

*Generative AI Tutors and Project-Based Learning: Boosting Financial Literacy
in Japanese Students*

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Abstract

This research study aimed to investigate how generative AI-enhanced Japanese university students' financial knowledge, behavior, and attitude following a 15-week course on personal finance. An electronic instrument was distributed to 49 English as a Foreign Language (EFL) students in two elective courses focused on teaching the basics of personal finance at a private university in Eastern Japan. The survey included the following sections: (1) financial knowledge, (2) financial behavior, and (3) financial attitude. The inquiry results showed that participants' responses to the financial knowledge and behavior subscales in the pre-survey ($M = 7.63$, $M = 2.87$) increased by the end of the course ($M = 8.91$, $M = 3.38$). A paired *t*-test demonstrated that these changes were significant. However, participants' responses to the financial attitude items decreased slightly from the pre-survey ($M = 2.37$) to the post-survey ($M = 2.40$). Responses to the open-ended questions in the post-survey revealed that overall, participants had a positive experience in the course using generative AI for learning and planned to apply what they had learned in their future lives and studies.

Keywords: EFL, Financial Attitudes, Financial Behavior, Financial Knowledge, Generative AI, Japanese University, Personal Finance

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Introduction

In an era where financial landscapes grow increasingly complicated, the importance of financial literacy has never been more evident, particularly among young adults preparing to enter the economic arena. As crucial turning points in the formative years of adult life, universities are responsible for equipping students with the understanding necessary to navigate personal finance confidently and competently. However, conventional pedagogical approaches often need to be revised to engage students and address their diverse learning needs, especially in financial education.

Recognizing this pedagogical gap, this study explores an innovative approach by integrating a generative AI tutor, ChatGPT, into a Japanese university elective class dedicated to financial literacy. The study aims to foster a more interactive and personalized educational experience by combining cutting-edge AI technology with project-based learning. This introduction to generative AI sets the stage for discussing the potential of such AI-powered tools to complement traditional teaching methods and potentially revolutionize the educational landscape regarding accessibility, engagement, and efficacy in fostering financial literacy among university students.

In recent years, issues such as the student loan crisis, housing affordability, and inflation have contributed to financial uncertainty, especially among young people. In Japan, these concerns have been exasperated by factors such as a rapidly aging and declining population, underfunded government social welfare programs, and the elimination of “lifetime employment” that many Japanese companies offered following the Second World War. In order to address these issues, the Japanese government has introduced tax-advantaged retirement accounts and private pension programs that have placed a greater burden on the individual to prepare for and manage one’s retirement. Currently, 54% of Japanese household financial assets are kept in simple savings accounts, while only 16% are in bonds, stocks, and funds (Nagata, 2022). In 2022, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) mandated nationwide financial literacy education in high school curricula (Financial Services, Agency, 2023).

While Japan is known worldwide as a highly technological country, the widespread usage of technology for education, especially in pre-tertiary education environments, was quite limited (Aoki, 2010; Funamori, 2017; Latchem et al., 2008). This has changed greatly since the COVID-19 pandemic forced schools to deliver content through technology at all levels. When ChatGPT was introduced to the general public in 2023, educators worldwide raced to understand how to prevent misuse of the technology and appropriately use it for educational purposes. Recent academic studies highlight the potential of AI in education. For example, Villasenor (2022) emphasized integrating AI-generated content in education to enhance learning and critical thinking. Another on using large language models in math education reveals that AI explanations significantly improve learning outcomes, particularly when students attempt problems independently (Kumar et al., 2023). Kumar et al. (2023) concluded that implementing the AI tutor, Khanmigo, in a Silicon Valley school demonstrated its effectiveness in actively engaging students in learning and offered a personalized approach. Finally, Mollick and Mollick (2023) discussed how AI can support evidence-based teaching strategies as a classroom learning catalyst.

These studies underscore the expanding role of AI in education, particularly in enhancing learning experiences and addressing pedagogical challenges. Our research seeks to contribute

to this evolving landscape by examining the integration of ChatGPT in financial literacy education, a critical area for empowering young adults in today's complex financial world.

Research Questions

This preliminary research study aimed to investigate how the use of generative AI-enhanced Japanese university students' financial knowledge, behavior, and attitude following a 15-week course on personal finance. The following research questions were addressed in this study:

1. What are Japanese university students' overall financial knowledge, financial behavior, and financial attitude pre and post a 15-week course on personal finance?
2. What are Japanese university students' intentions to use the knowledge learned in the personal finance course in the future?
3. What are Japanese university students' perceptions of generative AI for learning?

Methodology

Setting and Sample

The study was conducted at a private university in Eastern Japan, focusing on English as a Foreign Language (EFL) students. The university has approximately 11,000 students enrolled in undergraduate and postgraduate studies. There are approximately 1,000 faculty employed at the university across seven faculties. The sample for this study consisted of 51 students enrolled in two semesters of an undergraduate elective focused on learning the basics of personal finance in English.

Participants

Of the 51 students who participated in the elective personal finance course, 49 responded to the pre-survey, while 44 completed the post-survey. A slight majority (52.90%) of the students were female. The rest identified as male. The participants' class standing was as follows: 1st year (19.61%), 2nd year (35.29%), 3rd year (31.37%), and 4th year (13.73%). All participants in the study identified as ethnically Japanese, and Japanese was their first language. While no measure of English ability was given in the class, all students must have a minimum of 550 on the Test of English for International Communication (TOEIC) to take the class. The course catalog identifies the level of the course as B1 Common European Framework of Reference for Languages (CEFR).

Classroom Procedures

A significant aspect of the treatment involved using Chat GPT as a personal finance tutor. This innovative approach was central to the project-based learning component of the course.

Chat GPT was employed as an interactive, AI-driven tutor specifically tailored to assist students in understanding the foundations of personal finance. Its role facilitated learning by providing explanations, answering queries, and offering guidance on various financial topics. This approach aimed to create a more engaging and personalized student learning experience.

Students were tasked with creating Google Sites web pages as part of their assessment. These web pages served as a platform for students to demonstrate their understanding and

application of personal finance concepts. Chat GPT played a crucial role in this process by assisting students in conceptualizing, designing, and populating their web pages with relevant content. This task assessed students' knowledge and ability to communicate and present financial concepts in a digital format effectively.

Another innovative use of Chat GPT was developing speaking tasks. Students utilized the AI tutor to help them prepare and refine their spoken presentations on personal finance topics. These speaking tasks were recorded and uploaded to YouTube, providing a dynamic and accessible medium for showcasing their learning.

The YouTube videos of the speaking tasks were embedded into the students' Google Sites webpages. This integration presented each student's learning journey, combining written content, interactive elements, and video presentations. Using Chat GPT in this process ensured that students had continuous support in developing their written and spoken communication skills, which are crucial for effectively conveying an understanding of basic financial concepts.

This expanded use of Chat GPT as a personal finance tutor represents a novel approach in educational settings, particularly in enhancing students' financial literacy. The course provided students with a multifaceted educational experience by incorporating AI-driven tools in project-based learning, combining traditional learning with innovative technology-driven methods.

Instrument

The primary instrument used for data collection was a Personal Finance Questionnaire, administered before and after the course using Google Forms. This questionnaire assessed three key areas: financial knowledge, attitudes, and behavior (Appendix). The questionnaire included a range of question types, such as multiple-choice, Likert-scale, and open-ended questions, to capture a comprehensive view of students' financial literacy. The items for the questionnaire were adapted from a previously validated survey instrument (Potrich et al., 2020). The items were translated into Japanese from English by a researcher who is a native speaker of Japanese and possesses a high level of ability in English. A second native Japanese speaker checked the translation for ease of understanding.

Data Collection and Analysis

The data were collected during the Spring and Fall semesters of 2023 (April – December). The researchers created a Google Forms document administered to students through the university's learning management systems. The survey and cover letter were in Japanese and English. The cover letter gave potential participants information regarding the study and their rights as research subjects. It was made clear to the students that participation was voluntary and would not affect their course evaluation.

After the data collection phase, the researchers transcribed the data into an Excel spreadsheet for further analysis. Frequencies and descriptive statistics were calculated for all the scales and subscales. In addition, a paired *t*-test was conducted to investigate changes in responses between the pre-and post-survey.

Results

Research Question 1a: Financial Knowledge

The Financial Knowledge portion of the survey contained 12 items. In the pre-test, the participants' mean score was 7.63, which increased to 8.91 in the post-test. As Figure 1 shows, the most frequent pre-test score for the participants was a 5, while 9 was the most common in the post-test.

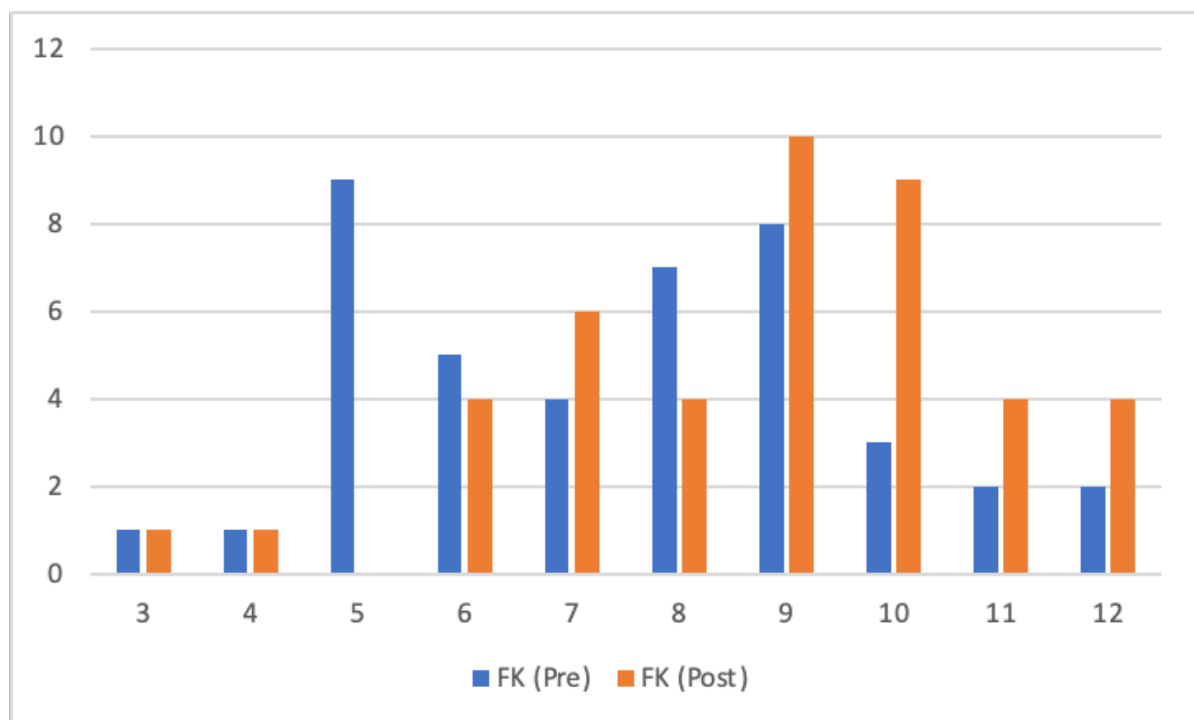


Figure 1: Distribution of Scores for Financial Knowledge

The most common questions missed in the pre-test were:

Imagine that you have received a donation and that you will keep the money in your safe at home. Considering that inflation is 5% per year, after one year, you will be able to buy:

- Less than 5 years (correct answer)
- From 5 to 10 years
- Over 10 years
- Do not know

Jon acquires a loan of \$1,000 that has an interest rate of 20% per year compounded annually. If he does not make payments on the loan and at that interest rate, how many years would it take for the amount due to double?

- Less than 5 years (correct answer)
- From 5 to 10 years
- Over 10 years
- Do not know

Both questions were concerned with interest rates and compound growth. The latter was also the most frequently missed in the post-test.

A Paired Sample *t*-test was calculated to determine differences in pre- and post-scores to the Financial Knowledge test. The results of this analysis showed that participants' scores on Financial Knowledge increased significantly from the pre-test ($M = 7.63$, $SD = 2.51$) to the post-test ($M = 8.92$, $SD = 2.30$; $t(48) = 2.79$, $p = .0075$).

Research Question 1b: Financial Behavior and Attitude

The highest mean values were associated with Item 14 on Financial Behavior, with over 50% of participants in the pre-survey and over 72% in the post-survey indicating they *almost always* or *always* personally oversaw their finances. The greatest change between pre- and post-survey means in this category was seen in Item 15: “I set long-term financial goals and strive to achieve them.”

Table 1: *Pre and Post Means and Standard Deviations of Financial Behavior*

Item	Pre		Post	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
13. I save money regularly to achieve long-term financial goals, such as educating my children, purchasing a home, and retiring.	2.43	1.06	2.86	1.17
14. I personally oversee my financial affairs.	3.45	1.29	4.00	.99
15. I set long-term financial goals and strive to achieve them.	2.73	1.18	3.30	1.02

Note. Scale ranging from 1 – *never* to 5 – *always*.

Responses to Items 16 and 18 on the Financial Attitude scale decreased slightly between the pre- and post-survey. The only item to increase was 17, where more participants disagreed with the statement, “Money is meant to be spent” in the post-survey compared to the pre-survey.

Table 2: *Pre and Post Means and Standard Deviations of Financial Attitude*

Item	Pre		Post	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
16. I find it more rewarding to spend money than to save for the future.	2.69	1.04	2.60	1.26
17. Money is meant to be spent.	1.97	.98	2.02	1.17
18. I tend to live today and let tomorrow happen.	2.73	1.10	2.59	1.30

Note. Scale ranging from 1 – *strongly agree* to 5 – *strongly disagree*.

A visual comparison of the pre- and post-survey means showed that the difference in Financial Attitudes before and after the course was negligible in comparison to Financial Behavior (Figure 2). A paired *t*-test was used to determine if the difference between pre- and post-survey means significantly differed for each factor. It was found that the pre-survey responses to Financial Attitudes ($M = 2.87$, $SD = 1.25$) increased significantly in the post-survey ($M = 3.38$, $SD = 1.15$; $t(48) = -2.79$, $p = .0076$). There was no significant difference

between pre- (M = 2.37, SD = 1.08) and post-survey (M = 2.40, SD = 1.26) responses to the Financial Attitude scale.

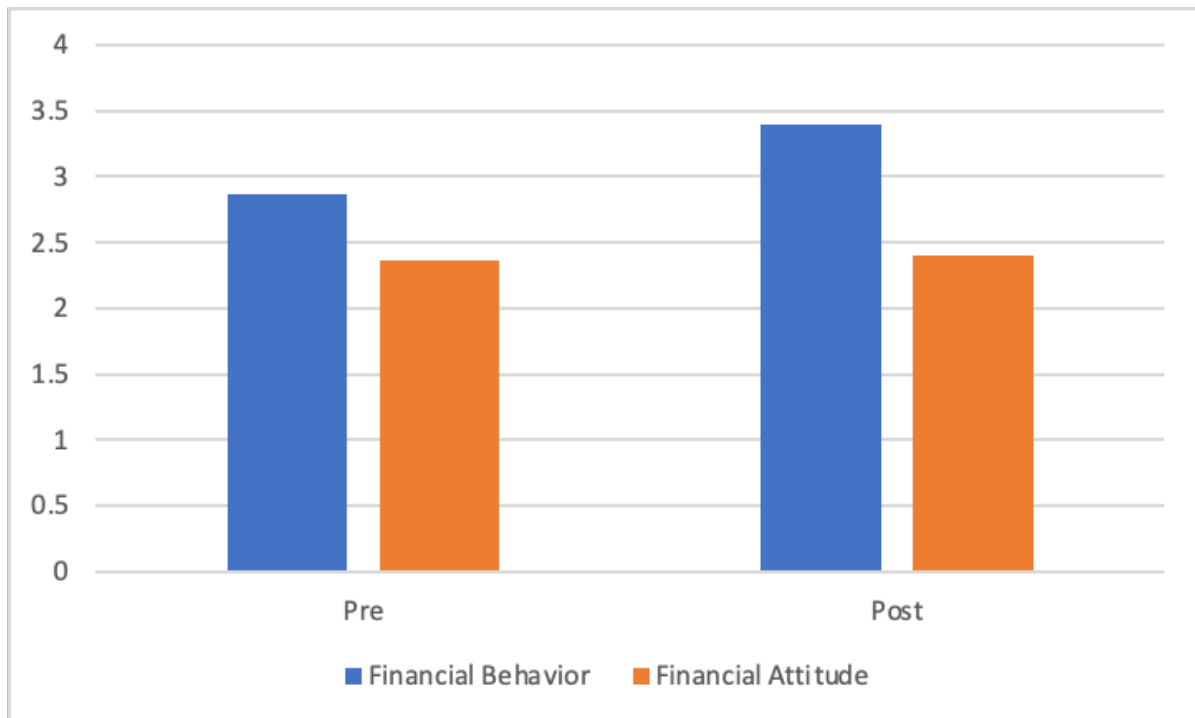


Figure 2: Comparison of Pre- and Post-Survey Means for Financial Behavior and Attitude

Research Question 2: Use of Financial Knowledge

Information was gathered from participants about how they would use the information they learned in the course in the future. A thematic analysis of the open-ended responses allowed the researchers to categorize the information into three themes: 1. Reflective Spending Habits, 2. Strategic Financial Planning, 3. Interest in Financial Instruments.

The first of these, Reflective Spending Habits, was evident in responses about budgeting, impulse spending, and being thoughtful in how money was spent and saved. Participants also expressed an interest in Strategic Life Planning in their discussion of taxes, insurance, and retirement preparation. The last theme that emerged was Interest in Financial Instruments. Many responses focused on specific financial instruments introduced in the course, such as the Nippon Individual Savings Account (NISA) and the Individual Defined Contribution Pension (iDeCo).

Research Question 3: Perceptions of Generative AI

Participants were asked to identify the positive and negative aspects of using Chat GPT for learning. Based on the provided responses, three overarching themes emerge regarding participants' perceptions of the advantages of using ChatGPT for financial information. The first was Convenience and Accessibility. Participants appreciated the ease with which they could obtain information and how they could ask unlimited questions and receive feedback. Another theme was that of Educational Value. Participants valued ChatGPT's ability to explain unfamiliar topics and vocabulary in a simple way. In addition, the tool was seen as a valuable resource in increasing their ability to manage their personal finances. The final theme was Efficiency and Customization. The tool was seen as helpful in providing specific

advice to the financial questions asked and scaffolding the information to the students' level of financial knowledge and English proficiency.

Three further themes regarding the negative aspects were identified in the participants' open-ended responses. The primary concern was that of Uncertainty and Reliability. Participants reported that ChatGPT could often provide false answers to their queries and that the data was not up to date. While Customization was identified as a positive theme, several responses highlighted the negative. Some students complained that the tool only provided general advice about their financial circumstances. Finally, many participants expressed concern that the tool posed a risk of Overreliance and Laziness. They acknowledge that because of the ease with which one could obtain information using ChatGPT, learners might lose the ability to research and make decisions.

Discussion

The results of this study highlight the significant role of generative AI, specifically Chat GPT, in enhancing the financial literacy of Japanese university students. Using Chat GPT as a personal finance tutor in a project-based learning environment not only improved students' financial knowledge, as evidenced by the increased scores in the post-test but also positively influenced their attitudes and behaviors towards personal finance.

1. **Enhanced Learning Experience:** The integration of Chat GPT allowed for a more interactive and personalized learning experience. Students could engage with complex financial concepts in a more accessible and user-friendly manner. Creating Google Sites webpages and developing speaking tasks, supported by Chat GPT, provided practical applications of their learning, reinforcing their understanding of personal finance.
2. **Digital Literacy and Communication Skills:** The project-based approach, including creating webpages and video presentations, also enhanced students' digital literacy and communication skills. These are essential competencies in the modern digital world, further adding value to the educational experience provided by the course.

Limitations

While the study provides valuable insights, it has limitations. The sample size, though diverse, was limited to students from specific universities in Japan, which may affect the generalizability of the findings. Additionally, the study focused on short-term outcomes; thus, long-term financial knowledge and skills retention still need to be explored.

Implications for Practice

The findings suggest that incorporating AI-driven tools like Chat GPT in educational settings can be highly effective, especially in subjects like personal finance that require a blend of theoretical knowledge and practical application. Educators and curriculum designers might consider integrating similar AI tools to enhance learning experiences in various disciplines.

Need for Future Research

1. **Long-Term Impact:** Future research should assess the long-term impact of AI tutors on students' knowledge retention and the sustained change in their financial behaviors and attitudes.
2. **Broader Applications:** Exploring the application of AI tutors in other subjects and educational contexts would provide a more comprehensive understanding of their effectiveness and versatility.
3. **Comparative Studies:** Comparative studies involving different AI platforms and teaching methodologies could offer deeper insights into the most effective strategies for integrating technology in education.
4. **Cultural and Linguistic Adaptations:** Given this study's cultural and linguistic specificity, research in diverse cultural and linguistic settings would be valuable to understand the broader applicability of AI tutors in global educational contexts.

In conclusion, this study underscores the potential of AI-driven tools like Chat GPT in revolutionizing educational methodologies and outcomes. The positive results in enhancing financial literacy among Japanese university students pave the way for further exploration and innovation in education technology.

Conclusion

This study explored the impact of generative AI tutors, specifically Chat GPT, on enhancing the financial literacy of Japanese university students. The findings clearly indicate that integrating AI-driven tools in a project-based learning environment significantly improved students' understanding of personal finance. Using Chat GPT as a personal finance tutor facilitated a deeper grasp of financial concepts and encouraged a more engaged and interactive learning experience.

Creating Google Sites webpages and developing speaking tasks, supported by Chat GPT, demonstrated the practical application of financial knowledge. This approach enhanced students' financial literacy and developed their digital literacy and communication skills, preparing them for the demands of the modern, technology-driven world.

While the study presents promising results, it also highlights the need for further research. Future investigations should focus on the long-term effects of AI tutors on knowledge retention, the application of AI in diverse educational contexts, and the effectiveness of different AI platforms in various learning environments.

The implications of this research are far-reaching. It suggests a paradigm shift in educational practices, where AI-driven tools like Chat GPT can be pivotal in enhancing learning outcomes. As the field of education technology continues to evolve, integrating such innovative tools could become a standard practice, offering students a more personalized, engaging, and effective learning experience.

In conclusion, the study provides compelling evidence of the benefits of using generative AI tutors in education, particularly in specialized subjects like personal finance. It opens up new

avenues for research and practice, encouraging educators and policymakers to embrace AI technologies in crafting the future of education.

Appendix

Survey Instrument (Potrich et al., 2020)

Financial Knowledge

Item Code	Item	Answers
Item 1	Suppose you had €100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow? You do not make any other deposits or withdraw any money from this account.	More than €102.*; Exactly €102; Less than €102.; Do not know.
Item 2	Imagine that you have received a donation and that you will keep the money in your safe at home. Considering that inflation is 5% per year, after one year, you will be able to buy:	More than today.; Exactly the same as today.; Less than today.; Do not know.
Item 3	Typically, which asset has the biggest fluctuations over time?	Savings.; Stocks.*; Bonds.; Do not know.
Item 4	Do you think that the following statement is true or false? Buying a single company stock usually provides a safer return than a stock mutual fund.	True.; False*.; Do not know.
Item 5	Suppose you took out a loan of \$10,000.00 to be paid after 1 year and the total cost of interest is \$600.00. The interest rate you will pay on this loan is:	0.3%; 0.6%; 3%; 6%*.; Do not know.
Item 6	Suppose you saw the same TV in two different stores for the starting price of \$1,000.00. Store A offers a discount of \$150.00. while store B offers a discount of 10%. What is the best alternative?	Buy at store A (\$150.00 discount).; Buy at store B (10% discount).; Do not know.
Item 7	Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, would you be able to buy more than, exactly the same as, or less than today with the money in this account?	More than today.; Exactly the same as today.; Less than today.; Do not know.
Item 8	Suppose you borrowed \$100.00 from a friend and after a week paid \$100.00. How much interest are you paying?	0%*.; 1%; 2%; Do not know.

Item 9	An investment with a high rate of return will have a high rate of risk. This statement is:	True *; False; Do not know.
Item 10	When inflation increases, the cost of living goes up. This statement is:	True.*; False.; Do not know.
Item 11	John acquires a loan of \$1,000.00 that has an interest rate of 20% per year compounded annually. If he does not make payments on the loan and at that interest rate, how many years would it take for the amount due to double?	Less than 5 years.*; From 5 to 10 years.; Over 10 years.; Do not know.
Item 12	It is possible to reduce the risk of investing in the stock market by buying a wide range of shares. This statement is:	True *; False; Do not know

Financial Behavior

Item Code	Description	Scale
Item 13	I save money regularly to achieve long-term financial goals, such as educating my children, purchasing a home, retiring.	1 = Never, 2 = Almost never,
Item 14	I personally oversee my financial affairs.	3 = Sometimes, 4 = Almost always,
Item 15	I set long-term financial goals and strive to achieve them.	5 = Always

Financial Attitude

Item Code	Description	Scale
Item 16	I find it more rewarding to spend money than to save for the future.	1 = Strongly agree, 2 = Agree,
Item 17	Money is made to spend.	3 = Indifferent, 4 = Disagree,
Item 18	I tend to live today and let tomorrow happen.	5 = Strongly disagree

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