

Standards for Financial Education. A Comparison of Two Approaches.

In 2021, the Council for Economic Education (CEE) and the Jump\$tart Coalition for Personal Financial Literacy (Jump\$tart) created a set of national standards for personal finance education that would unite and guide the diverse financial literacy community, called *the National Standards for Personal Financial Education*.

At Financial Life Cycle Education (FiCycle), we champion the idea of combining mathematics and personal finance and are seeking public comment on a set of standards that combine both personal finance standards and mathematics standards, *the FiCycle Standards for Personal Finance and Mathematics*.

The development of an additional set of standards is motivated in part to meet the needs of mathematics educators interested in personal finance. There has been recent focus in high school mathematics on course “pathways” as alternatives to the current high school sequence from Algebra I to Calculus. Mathematics educators recognize that there is a broader set of mathematical skills that are beneficial to students, especially those who are pursuing higher education and careers where calculus is not an essential skill. Alternative pathways often include statistics, quantitative reasoning, data science, and personal finance. The development of an effective personal finance pathway in mathematics necessitates standards that combine math and personal finance at a conceptual level rather than appending math content to personal finance standards or appending personal finance to a traditional high school math class.

Our standards are also motivated by the belief that high quality financial education requires building understanding of fundamental financial concepts and the interconnections between them, and that doing this requires connecting financial topics to the underlying mathematics.

While covering much, if not all, the material in the CEE and Jump\$tart *National Standards for Personal Financial Education* (NSPFE), the *FiCycle Standards for Personal Finance and Mathematics* (SPFM) take a different approach. While the NSPFE are organized by activities (earning income, spending, saving), The SPFM are organized around financial concepts (wealth, time, risk) and the associated mathematical topics. Very different financial activities, such as borrowing and investing, can be explained by the same financial concepts, as is revealed by their mathematical models. We believe that structuring a curriculum by underlying concepts is necessary to build deeper understanding.

In broad strokes, the Jumpstart/CEE standards are about “How” to manage finances while the FiCycle standards focus on the “Why” of financial decision-making.

The CEE and Jump\$tart National Standards for Personal Financial Education (NSPFE)

The NSPFE are financial activity-based with a focus on knowledge, skills, and decision making. The National Standards document states:

The *National Standards for Personal Financial Education* is organized around six Topics, with Standards and Learning Outcomes expected by the end of the 4th, 8th, and 12th grades. The Topics are:

- I. Earning Income
- II. Spending
- III. Saving
- IV. Investing
- V. Managing Credit
- VI. Managing Risk

Topics need not be addressed in a particular order and Standards covered in earlier grade levels are not repeated unless there is an expectation for a higher level of learning or need to cover more advanced elements within the Topic.

Standards identify specific information that a student should understand at the completion of the given grade level.

Source: <https://www.jumpstart.org/what-we-do/support-financial-education/standards/>

The FiCycle Standards for Personal Finance and Mathematics (SPFM)

The SPFM are built around essential understandings about the financial life cycle. This approach emphasizes financial themes and the associated mathematical concepts. Knowledge and skills are built within this structure. The FiCycle Standards document states:

...a high-quality education in finance should focus on developing conceptual understanding. Consistent with academic financial theory, the central concept in personal finance is the financial life cycle. Therefore, financial education should include instruction in:

- How and why individuals and households transfer consumption over time.
- What financial risks individuals and households face and how they manage those risks.

These concepts are reflected in four essential understandings:

F1. The fundamental measure of financial wellbeing is wealth, which encompasses assets, liabilities, income, and expense. Financial statements are used to measure and track wealth over the financial life cycle.

F2. The transfer of consumption forward and backward over time is generally financed via payment series, often with compound interest. Present value and future value are the tools used to evaluate payment series.

F3. Risk can be measured using probability and expected utility. These tools provide the means to evaluate risk management tools such as insurance.

F4. Investments in the stock market can be modeled using probability distributions to assess risk and return. These tools can be used to demonstrate that for sufficiently diversified stock market portfolios, over long investment horizons, the additional expected return increases more rapidly than the risk, increasing the probability of outperforming lower risk, lower-return investments.

Source: <https://ficycle.org/ficycle-standards-for-personal-finance-and-mathematics/>

The table below provides a side-by-side comparison of the FiCycle and the Jumpstart/CEE standards. The FiCycle Standards show both the financial standards and the associated mathematical standards. The order of the NSPFE has been changed to better align with the organization of the SPFM. Both sets of standards have more detailed and specific items not shown here.

FiCycle Standards for Personal Finance and Mathematics	Jumpstart / CEE National Standards for Personal Financial Education
<p>Understanding Wealth The fundamental measure of financial well-being is wealth, which encompasses assets, liabilities, income, and expense. Financial statements are used to measure wealth over the financial life cycle.</p> <p><i>The dynamics of financial transactions and wealth can be modeled using financial statements which are mathematical models that utilize concepts of algebraic manipulation and linear relationships to capture the relationships between income, expense, assets, and liabilities.</i></p>	<p>Earning Income Most people earn wage and salary income in return for working, and they can also earn income from interest, dividends, rents, entrepreneurship, business profits, or increases in the value of investments.</p> <hr/> <p>Spending A budget is a plan for allocating a person's spendable income to necessary and desired goods and services. When there is sufficient money in their budget, people may decide to give money to others, save, or invest to achieve future goals.</p>
<p>Time Value of Money/Consumption The transfer of consumption forward and backward over time is generally financed via payment series with compound interest. Present value and future value are the tools used to evaluate payment series.</p> <p><i>Time can be modeled mathematically using natural numbers, integers, rational numbers, and real numbers. The mathematics of time involves series, sequences, limits, exponents, logarithms, and other functional forms.</i></p>	<p>Saving People who have sufficient income can choose to save some of it for future uses such as emergencies or later purchases.</p> <hr/> <p>Managing Credit Credit allows people to purchase and enjoy goods and services today, while agreeing to pay for them in the future, usually with interest.</p>



<p>Measuring and Managing Risk Risk can be measured using probability and expected utility. These tools provide the means to evaluate risk management tools such as insurance.</p> <p><i>The mathematics of financial risk can be modeled with random variables. Random variables represent a combination of probability and outcomes and are often evaluated using expected value and other measures.</i></p>	<p>Managing Risk People are exposed to personal risks that can result in lost income, assets, health, life, or identity. They can choose to manage those risks by accepting, reducing, or transferring them to others.</p> <p>When people transfer risk by buying insurance, they pay money now in return for the insurer covering some or all financial losses that may occur in the future.</p>
<p>Risk and Return in Investing Investments in the stock market can be modeled using probability distributions to assess risk and return. These tools can be used to demonstrate that for sufficiently diversified stock market portfolios, over long investment horizons, the additional expected return increases more rapidly than the risk, increasing the probability of outperforming lower risk, lower-return investments.</p> <p><i>Investment outcomes can be modeled with probability distributions, such as the binomial distribution and the normal distribution. The movement of stock prices is often modeled as a sequence of random variables sometimes called "random walks." Generally, compound returns increase exponentially over time, while the standard deviation of such processes increases proportionally to the square root of time.</i></p>	<p>Investing People can choose to invest some of their money in financial assets to achieve long-term financial goals, such as buying a house, funding future education, or securing retirement income.</p> <p>People can more easily achieve their financial goals by investing steadily over many years, reinvesting dividends, and capital gains to compound their returns. Investors have many choices of investments that differ in expected rates of return and risk.</p>

Connecting the Standards

The FiCycle and Jumpstart/CEE Standards cover many of the same topics but with different approaches and emphasis. The FiCycle standards set an overall framework for financial decision-making and then explore various financial decisions faced by individuals over their lifetime, while the NSPFE is organized around various financial activities.

<p>Understanding Wealth The fundamental measure of financial well-being is wealth, which encompasses assets, liabilities, income, and expense. Financial statements are used to measure wealth over the financial life cycle.</p> <p><i>The dynamics of financial transactions and wealth can be modeled using financial statements which are mathematical models that utilize concepts of algebraic manipulation and linear relationships to capture the relationships between income, expense, assets, and liabilities.</i></p>	<p>Earning Income Most people earn wage and salary income in return for working, and they can also earn income from interest, dividends, rents, entrepreneurship, business profits, or increases in the value of investments.</p> <p>Spending A budget is a plan for allocating a person's spendable income to necessary and desired goods and services. When there is sufficient money in their budget, people may decide to give money to others, save, or invest to achieve future goals.</p>
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The NSPFE topics include Earning Income and Spending. These topics are largely organized around the concept of budgets and cash. "A budget is a plan for allocating a person's spendable income to necessary and desired goods and services. When there is sufficient money in their budget, people may decide to give money to others, save, or invest to achieve future goals."

In the SPFM these topics are all presented as components of wealth and are reflected in financial statements and financial calculations. "To think about navigating the financial life cycle, we need to know how to adequately measure a financial situation. This requires thinking in terms of wealth, rather than cash balance. Students must understand that their wealth is the means by which they can meet their needs across the life cycle."

In the SPFM, Saving (Assets) and Credit (Liabilities) are first discussed within the financial equations of the standards on wealth and then are further addressed in the standards related to the time value of money. They appear in the wealth standard through:

The net worth equation: $NW = A - L$ (net worth = assets - liabilities).

The net income equation: $NI = I - E$ (net income = gross income - expenses)

Net income is a change in net worth over a time period. $NI = \Delta NW$

Within this framework, students learn about how education affects earning potential and how borrowing may lead to either increased wealth or decreased wealth depending on how the borrowed money is spent and the cost of debt.

<p>Time Value of Money/Consumption The transfer of consumption forward and backward over time is generally financed via payment series with compound interest. Present value and future value are the tools used to evaluate payment series.</p> <p><i>Time can be modeled mathematically using natural numbers, integers, rational numbers, and real numbers. The mathematics of time involves series, sequences, limits, exponents, logarithms, and other functional forms.</i></p>	<p>Saving People who have sufficient income can choose to save some of it for future uses such as emergencies or later purchases.</p> <p>Managing Credit Credit allows people to purchase and enjoy goods and services today, while agreeing to pay for them in the future, usually with interest.</p>
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In NSPFE, savings and credit are viewed as separate topics. The SPFM unify these into concepts about transferring consumption through time. FiCycle views transferring wealth across time as a central theme of finance and shows the link between borrowing and savings, as borrowing by one party is related to investing by another.

The SPFM also focus on the mathematics of present value as a tool to evaluate the impact of financial decisions on wealth. The mathematics of compound interest is the same for both borrowing and saving, and studying present value and future value allows for the development of better understanding of exponents and logarithms. In this way, a lesson in finance becomes a basis for improved understanding of mathematical concepts, while deeper understanding of the underlying mathematical concepts further informs understanding of financial concepts.

<p>Measuring and Managing Risk Risk can be measured using probability and expected utility. These tools provide the means to evaluate risk management tools such as insurance.</p> <p><i>The mathematics of financial risk can be modeled with random variables. Random variables represent a combination of probability and outcomes and are often evaluated using expected value and other measures.</i></p>	<p>Managing Risk People are exposed to personal risks that can result in lost income, assets, health, life, or identity. They can choose to manage those risks by accepting, reducing, or transferring them to others. When people transfer risk by buying insurance, they pay money now in return for the insurer covering some or all financial losses that may occur in the future.</p>
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Both NSPFE and SPFM address Risk and Investing. However, the approach to these topics is substantially different. NSPFE focuses on students being able to describe and explain various aspects of risk management and investing. The SPFM focus on the mathematics of risk: expected return and expected utility, variance, and how these mathematical concepts are reflected in products such as insurance and stock market investing. This allows students to analyze whether a given insurance product will be beneficial for them. For example, they may find that purchasing health insurance has positive expected utility while phone insurance may not.

<p>Risk and Return in Investing Investments in the stock market can be modeled using probability distributions to assess risk and return. These tools can be used to demonstrate that for sufficiently diversified stock market portfolios, over long investment horizons, the additional expected return increases more rapidly than the risk, increasing the probability of outperforming lower risk, lower-return investments.</p> <p><i>Investment outcomes can be modeled with probability distributions, such as the binomial distribution and the normal distribution. The movement of stock prices is often modeled as a sequence of random variables sometimes called "random walks." Generally, compound returns increase exponentially over time, while the standard deviation of such processes increases proportionally to the square root of time.</i></p>	<p>Investing People can choose to invest some of their money in financial assets to achieve long-term financial goals, such as buying a house, funding future education, or securing retirement income. People can more easily achieve their financial goals by investing steadily over many years, reinvesting dividends, and capital gains to compound their returns. Investors have many choices of investments that differ in expected rates of return and risk.</p>
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The FiCycle standards provide students with the tools to assess risk and diversification through the use of probability distributions so that students can discover the value of diversification through mathematics rather than general statements about investment strategy.

Conceptual Understanding and Decision-Making

Both NSPFE and SPFM stress the need for conceptual understanding. The NSPFE document states: “Effort was made to establish standards that focus on how the content would be used to make good financial decisions rather than standards that are merely terminology definitions. Similarly, the new standards focus on concepts and principles over specific products, laws, and regulations, which are subject to continual change.”

The SPFM are built on a similar goal but go further to achieve a focus on conceptual understanding; by linking financial activities to an overall focus on wealth, students learn how concepts related to earning and expense are related not just to each other, but also to borrowing and saving. The mathematical tools for computing expected value and standard deviation make decision-making more concrete. To take a simplified example, in a math-based class, rather than ask students to estimate whether a square with sides of 1.5 meters has a greater area than a circle with a diameter of 2 meters, we can ask students to calculate and express the difference between the two in both equations and numbers. A similar problem in personal finance is to compare the expected value of assets at retirement from taxable and tax-deferred retirement savings, rather than simply stating which is likely to have higher value.

Conclusion

A growing focus on personal finance education as part of high school mathematics pathways necessitates standards that combine mathematics and finance. While the NSPFE reflect the financial knowledge that students should have, we believe a math-based approach allows for a richer learning environment to build financial understanding and decision-making skills. One significant concern about personal finance education without a focus on mathematics is that it may build financial confidence without sufficiently building skills. As further described in the FiCycle standards document, research shows that people with a high degree of confidence in their financial knowledge often engage in more financial actions. However, they may engage in both positive and negative actions. People with higher mathematical skills and financial knowledge are more likely to avoid negative actions.

Equipping students with financial concepts, financial knowledge, and mathematical skills as reflected in the FiCycle Standards for Personal Finance and Mathematics is more likely to produce long-term positive financial outcomes than financial literacy alone.