as insurance, maintenance, and gas/electric expenses.

Unit 5: Employment Basics

Students learn the different methods of getting paid, such as W2 and 1099 (commission). Students learn about pay stub deductions.

Unit 6: Income Taxes

Students learn how to fill out a 1040 form and why.

Unit 7: Housing and Real Estate

Students learn the difference between renting and buying a home. Students learn about what a mortgage is and homeowner's association (HOA) costs.

Unit 8: Stock Market

Students learn the different types of investments, stocks, bonds, and mutual funds. Students learn about stock growth and dividends.

Unit 9: Starting a Business

Students learn when they need a storefront (brick and mortar), employees, and online services. Students learn about all start-up costs, break-even points versus profits, and fixed versus variable expenses.

Unit 10: Retirement

Students learn how to calculate what they will need to retire and different retirement plans.

Unit 11: Budgeting

Students learn how to manage a monthly budget.

Content, Activities, and Assessments

The Famous Birthday Problem.

Mathematics: Surveying, relative frequencies, probabilities. Did students need or want the expenses?

Mathematics Learning Goals: To determine why and how the answer to this problem defies mathematical intuition.

A very famous problem in statistics is the "Birthday Problem." Students will be asked to answer the program before embarking on an empirical quest to find the answer. Students will poll classes in school and compile data on birthdates. They then need to determine what percent of the classes had matching birth dates. After the experimental approximation of the solution, students will then research, interpret and explain the theoretical solution. They will then explain why the problem is so mathematically deceptive.

How Interest Method Affects Monetary Growth

Mathematics: Simple interest, compound interest

Mathematics Learning Goals: To determine how increased compounding affects growth.

Students are first introduced to the meaning of compounding numerically via mathematical iteration. Before embarking on a rigorous study of limits and compound interest algebraic

formulas, students are asked, "How much would $1,000 grow to in one year at 100% interest compounded continuously?" The 100% interest and continuous compounding often leads them to guess much higher than the actual amount. Student guesses are then recorded, and a statistical analysis of their guesses are made. Students will see the range of the students' participation. Outliners are carefully noted.

Creating A Financial Portfolio Using Linear Programming

Mathematics: Linear programming

Mathematics Learning Goals: To set up constraint inequalities and a feasible region in order to set up an optimal financial portfolio.

Students will focus on modeling a business "530" (Chapter 9). Students are to assume that they have $500,000 to invest. They should interview a financial advisor and ask for a recommendation of two investment plans. In addition, they should ask what the estimated return on investment for each plan would be. Ask the advisor for constraints on the investment similar to those in chapter 9. Then students are to apply the linear programming process to this investing situation and determine the amount to invest in each plan that will yield an optimal return of the investment.

Creating the Tax Worksheet

Mathematics: Domains, piecewise function, linear functions and graphs, point-slope form, slope-intercept form, graphs with cusps.

Mathematics Learning Goals: To derive the slope-intercept form used on the IRS tax worksheet by translating tax tables into piecewise functions.

The tax tables give taxpayers a function in which the independent variable is the taxable income and the decade, the IRS created a worksheet that uses the slope-intercept form of the equations of a line to simplify calculations for the taxpayer. In this assignment, students interpret the IRS Schedule, express the domains using compound inequality notation, and create the piecewise function that models the IRS intentions. They then convert this function, which is a translated version of point-slope form, into the slope-intercept form to create the tax worksheet.

Automobile Cost and Depreciation

Mathematics: Exponential regression, graphing linear and exponential functions, rational functions, linear/exponential systems, systems of linear equations, slope-intercept form.

Mathematics Learning Goals: To use graphing techniques to compare the value of a car to the expense of purchasing it throughout its lifetime.

Using the monthly payment rational function, students graph the cost C of purchasing a new car, using the down payment as the y-intercept, and the monthly payment as the slope. They then

investigate three types of depreciation: straight-line, exponential, and historical bathtub graphs. They graph the cost and depreciation functions on the same set of axes to find the month at which the total cost C of owning the car surpasses its value V as it depreciates. They identify and interpret the domains on which $C > V$ and $C < V$.

Mathematically Modeling a Credit Card Statement

Mathematics: Algebraic modeling and spreadsheet formula creation.

Mathematics Learning Goals: To algebraically model a month of activity on a person's credit card.

Students create a 21-day credit calendar that depicts algebraic representations of daily balances based upon an opening balance of Y dollars, an X-dollar purchased on the 8th day, a Z dollar payment on the 13th day, and a W-dollar purchased on the 20th day. Using these representations from the calendar, they write algebraic expressions for the sum of the daily balances, the average daily balance, and the finance charge for this 21-day period given that the APR on this credit card is P%. Students then create a spreadsheet that models the situation described above and test their spreadsheet for a given data set.

Areas of Shaded Regions

Mathematics: Area formulas

Mathematics Learning Goals: To determine areas of plane figures that have sections removed from them.

As part of a unit on floor plans and interior design, students compute areas of floors to find the cost of new flooring. They also compute the cost of paint by taking the areas of the walls and subtracting window and door areas. They employ the area of a circle, square, triangle, rectangle, trapezoid, and parallelogram, and create a poster display on what a specific room cost to redo.

Budget Line Equations

Mathematics: Linear equations, domain, range, constraints, modeling.

Mathematics Learning Goals: To construct and interpret a graphical representation of a particular aspect of a budget.

A budget line graph allows the user to interpret many combinations of product usage based upon given constraints. The interpretation of the combinations allows the user to make decisions about affordability. Students are given information about a particular aspect of a personal budget. This data contains prices and budgeting constraints. Students are asked to construct a budget line equation of the form where costs are related to two budgeted items, x, and y, and B is the budgeted amount. They then examine the regions above, on, and below the budget line to

identify points representing affordability data. Students make recommendations for this budget item based upon the interpretation of the budget line graph.

Assessment Methods:

Course will use a combination of quizzes and internet related activities to establish formative assessments designed to provide multiple "checks for understanding." Performance tasks can be used as unit/summative assessments. Teachers may choose to vary the method of assessment to capture multiple learning modalities as well as modifying assignments to meet individual classroom needs. The ability to incorporate actual companies and scenarios can be used to create relevance and authentic assessments. For example, after the unit on banking, students can research banks such as Bank of America, Wells Fargo, and Chase in order to compare and contrast different terms, conditions, rates, and limits.

Evaluation Standards:

This course implements the standards of advanced algebra, statistics, probability, precalculus, and calculus under seven financial umbrellas: banking, investing, credit, employment and income taxes, automobile ownership, independent living, and retirement planning and household budgeting.

Signature of Piloting Instructor: **Date:** 6/20/23

Signature of Principal: **Date:** 6/20/23

Approved by:

Signature of Director of Secondary Support: **Date:**

Pilot Course of Study and Evaluation and Recommendation for Improvement

Create a student-center project-based curriculum per unit or a guided syllabus that merges and aligns the above units into corresponding projects (i.e. 11 units versus 8 project-based activities).

Incorporate for example the following in unit 3 below:

Unit 1: Discretionary Expenses

Unit 2: Banking Services

Unit 3: Consumer Credit

Students learn the difference between installment debt, revolving debt, and different types of loans. Students learn how interest rates and loan terms greatly affect their payments.

Students would group up to collaborate on how to research and derive their FICO scores. After researching their potential credit score, students were to role-play how their scores resulted in their buying power or lack thereof and how it affected their interest payments, i.e. the higher their score the lower their interest payment on revolving credit cards/loan amounts.

Unit 4: Owning a Car

Unit 5: Employment Basics

Unit 6: Income Taxes

Unit 7: Housing and Real Estate

Unit 8: Stock Market

Unit 9: Starting a Business

Unit 10: Retirement

Unit 11: Budgeting

The above content, activities, and assessment projects are not listed linearly.