WAMC Lesson Plan

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Lesson Title: I'm Gonna Be Rich!
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Text: Financial Algebra STEM Correlation: Math/Technology
Lesson Length: 3 or 4 days
Section 3-7; Future Value

Big Idea (Cluster): Future Value/Algebra-Expressions/Functions

Mathematics K–12 Learning Standards:

Seeing Structure in Expressions A-SSE

Interpret the structure of expressions

1. Interpret expressions that represent a quantity in terms of its context.
a. Interpret parts of an expression, such as terms, factors, and coefficients.
b. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret P*(1+*r*)^n *as the product of P and a factor not depending on P.*

Interpreting Functions F-IF

Understand the concept of a function and use function notation

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. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

Analyze functions using different representations

7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

Linear, Quadratic, and Exponential Models F-LE

Interpret expressions for functions in terms of the situation they model

Interpret the parameters in a linear or exponential function in terms of a context.

Washington English Language Arts Standards (Common Core State Standards) - Science and Technology Literacy Standards (Grades 11-12):

- RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

Educational Technology:

- 3.d Students build knowledge by actively exploring real-world issues and problems,

developing ideas and theories and pursuing answers and solutions

Standards for Mathematical Practice:
Practice 1: Make sense of problems and persevere in solving them.
Practice 2: Reason abstractly and quantitatively.
Practice 3: Construct viable arguments and critique the reasoning of others.
Practice 4: Model with mathematics.
Practice 5: Use appropriate tools strategically.
Practice 6: Attend to precision.
Practice 7: Look for and make use of structure
Practice 8: Look for and express regularity in repeated reasoning.

Content Objectives:	Language Objectives (ELL):
• Calculate the future value of periodic deposit investment • Graph the future value of function • Interpret the graph of a future value function	Adapt and support as needed, translation tools as needed, etc.
Vocabulary: Rate of growth, compound interest, periodic investment, time value of money, linear vs exponential growth, future value	Connections to Prior Learning Prior knowledge of compound interest, arithmetic operations, exponents, use of a calculator, previously developed rubric for presentations, PowerPoint, spreadsheets
Questions to Develop Mathematical Thinking: • How can I build financial wealth in time? • What is the most impactful factor of increasing the future value of an investment? • Why do the different factors impact the future value? • How does one best represent the data collected graphically? What can the graph tell you about the growth of your fund? • Does your data confirm or contradict your original prediction? Justify your response.	Common Misconceptions: • Money grows quickly • High interest/growth rates are easy/hard to find • Every growth pattern is linear • This formula is impossible!—no, it isn't…

Assessment (Formative and Summative):

- Frequent thumb checks during individual and triad time.
- Student feedback and rubric for presentation (see below)
- Quiz (see below)

Materials:

- Calculators, Chromebooks, poster paper/materials, envelopes with variable info,

- Lab Instructions / Student Handout(s)
- Rubric and/or Assessment Tool

Instruction Plan:

Introduction: Everyone wants to be rich, right? How can we all accomplish that by looking into our financial future?

Explore: Students will explore the concept and mathematical formula for future value by developing their own patterns of growth emphasizing changes in one of three factors involved in calculating future value. Students will work independently and together to develop an understanding of impact of time, growth rate, and periodic investments with respect to developing future monetary wealth.

When I observe students:
Students are working in triads, both as a team and independently at times. They are conversing, debating the most impactful factor for future value, working through the mathematical processes as they make predictions and evaluate the quality of predictions. I will help reinforce the use of proper mathematical language.

Questions to Develop Mathematical Thinking as you observe:

- How can I build financial wealth in time?
- What is the most impactful factor of increasing the future value of an investment?
- Why do the different factors impact the future value?
- How does one best represent the data collected graphically? What can the graph tell you about the growth of your fund?
- Does your data confirm or contradict your original prediction? Justify your response.

Answers:
Time, periodic investments, and finding a decent rate of growth are all important factors in determining the future value of an investment. The time value of money is critical to a growth fund. Students will discover that as they work through the future value formula for a variety of different values in their groups. Looking at a future value as a function of time helps students visualize the time value of money and allows them to make predictions to reach financial goals.

Summarize: Students will have many opportunities to discuss their predictions, processes, and findings in a triad. The triad will develop a presentation (poster, PowerPoint, etc) emphasizing their technological, mathematical, and artistic skills.
Students will also complete a feedback process and rubric evaluation as well as a quiz.

Career Application(s):

- Business, Personal Finance, Investing, Wealth Management, Banking

Leadership/21st Century Skills:

21st Century Interdisciplinary themes (Check those that apply to the above activity.)

☐ Global Awareness ☒ Financial/Economic/Business/Entrepreneurial Literacy ☐ Civic Literacy
☐ Health/Safety Literacy ☐ Environmental Literacy

21st Century Skills (Check those that students will demonstrate in the above activity.)

LEARNING AND INNOVATION
Creativity and Innovation
☐ Think Creatively
☐ Work Creatively with Others
☐ Implement Innovations
Critical Thinking and Problem Solving
☒ Reason Effectively
☐ Use Systems Thinking
☐ Make Judgments and Decisions

INFORMATION, MEDIA & TECHNOLOGY SKILLS
Information Literacy
☐ Access and Evaluate Information
☐ Use and manage Information
Media Literacy
☐ Analyze Media
☐ Create Media Products
Information, Communications and

LIFE & CAREER SKILLS
Flexibility and Adaptability
☒ Adapt to Change
☐ Be Flexible
Initiative and Self-Direction
☐ Manage Goals and Time
☐ Work Independently
☐ Be Self-Directed Learners
Social and Cross-Cultural

Productivity and Accountability
☒ Manage Projects
☒ Produce Results
Leadership and Responsibility
☐ Guide and Lead Others
☒ Be Responsible to

☒ Solve Problems	Technology (ICT Literacy)	☒ Interact Effectively with Others	Others
Communication and Collaboration	☒ Apply Technology Effectively	☐ Work Effectively in Diverse Teams	
☒ Communicate Clearly			
☒ Collaborate with Others			

Feedback:

- What things went well in this activity? What do you wish you could change? What advice do you have for the next time I share this activity with students?
- Rate your performance as a team member: 1 2 3 4
- Rate your team's ability to work together effectively: 1 2 3 4
- What is the most important thing you will take away from this activity?
- Write a brief summary sharing what you learned with someone who knows nothing about investing, compound interest, and future value. For extra credit, teach someone what you learned and ask for their feedback on your mini-lesson.

Rubric (I am not including definitions of the point values—I prefer to have the students develop these as a class in prior activities. It helps develop norms, personal accountability, and a deep understanding of what's expected when we work together to develop the rubric. It changes each semester).

Communication
1 2 3 4

Independent learner
1 2 3 4

Supporting your team
1 2 3 4

Respecting other teams
1 2 3 4

Ability to stay on task
1 2 3 4

Accuracy of calculations
1 2 3 4

Group Presentation/Poster/PowerPoint
1 2 3 4

Attentiveness during other presentations
1 2 3 4

Active involvement with guest speaker
1 2 3 4

What I learned summary
1 2 3 4

Extra Credit: Feedback from your “student” after mini lesson
1 2 3 4

Quiz/Future Value

Name: Date: Period:

1. Kiaya has budgeted $300 monthly for future growth investments. She is working with a financial planner who is has found an investment which averages a rate of growth of 8.3%. She wonders if and/or when she will reach $1,000,000. Help her calculate the future value of her investment after 20, 30, and 40 years. Will she reach her goal of $1,000,000?

   a. 20 years

   b. 30 years

   c. 40 years

2. How much total did she contribute to her investment over 40 years?

3. How much interest/profit did she earn in those 40 years?

4. Solve for the approximate year in which Kiaya reaches $1,000,000.

KEY:
1a. $183,441.35
1b. $475,301.14
1c. $1,142,718.95
2. $144,000
3. $998,718.95
4. 39 years

Years	Rate	Periodic Investment	Years	Rate	Periodic Investment	Years
10	4%	$ 100.00	20	4%	$ 100.00	30
10	6%	$ 100.00	20	6%	$ 100.00	30
10	8%	$ 100.00	20	8%	$ 100.00	30
10	10%	$ 100.00	20	10%	$ 100.00	30
10	4%	$ 150.00	20	4%	$ 150.00	30
10	6%	$ 150.00	20	6%	$ 150.00	30
10	8%	$ 150.00	20	8%	$ 150.00	30
10	10%	$ 150.00	20	10%	$ 150.00	30
10	4%	$ 200.00	20	4%	$ 200.00	30
10	6%	$ 200.00	20	6%	$ 200.00	30
10	8%	$ 200.00	20	8%	$ 200.00	30
10	10%	$ 200.00	20	10%	$ 200.00	30
10	4%	$ 250.00	20	4%	$ 250.00	30
10	6%	$ 250.00	20	6%	$ 250.00	30
10	8%	$ 250.00	20	8%	$ 250.00	30
10	10%	$ 250.00	20	10%	$ 250.00	30

Rate	Periodic Investment	Years	Rate	Periodic Investment
4%	$ 100.00	40	4%	$ 100.00
6%	$ 100.00	40	6%	$ 100.00
8%	$ 100.00	40	8%	$ 100.00
10%	$ 100.00	40	10%	$ 100.00
4%	$ 150.00	40	4%	$ 150.00
6%	$ 150.00	40	6%	$ 150.00
8%	$ 150.00	40	8%	$ 150.00
10%	$ 150.00	40	10%	$ 150.00
4%	$ 200.00	40	4%	$ 200.00
6%	$ 200.00	40	6%	$ 200.00
8%	$ 200.00	40	8%	$ 200.00
10%	$ 200.00	40	10%	$ 200.00
4%	$ 250.00	40	4%	$ 250.00
6%	$ 250.00	40	6%	$ 250.00
8%	$ 250.00	40	8%	$ 250.00
10%	$ 250.00	40	10%	$ 250.00

Years	Rate	Periodic Investment	Years	Rate	Periodic Investment	Years
10	6%	$ 100.00	20	6%	$ 100.00	30
10	8%	$ 100.00	20	8%	$ 100.00	30
10	10%	$ 100.00	20	10%	$ 100.00	30
10	6%	$ 150.00	20	6%	$ 150.00	30
10	8%	$ 150.00	20	8%	$ 150.00	30
10	10%	$ 150.00	20	10%	$ 150.00	30
10	6%	$ 200.00	20	6%	$ 200.00	30
10	8%	$ 200.00	20	8%	$ 200.00	30
10	10%	$ 200.00	20	10%	$ 200.00	30
10	6%	$ 250.00	20	6%	$ 250.00	30
10	8%	$ 250.00	20	8%	$ 250.00	30
10	10%	$ 250.00	20	10%	$ 250.00	30

Rate	Periodic Investment	Years	Rate	Periodic Investment
6%	$ 100.00	40	6%	$ 100.00
8%	$ 100.00	40	8%	$ 100.00
10%	$ 100.00	40	10%	$ 100.00
6%	$ 150.00	40	6%	$ 150.00
8%	$ 150.00	40	8%	$ 150.00
10%	$ 150.00	40	10%	$ 150.00
6%	$ 200.00	40	6%	$ 200.00
8%	$ 200.00	40	8%	$ 200.00
10%	$ 200.00	40	10%	$ 200.00
6%	$ 250.00	40	6%	$ 250.00
8%	$ 250.00	40	8%	$ 250.00
10%	$ 250.00	40	10%	$ 250.00