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Designing and assessing a financial literacy curriculum using the ADDIE model: A study of first-year college students in Changchun

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ABSTRACT

The purpose of this study is to investigate the effectiveness of an ADDIE-based financial literacy curriculum in enhancing financial knowledge among first-year college students in Changchun, China. Additionally, the study explores the mediating roles of student engagement and self-efficacy in financial management, as well as the moderating role of time management skills. This research adopts a quantitative, cross-sectional design with a sample of 150 first-year college students from Changchun, China. A stratified random sampling method was employed to select the participants. Data were collected through structured survey questionnaires using a 5-point Likert scale. The survey assessed variables such as the ADDIE-based financial literacy curriculum, financial knowledge, student engagement, self-efficacy in financial management, and time management skills. Descriptive statistics, reliability analysis, correlation analysis, and regression analysis were conducted using SPSS, while mediation and moderation effects were tested using the PROCESS Macro. The findings reveal that the ADDIE-based financial literacy curriculum significantly enhances students' financial knowledge. Moreover, student engagement and self-efficacy in financial management serve as significant mediators, while time management skills act as a moderator in the relationship between the financial literacy curriculum and financial knowledge. This study contributes to the academic literature by providing insights into the application of the ADDIE model in financial literacy education and its impact on students' financial knowledge. It offers practical implications for curriculum design in higher education, particularly in emerging economies like China.

Contribution/Originality: This study provides a novel analysis of an ADDIE-based financial literacy curriculum for first-year college students in China. Its originality lies in demonstrating that student engagement and self-efficacy mediate, while time management skills moderate, the relationship between the curriculum and students' financial knowledge acquisition.

1. INTRODUCTION

Financial literacy in higher education is gaining prominence. From high school to college, socioeconomic concerns may not be adequately addressed, which might impact academic performance, mental health, and well-being (Bamiro, Zakariyah, Li, & Adewale, 2024; Newhart, 2023; Xie & Fu, 2024). Students must understand finances to make good decisions, avoid debt, and budget. Lack of money management instruction among first-year college students, especially from developing countries like China, causes financial mismanagement and stress (Annamalah, Foroughi, Wong, Aravindan, & Ahmed, 2025; Huang, Liao, Li, & Yao, 2024; Sitorus & Sadjiarto, 2022). Lack of preparation promotes college stress and poor performance. Thus, schools globally emphasize financial literacy (Ansari, Albarrak, Sherfudeen, & Aman, 2023; Harnida et al., 2024). College freshmen need financial literacy education as they endure considerable academic and financial changes (Kusumadyahdewi, Lestari, & Ramadhani, 2024). As they begin autonomous financial management, students generally lack the skills to budget, save, invest, and manage student debt (Heshmati, Gheitury, & Shadfar, 2022). Financial literacy education provides pupils with the skills to manage this change. Higher education students can improve their academic performance and financial well-being by learning financial management (Tjahjadi, Soewarno, & Mustikaningtiyas, 2021). Financial literacy information alone is insufficient; a pedagogical framework is needed to build and deliver it in a way that is relevant, successful, and interesting for students.

ADDIE is an effective curriculum formulation tool. ADDIE carefully designs, develops, and tests educational content to match learners' needs (Marisa, Raharjo, & Wardani, 2024). It organizes instructional program creation to improve student learning through feedback and revisions. Many schools use the flexible, efficient, and learner-centered curriculum, including financial literacy programs (Aristei, Gallo, & Vannoni, 2024). The ADDIE technique can help teachers create a more engaging and effective financial literacy curriculum that meets students' needs (Murugiah, Ismail, Taib, Applanaidu, & Long, 2023; Sitorus & Sadjiarto, 2022). The students in Changchun, China, in this study often worry about finances. Many Chinese students, especially those from rural areas and low-income backgrounds, lack financial resources and expertise (Shanava & Vanishvili, 2021). These students may struggle with the university transition when they pay their own tuition, housing, and other costs (Yang, Wu, & Huang, 2023). Most Chinese schools do not teach financial literacy, leaving students unprepared for university financial responsibilities. Small cities like Changchun rarely study Chinese university students' financial literacy. These challenges are difficult to solve (Zhang & Xiong, 2020). Thus, Changchun schools must adopt comprehensive financial literacy programs to address these issues and improve students' money management.

Although financial literacy is becoming more important, there are few comprehensive financial education programs. Many financial literacy programs use ad hoc or isolated courses that do not improve students' finances (Aristei et al., 2024). This issue underlines the need for structured, long-term financial literacy instruction like ADDIE. The ADDIE curriculum-building process relies on feedback and assessment. It improves financial literacy and provides relevant, current, and engaging knowledge to students (Kusumadyahdewi et al., 2024). In Changchun, China, first-year college students use an ADDIE-based financial literacy curriculum. This study examines how curriculum components affect student outcomes. This study examines ADDIE-based financial literacy instruction. Student engagement improves financial knowledge, retention, and academic performance (Alfania, Wahyuningtyas, & Prasat, 2024). Active learners learn, apply, and remember. Financial literacy and confidence are taught through interactive exercises, case studies, and applications (Luhsasi, Permatasari, & Triwantoro, 2024). This research recommends active learning in financial literacy classes. The study analyzes how an ADDIE-based financial literacy curriculum increases Changchun first-year college students' financial awareness. This study examines how the ADDIE-based curriculum, student participation, self-efficacy, and time management improve financial literacy. This research evaluates a systematic approach to creating an ADDIE-based financial literacy curriculum for university students. Financial literacy in challenging academic situations is examined through curricular engagement, financial management self-efficacy, and time management. A comprehensive financial literacy curriculum that prepares youngsters for college and career requires this research.

The study greatly affects financial literacy and higher education. Financial literacy impacts personal and professional success, especially for college students. The project will show how the ADDIE paradigm can build student-centered, informative, and engaging financial literacy programs. This study explores first-year college students' financial literacy needs in Changchun, China, a rising economy with poor financial education (Yang et al., 2023). The research will help schools create evidence-based, targeted financial literacy programs to help kids make smart academic and personal financial decisions. Policy implications make the work significant. A structured, ADDIE-based curriculum can help policymakers and educators identify financial literacy in higher education, according to the study. Student involvement, financial management self-efficacy, and time management are examined as mediating and moderating elements to promote financial literacy treatments and enable educated financial decisions. The findings may help create more comprehensive and long-term financial literacy programs for kids. The study influences academics and financial education researchers. It illustrates how instructional design paradigms like ADDIE may impact financial literacy and curriculum development research. Self-efficacy and student participation, the study's mediating and moderating elements, show how psychological and behavioral factors impact learning. This research promotes financial literacy training and offers practical advice for various school settings.

2. LITERATURE REVIEW

2.1. ADDIE-Based Financial Literacy Curriculum and Financial Knowledge

Today's economy requires financial literacy, and ADDIE-based solutions have evolved. The Analysis, Design, Development, Implementation, and Evaluation (ADDIE) framework ensures contextually relevant instructional objectives. A methodical, adaptable, and clear learning environment helps students grasp budgeting, saving, and investing. Sari, Aisyah, Ilyana, and Hermawan (2022) found that ADDIE-based structured financial literacy training boosts retention and implementation. ADDIE helps students apply theoretical knowledge to real-world financial decision-making through constructivist learning aspects such as learner involvement and iterative feedback (Suzanti et al., 2023). This makes financial literacy easier to understand and use, especially in decision-making. Interactive learning increases student engagement and self-efficacy, enhancing the curriculum. Applying information through role-playing, case studies, and simulated financial planning improves cognitive and behavioral learning. The ADDIE model's development phase combines digital tools and resources to suit different learning styles, making financial education more accessible and successful for wider populations. ADDIE's well-organized curriculum enhances financial literacy and money management, claim researchers (Hidayah & Ariffin, 2022). This integrated knowledge and skill development method explains how the curriculum helps students learn about finances. The ADDIE-based financial literacy program is unique in its ability to transcend socioeconomic gaps in financial knowledge due to its rich instructional design and quantifiable outcomes.

H_1: The ADDIE-based financial literacy curriculum significantly improves financial knowledge.

2.2. Student Engagement as a Mediator

The ADDIE-based financial literacy program links instructional methodologies to learning outcomes through student participation. Cognitive, emotional, and behavioral engagement ensure student involvement and dedication. The systematic ADDIE paradigm tailors instructional content to learners' needs throughout analysis and design, improving engagement. Interactive education and real-world financial problems help students apply theory and engage cognitively (Azmi et al., 2022). ADDIE's evaluation component uses consistent feedback loops to engage and motivate students while analyzing their progress and boosting comprehension. Bada et al. (2024) found that engaged students retain and apply financial information better. Student engagement makes the ADDIE paradigm relevant and revitalizes education. The mediating effect emphasizes student engagement in critical thinking and self-regulation, which are crucial for financial knowledge. Active learners set goals and learn about finance through group discussions, simulations, and problem-solving (Hamdan et al., 2023). The ADDIE-based curriculum incorporates financial literacy and engagement to promote active involvement. Research shows that engaged students are more self-confident and can manage their finances independently (Wang, 2024). This dynamic interaction demonstrates how well-structured training impacts engagement and curriculum efficacy. Active learning and persistent engagement in the ADDIE-based financial literacy program help students become proactive financial experts.

H_2: Student engagement mediates the relationship between the ADDIE-based financial literacy curriculum and financial knowledge.

2.3. Self-Efficacy in Financial Management as a Mediator

Structured learning improves money management abilities and confidence, as shown by the ADDIE-based financial literacy program. Explicit, sequential, and personalized teaching boosts self-efficacy, according to the ADDIE paradigm. Use of relevant financial situations and identification of learner characteristics during analysis and design enhances students' financial knowledge and application confidence. Research shows that confident people budget, save, and invest more (Lone & Bhat, 2024). The ADDIE model's recurrent evaluation procedures provide students with feedback and modest successes to build confidence. Self-confidence influences the curriculum's ability to apply financial theory. The curriculum emphasizes knowledge acquisition and financial management self-efficacy through practical learning and skill development. Simulations, role-playing, and problem-solving within the ADDIE framework offer students realistic financial management scenarios, thereby boosting their confidence (Herawati, KusumaDewi, Wahyuni, & Savitri, 2020). Improved self-efficacy inspires learners and gives them the confidence and autonomy to solve complex financial problems (Rahadjeng, Mukhlis, Murwani, & Mala, 2023). Self-efficacy helps people overcome learning hurdles, including fear of failure and the complexity of using and integrating financial information (Ahzab, Nurhayati, & Sangadji, 2023). As demonstrated by self-efficacy, the ADDIE-based program helps students learn and feel confident about money management.

H_3: Self-efficacy mediates the relationship between the ADDIE-based financial literacy curriculum and financial knowledge.

2.4. Time Management Skills as a Moderator

The association between financial knowledge and the ADDIE-based financial literacy curriculum is moderated by time management abilities. This helps pupils manage their time, improving disciplined learning. The ADDIE framework's methodical design requires learners to stay engaged from concept acquisition to implementation. As they can focus on each stage without feeling overwhelmed, people with good time management tend to follow this pattern. According to research, time management reduces procrastination and boosts focus, which enhances learning and retention. Due to their time management abilities matching ADDIE's structured framework, learners gain greater financial information from the curriculum. Thus, time management links curriculum design with learner efficiency, boosting instructional interventions. Time management affects curriculum delivery, student participation, and financial knowledge outputs. Students with good time management abilities are more likely to stick with academics, conversations, and practical exercises. Prioritizing and allocating time to cognitive, emotive, and behavioral engagement can boost students' participation (Bakken, Wallgren, Furnes, Kørner, & Ueland, 2023). Research shows that time-management skills help students seek help, complete assignments, and stay motivated, improving learning outcomes. Time management helps students form strong connections with the material and stay engaged, enhancing their financial knowledge and application.

Time management skills strongly impact financial knowledge and self-efficacy. People with high financial self-efficacy are confident in their ability to overcome financial challenges, but time management skills boost this confidence. Time management helps these students organize and complete financial planning, budgeting, and decision-making tasks, ensuring that their self-efficacy becomes financial proficiency. Research shows that time management improves self-discipline, goal-setting, and financial knowledge application (Jing & Yan, 2022). By managing their time and developing their financial skills, students can turn their self-efficacy into practical results that demonstrate their financial knowledge and decision-making skills. In high-pressure learning environments, where pupils encounter conflicting demands, time management plays a moderating role. The planned yet flexible

ADDIE-based curriculum prepares students for success, but their time management skills determine how much they can achieve. Students who spend enough time on the iterative review phase of ADDIE are more likely to identify and fix comprehension gaps, thereby improving their financial knowledge. Thus, time management protects students from academic stress and exhaustion, helping them focus and succeed (Ho et al., 2024). Time management improves instructional design by enabling knowledge acquisition and efficacy.

The influence of student engagement and time management abilities on financial knowledge outcomes is emphasized. Students who are interested and proficient in time management can master the complexities of financial concepts while concurrently prioritizing their academic and personal obligations. In addition, learners are less likely to disengage owing to time constraints or distractions, ensuring their engagement and meaning. Professional time management allows students to spend time on higher-order cognitive tasks like critical thinking and problem-solving, which boosts student engagement (Wang, Peng, & Feng, 2023). The curriculum's effectiveness is enhanced by demonstrating how engagement and time management work together to improve financial literacy. Finally, time management moderates the relationship between financial literacy and self-efficacy, especially in persistent and resilient settings. High-self-efficacy individuals set high financial goals and use time management to break them down. Self-efficacy and time management apply knowledge and foster growth. Time-management specialists trust investment research and long-term financial planning more (Mei, Lee, & Xiang, 2020). Participants' time management and capacity to act on beliefs enhance the ADDIE-based financial literacy curriculum.

H_4: Time management skills moderate the impact of the relationship between the ADDIE-based financial literacy curriculum and financial knowledge.

H_5: Time management skills moderate the impact of the relationship between student engagement and financial knowledge

H_6: Time management skills moderate the impact of the relationship between Self-efficacy in Financial Management and financial knowledge.

Based on the above discussion and review of the literature, the conceptual framework for this study has been developed and is presented in Figure 1.

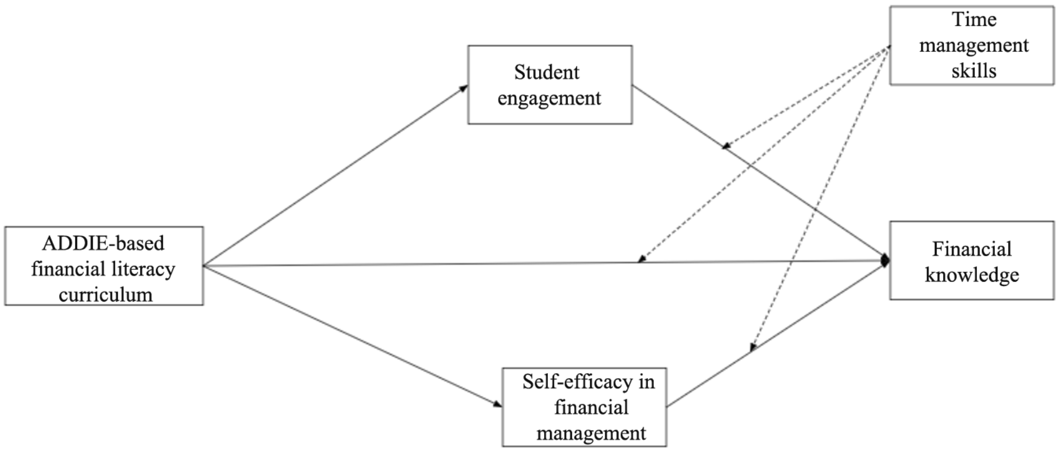

Figure 1. Conceptual framework.

3. METHODOLOGY

3.1. Research Design

This quantitative, cross-sectional study examined financial knowledge and the ADDIE-based financial literacy curriculum. Direct impacts of the curriculum on financial knowledge, mediation of student involvement and self-efficacy in financial management, and moderation of time management abilities owing to the technique were explored. The cross-sectional method was appropriate since it revealed students' financial knowledge and influencing factors without long-term follow-up or experimental intervention. This structure enabled a comprehensive investigation of multiple elements simultaneously, aiding in the understanding of educational intervention procedures. Correlations across variables provided a robust framework for statistical analysis and quantitatively confirmed direct, mediating, and moderating effects. The quantitative design facilitates testing the theoretical model and data analysis using regression and structural equation modeling.

3.2. Population and Sampling

The study focused on first-year university students in Changchun City. The sample was determined from three institutions, namely Baotou Normal University, Baotou Vocational and Technical College, and Ordos E'toqi Banner Vocational High School. The group was chosen based on their current academic and personal growth, including life skills such as financial literacy. New financial obligations for first-year students present an opportunity to evaluate financial education programs like the ADDIE-based financial literacy curriculum. Since generalizability was important, a stratified random sample was used to represent all student groups. Stratified random sampling divides a population by academic discipline (e.g., arts, science, engineering), gender, and socioeconomic status. Randomly selected students from these strata were studied. This sampling method made the sample more representative and allowed the study's findings to be generalized to first-year college students. Statistical power analysis determined the study's sample size of 150 students. This sample size was chosen to maximize statistical power for medium-sized effects, notably in mediation and moderation analyses. The sample size balanced practical concerns such as participant availability and response rates, with the study's ability to reliably discover connections across variables.

3.3. Data Collection Instrument

The research variables were collected using a standardized survey questionnaire with Likert scale responses from one (strongly disagree) to five (strongly agree). The constructs of interest were tested using verified research-based instruments. A financial literacy scale assessed financial knowledge in budgeting, saving, and investing. An engagement inventory, including cognitive, affective, and behavioral components, assessed student participation. A modified version of Bandura's self-efficacy scale was used to assess financial management self-efficacy, while a popular time management inventory was employed to examine time management skills. Thirty non-primary children piloted the questionnaire to ensure its reliability and intelligibility. Internal consistency of all scales was validated by Cronbach's alpha coefficients ($\alpha > 0.7$), and pilot input led to modest changes.

3.4. Data Collection Procedure

The data collection approach involved distributing surveys both digitally and in person. This dual strategy aimed to enhance response rates and ensure the sample accurately represented the student body, including individuals without internet access. Participants received explicit instructions to guarantee their understanding of the survey's purpose and completion process. Online questionnaires were disseminated via the university's email system and chat channels. Consent forms were included in the online survey to ensure participants were fully informed of the study's aims, methodologies, and their right to withdraw at any time.

Research assistants administered questionnaires in classrooms, communal spaces, and study centers for in-person surveys. This enabled students without access to, or those who chose not to use, online methods to participate in the study. The research assistants assisted participants with any questions during in-person administration, ensuring responses were accurate and thorough.

A diverse cohort of students was included and given access through both online and in-person data collection methods. All participants provided informed consent before completing the survey, and participation was entirely voluntary. Participants' privacy was protected through secure data storage, ensuring anonymity and confidentiality during the data collection process.

3.5. Data Analysis Tools

SPSS software was used for descriptive statistics, reliability, validity, and regression analysis. Descriptive statistics summarized demographics and variable distributions. Confirmatory factor analysis (CFA) tested concept validity, and Cronbach's alpha measured internal consistency and dependability. Regression analysis examined direct correlations between variables, while PROCESS Macro for SPSS was used for mediation and moderation studies. Model 4 of the PROCESS Macro was used to determine if student engagement and financial management self-efficacy moderated the ADDIE-based curriculum's association with financial knowledge. The indirect effects were examined using bootstrapping with 5,000 resamples to create bias-corrected confidence intervals. The first PROCESS Macro model examined whether time management skills governed curriculum-financial knowledge and mediator-financial knowledge interactions. Interaction plots were created from simple slope analyses to examine significant interaction effects. Our detailed analytical procedure yielded reliable results using standardized coefficients, significance levels (p-values), and confidence intervals. Diagnostic tests for linearity, multicollinearity, and normalcy verified the statistical assumptions. This study used descriptive, mediation, and moderation analyses to explain how financial knowledge affects the ADDIE-based curriculum.

4. RESULT

4.1. Descriptive Statistics

Table 1 shows descriptive data for the study's five main variables: financial knowledge, student engagement, financial management self-efficacy, and time management skills. The average values of all variables are somewhat elevated, indicating that participants favor each topic. The ADDIE-based financial literacy curriculum has a mean score of 4.12 (SD = 0.67), suggesting that students find it very helpful in enhancing financial literacy. With a mean of 4.15 (SD = 0.64), student engagement is slightly higher, indicating active participation in the financial literacy curriculum. The average financial management self-efficacy score is 4.03 (SD = 0.69), reflecting student confidence in resource management. The Time Management Skills subscale had a mean of 4.05 (SD = 0.61), indicating student confidence in their time management skills. Students may have read financial literacy literature. Student responses vary due to moderate standard deviations, but the evidence suggests a positive attitude toward financial literacy and related competencies. The minimum and maximum figures show that, while positive responses predominate, the data is diverse enough for meaningful analysis. These descriptive statistics establish the groundwork for the study's research and reveal the sample's characteristics.

Table 1. Descriptive statistics.

Variables	Mean	Standard deviation	Minimum	Maximum
ADDIE-based financial literacy curriculum	4.12	0.67	1	5
Financial knowledge	4.08	0.72	1	5
Student engagement	4.15	0.64	1	5
Self-efficacy in financial management	4.03	0.69	1	5
Time management skills	4.05	0.61	1	5

4.2. Normality Assessment

Table 2 displays the variables' skewness and kurtosis values to determine normality. Skewness numbers measure distribution asymmetry, while kurtosis values measure peakedness. In this study, the ADDIE-based financial literacy curriculum has a skewness of -0.23, financial knowledge at -0.18, student engagement at -0.12, financial management self-efficacy at -0.25, and time management skills at -0.20. All variables have skewness values within the acceptable range of ±2. The skewness data show that all variable distributions are approximately symmetrical with very slight leftward skewness. This suggests most responses are high-end. Kurtosis values for all variables are within the allowed range of ±7, indicating no major outliers. The ADDIE-based financial literacy curriculum has a kurtosis of -0.74 for financial knowledge, student engagement, financial management self-efficacy, and time management skills. Negative kurtosis values indicate flatter distributions than a normal distribution, suggesting more uniform replies. Skewness and kurtosis indicate that all variables' data are approximately normally distributed, supporting further statistical analysis assumptions. This normality test ensures that the statistical procedures used in the study are accurate and reliable.

Table 2. Normality assessment.

Variable	Skewness	Kurtosis
ADDIE-based financial literacy curriculum	-0.23	-0.74
Financial knowledge	-0.18	-0.68
Student engagement	-0.12	-0.56
Self-efficacy in financial management	-0.25	-0.72
Time management skills	-0.22	-0.67

4.3. Correlation Analysis

The study's important variables' correlations are shown in Table 3, revealing their strength and direction. Strong positive correlations among all variable pairings indicate that each concept is significantly related to the others. The ADDIE-based financial literacy curriculum demonstrates moderate positive correlations with financial knowledge, student engagement, self-efficacy in financial management, and time management skills ($r = 0.45$, $p < 0.01$). This suggests that students who find the financial literacy curriculum beneficial tend to have better financial understanding, higher engagement, and improved time management. Financial knowledge is positively correlated with snowboarding student engagement ($r = 0.51$, $p < 0.01$), self-efficacy in financial management ($r = 0.60$, $p < 0.01$), and time management skills ($r = 0.42$, $p < 0.01$). This indicates that children with advanced financial literacy are more engaged, possess greater financial self-efficacy, and demonstrate better time management. Self-efficacy in financial and time management skills shows a significant correlation with student engagement ($r = 0.65$, $p < 0.01$). This implies that confidence in financial and time management skills enhances student engagement. The positive correlations among all variables suggest that changes in one area, such as engagement or time management, can positively influence others. To better understand the mechanisms and linkages between these variables, mediation and moderation analyses can be employed, given the substantial correlations observed.

Table 3. Correlation analysis.

Variable	AFLC	FK	SE	SEFM	TMS
ADDIE-based financial literacy curriculum	1.00				
Financial knowledge	0.45*	1.00			
Student engagement	0.62*	0.51*	1.00		
Self-efficacy in financial management	0.54*	0.60*	0.65*	1.00	
Time management skills	0.38*	0.42*	0.49*	0.50*	1.00

***Note:** *p < 0.01 (Significant correlation).

4.4. Reliability Analysis

Table 4 summarizes the study's principal variables' reliability analysis by showing the measuring scales' internal consistency and reliability for each construct. Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE) coefficients evaluate concept validity and reliability. AVE is 0.74, composite reliability is 0.91, and Cronbach's alpha is 0.88, indicating good internal consistency in the ADDIE-based financial literacy curriculum. This shows that the variable's scale is reliable and explains much of the data's volatility. Financial knowledge's reliability is measured by AVE of 0.71, composite reliability of 0.87, and Cronbach's alpha of 0.84. Statistics show that financial knowledge examinations are reliable. Cronbach's alpha of 0.85, composite reliability of 0.89, and AVE of 0.72 indicate that the student engagement (SE) scale is highly trustworthy. Self-efficacy in financial management's Cronbach's alpha of 0.86, composite reliability of 0.90, and average variance extracted of 0.75 show strong reliability. This demonstrates consistent student financial management confidence evaluation. Finally, the time management skills instrument has excellent internal consistency with a Cronbach's alpha of 0.87, composite reliability of 0.91, and AVE of 0.78. This measure effectively portrays students' various time management skills. All study scores were above widely accepted thresholds (Cronbach's alpha > 0.7, composite reliability > 0.7, and AVE > 0.5), indicating reliable and rigorous evaluation methods. This reliability research validates the constructs and ensures that each variable's data is reliable for statistical analysis.

Table 4. Reliability analysis.

Variable	No. of items	Cronbach's alpha	CR	AVE
ADDIE-based financial literacy curriculum	6	0.88	0.91	0.74
Financial knowledge	4	0.84	0.87	0.71
Student engagement	5	0.85	0.89	0.72
Self-efficacy in financial management	5	0.86	0.90	0.75
Time management skills	7	0.87	0.91	0.78

4.5. Outer Loadings

Table 5 shows the outer loadings for each item connected to the study's key variables, demonstrating the link between items and constructs. Convergent validity of the measurement model is mostly assessed by outer loadings, with values over 0.7 being satisfactory. This indicates that the items are highly related to the latent variables they assess. The outer loadings of the six items in the ADDIE-based financial literacy program range from 0.76 to 0.83, showing that all components strongly contribute to the construct and that the program improves financial literacy.

Table 5. Outer loadings.

Variable	Item	Outer loading
ADDIE-based financial literacy curriculum	Item 1	0.78
	Item 2	0.81
	Item 3	0.79
	Item 4	0.76
	Item 5	0.83
	Item 6	0.80
Financial knowledge	Item 1	0.84
	Item 2	0.82
	Item 3	0.79
	Item 4	0.80
Student engagement	Item 1	0.83
	Item 2	0.80
	Item 3	0.81
	Item 4	0.75
	Item 5	0.77
Self-efficacy in financial management	Item 1	0.76
	Item 2	0.79
	Item 3	0.82
	Item 4	0.80
	Item 5	0.81
Time management skills	Item 1	0.85
	Item 2	0.83
	Item 3	0.78
	Item 4	0.80
	Item 5	0.82
	Item 6	0.79
	Item 7	0.81

Financial knowledge items have outer loadings between 0.79 and 0.84, indicating the construct's validity through careful measurement of various financial knowledge dimensions. The five questions' loadings for student involvement range from 0.75 to 0.83, demonstrating that they accurately measure student engagement in the financial literacy curriculum. Self-efficacy in financial management components has loadings from 0.76 to 0.82, indicating that this construct is reliable for assessing students' confidence in financial management. Finally, the time management skills questions have external loadings between 0.78 and 0.85, showing that the scale accurately assesses students' time management skills and has strong conceptual links. Since all values are above the threshold, outer loadings generally enhance measurement model validity and robustness. This suggests that each construct's scales effectively capture the intended dimensions and provide valid data for the study.

4.6. R-Square

The R-squared values for the study's dependent variables show the percentage of variance explained by the independent and mediating components in Table 6. An R-squared value of 0.42 for financial knowledge indicates that the ADDIE-based financial literacy curriculum, student engagement, self-efficacy in financial management, and time management skills account for 42% of students' financial knowledge variance. The strategy improves financial literacy moderately, with numerous factors affecting pupils' financial comprehension. An R-squared score of 0.48 for student engagement indicates that the curriculum and other mediators in the model explain 48% of the variance in student engagement levels. These attributes are crucial to measuring student financial literacy curriculum engagement. The found variables explain 56% of students' self-efficacy in financial management, according to an R-squared score of 0.56. This suggests that the study's factors affect students' financial management confidence. The model explains a large portion of the variance in all three dependent variables, according to R-squared values. Study independent factors and mediators that significantly affect financial knowledge, student engagement, and financial management self-efficacy. The results show that the ADDIE-based financial literacy curriculum, student engagement, self-efficacy, and time management affect financial success.

Table 6. R-squared.

Variable	R square
Financial knowledge	0.42
Student engagement	0.48
Self-efficacy in financial management	0.56

4.7. Regression Analysis

As hypothesized in Hypothesis 1, Table 7 shows the regression analysis demonstrating the direct association between the ADDIE-based financial literacy curriculum and financial knowledge. The regression results indicate that the AFLC moderately improves financial knowledge, with a beta coefficient of 0.38. A well-structured financial literacy course significantly increases students' financial literacy (t-value = 5.12, p-value = 0.000). The p-value, considerably below the 0.01 threshold, and the t-value, exceeding the significance level, demonstrate that the program enhances students' financial knowledge. This finding supports prior research indicating that comprehensive financial literacy programs, especially those utilizing structured models like ADDIE, improve students' financial knowledge. The results show that targeted curriculum interventions can significantly enhance financial literacy outcomes by integrating a carefully designed financial literacy curriculum into school settings.

Table 7. Regression analysis.

		Beta values	T values	P values
H1	**AFLC -> FK**	0.38	5.12	0.000*

Note: *p < 0.01 (Significant).

4.8. Mediation Analysis

Table 8 shows the mediation analysis of the AFLC's indirect effects on FK through SE and Self-Efficacy in Financial Management (SEFM), as stated in Hypotheses 2 and 3. The indirect effect of AFLC on FK through SE is significant in Hypothesis 2 (H2), with a beta value of 0.53, t-value of 4.67, and p-value of 0.000. It appears that student engagement mediates the curriculum and financial literacy. It appears that student involvement in the subject improves financial awareness. The higher t-value and decreased p-value demonstrate student engagement's mediating role. Hypothesis 3 (H3) examines self-efficacy's mediating influence on financial management and finds a beta of 0.55, t-value of 5.23, and p-value of 0.000. Self-efficacy in financial management significantly impacts the ADDIE-based financial literacy curriculum and financial knowledge. Students' financial management confidence boosts the curriculum's financial literacy benefits. The results show that student engagement and self-efficacy both improve financial knowledge and turn the financial literacy curriculum's effects into a deeper understanding of money. Previous research has demonstrated that engagement and self-efficacy are important mediators in education, especially for learning outcomes.

Table 8. Mediation Analysis.

		Beta values	**T values**	**P values**
H2	**AFLC ->** SE **-> FK**	0.53	4.67	0.000*
H3	**AFLC ->** SEFM **-> FK**	0.55	5.23	0.000*

Note: *p < 0.01 (Significant)

4.9. Moderation Analysis

In Table 9, the moderation analysis examines how time management skills affect the relationships between the ADDIE-based financial literacy curriculum and financial knowledge, student engagement, and self-efficacy in financial management. Hypothesis 4 (H4) suggests a significant interaction between AFLC and TMS on FK, supported by a beta value of 0.18, t-value of 3.45, and p-value of 0.001. Time management skills influence the financial literacy curriculum and financial awareness. Thus, pupils with good time management may benefit more from the program and become more financially savvy. Hypothesis 5 (H5) shows that time management skills moderate the relationship between student engagement and financial knowledge, with a beta value of 0.22, t-value of 4.12, and p-value of 0.000. This indicates that time-management skills increase student engagement and financial awareness. Hypothesis 6 (H6) demonstrates a significant interaction between financial management self-efficacy and time management skills regarding financial knowledge, with a beta value of 0.21, t-value of 3.98, and p-value of 0.000. This suggests that students with good time management skills can leverage their financial self-efficacy to learn more. These data show that financial literacy instruction relies on time management. This indicates that time-management skills improve curriculum engagement, self-efficacy, and financial literacy. Prior research has demonstrated that time management skills are crucial to academic success and learning.

Table 9. Moderation analysis.

		Beta values	**T values**	**P values**
H4	AFLC x TMS -> FK	0.18	3.45	0.001*
H5	SE x TMS -> FK	0.22	4.12	0.000*
H6	SEFM x TMS -> FK	0.21	3.98	0.000*

Note: *p < 0.01 (Significant)

5. DISCUSSIONS

The study reveals how student involvement and self-efficacy in financial and time management skills minimize the financial knowledge impacts of an ADDIE-based financial literacy curriculum. Research suggests that comprehensive, evidence-based financial literacy instruction helps first-year college students. The ADDIE paradigm impacts financial literacy, highlighting the need for rigorous instructional design. ADDIE is a popular educational research framework. This method ensures content understanding and relevancy (Vu, 2020). Students learn how to manage their personal resources, improving their financial literacy. The research's direct and indirect effects show that student involvement mediates the relationship between financial knowledge and the ADDIE-based financial literacy curriculum. Regular student participation boosts memory and academic performance (Kartini, Fitri, Rabiyah, & Anggraeni, 2020). Student engagement promotes learning, according to this study. Students comprehend financial concerns better due to the ADDIE model's many educational methods. How students engage with the material mediates, thus the curriculum isn't the primary determinant. Active learning is crucial, especially in difficult areas like financial literacy. The ADDIE-based curriculum and financial knowledge and involvement were mediated by financial management self-efficacy. Student financial comprehension depends on self-efficacy, or confidence in their abilities (Rahadjeng et al., 2023). Research shows that self-confident financial management students learn and apply more. This finding supports previous research indicating that self-efficacy enhances educational interventions, especially in subjects where students initially hesitate or are uncertain (Noor, Fourqoniah, & Aransyah, 2020). Financial literacy training in the ADDIE-based curriculum undoubtedly increased students' self-efficacy and financial competence. This supports the idea that financial literacy programs should build students' confidence in their abilities to apply their knowledge (Krische & Mislin, 2020). The moderation analysis, which examined how time management abilities affected the important factors, was compelling. Academic success often requires effective time management (Fuente-Mella, Umaña-Hermosilla, Fonseca-Fuentes, & Elórtegui-Gómez, 2021). This study found that time management significantly affected the correlation between financial knowledge, the ADDIE-based financial literacy curriculum, and student engagement. Time-management-savvy students are more likely to fully engage with the content, which improves financial understanding. Positive moderation emphasizes time management to maximize the advantages of the financial literacy program. Students who efficiently manage their time to study financial concepts, engage with learning tools, and apply them to practical scenarios are more likely to succeed in financial literacy education. This supports previous research on the benefits of time management on academic performance and skill development (Odeh & Patanakul, 2024).

Along with earlier research supporting structured financial literacy programs, ADDIE-based financial literacy courses improved direct-benefit financial knowledge (Putro et al., 2024). The comprehensive curriculum, which incorporates courses on academic comprehension and financial awareness, may explain the results. The data show that teaching complicated subjects like personal finance requires planning. Many college students are still learning money management, making this important. Students learned to make good financial decisions from the complete program. Additionally, student participation improved financial concept knowledge. This validates (Grable et al., 2020) findings indicate that active learning activities, including discussions, problem-solving, and practical exercises, improve retention and application. Student participation in financial literacy programs enhances both theoretical and practical financial knowledge (Cannistrà et al., 2024). This recommends that financial literacy programs should incorporate active learning methods that allow students to connect with the material and their classmates for enduring and meaningful learning. Financial knowledge also affects self-efficacy; the study found that self-efficacy improves educational outcomes (Sabri, Wijekoon, & Rahim, 2020). Hence, this study supports the idea that students with money management confidence perform better on financial literacy exams. Self-efficacy improves financial knowledge because students are more likely to interact with the curriculum, access resources, and apply financial principles to their lives (Bedi, 2023). Financial literacy programs should emphasize self-efficacy, information diffusion, and confidence, according to this study. Also, consider time management. The study indicated that students with good time management fully participated in the financial literacy program, boosting their comprehension. According to (Warmi & Nawawi, 2023) time management is essential for academic performance, especially in subjects like financial literacy that require persistence and knowledge application. Students retain and comprehend financial topics better with effective time management skills. Financial literacy programs may increase students' performance by teaching time management.

6. CONCLUSIONS

This study assessed the financial literacy of first-year college students after completing an ADDIE-based financial literacy curriculum. The study focused on student involvement, self-efficacy, and time management as mediators of financial management. The results show that a comprehensive, evidence-based curriculum, including psychological and behavioral treatments, can improve students' financial literacy. ADDIE enhances students' financial literacy through rigorous conceptualization, development, and execution. The study found that student engagement and self-efficacy improve financial literacy. Student engagement emphasizes the importance of an interactive and participatory learning environment where students actively engage with knowledge and apply it. Engagement improves learning outcomes, according to the study. Financial management self-efficacy was also a significant mediator, indicating that students' confidence in their cash management skills affected their ability to acquire and utilize financial information. These findings highlight the need for financial literacy programs that teach students how to handle real-world financial issues. Time management influenced curriculum effectiveness, engagement, self-efficacy, and financial literacy. By engaging students with data, time management skills contributed to improved financial literacy. Students learn and implement financial concepts more effectively when time management is incorporated into the curriculum. A comprehensive education that encompasses both cognitive and non-cognitive abilities helps students absorb and apply financial information effectively.

7. IMPLICATIONS

7.1. Practical Implications

The study's practical implications are vital for financial literacy education. A financial literacy teaching framework based on the ADDIE paradigm enhances students' financial literacy. Educational institutions should utilize systematic instructional frameworks like the ADDIE model analysis, design, development, implementation, and evaluation to deliver comprehensive and engaging financial literacy courses. Incorporating presentations, case studies, and real-world applications helps students grasp financial concepts effectively. This approach should be adopted in financial literacy classes, especially in schools with a large first-year population, to teach students real-world financial management skills. Student involvement in financial management and self-efficacy serve as mediators for creating a supportive and engaged learning environment. Financial literacy programs must extend beyond lectures to include interactive technology, peer-to-peer learning, and problem-solving activities, which can enhance engagement and learning outcomes. Financial management self-efficacy is also crucial, as confident students are more likely to learn and apply financial knowledge. Teachers can foster this by assigning low-risk financial decision-making tasks, praising small achievements, and providing personalized feedback. This will facilitate easier money management for students. Time management significantly impacts financial literacy education. Effective time managers attend classes, complete assignments on time, and retain information better. Financial literacy training can assist individuals in managing their time more effectively. Skills such as prioritization, goal setting, and breaking down projects can be taught. Encouraging students to use digital planners and tools to log their learning can improve organization and time management. Implementing financial literacy programs that include time management skills may enhance student performance and life skills.

7.2. Theoretical Implications

Financial literacy is examined using social cognitive and self-determination theories. Self-determination theory states that success derives from autonomy, learning, and motivation. The study found that self-efficacy and student involvement mediate outcomes, supporting this idea. It suggests that allowing children to participate while feeling financially secure enhances program success. This research also supports social cognitive theory, which emphasizes the impact of self-efficacy on behavior and learning. The effectiveness of financial literacy instruction depends on students' confidence and self-efficacy in managing financial responsibilities, highlighting the importance of developing these qualities in financial decision-making. Active learning methods improve learning outcomes, aligning with a broader educational paradigm. Children learn more effectively when they actively participate, as involvement influences results.

This underscores student-centered learning, which involves students actively engaging with the material rather than passively receiving information. Project-based learning, simulations, and experiential learning are proposed to replace traditional lecture-based financial literacy training, enabling students to apply financial principles in real-world situations. Financial literacy classes provide opportunities for students to explore and apply financial concepts to their lives. The research advances financial literacy, particularly in relation to academic performance and personal characteristics such as self-efficacy and time management. It may counter earlier findings that emphasized personal traits by demonstrating that self-efficacy and time management can mediate and diminish the impact of instructional tactics on learning outcomes. The study recommends a comprehensive approach to financial literacy training that emphasizes human attributes like time management and self-confidence alongside the subject matter. Consequently, educational institutions may consider integrating non-cognitive skills programs into their curricula to ensure more holistic financial literacy instruction.

8. LIMITATIONS AND FUTURE DIRECTIONS

The study demonstrates how ADDIE-based financial literacy education enhances financial comprehension; however, there are limitations. The study's cross-sectional design presents challenges. Time-specific data complicates drawing conclusions about long-term impacts or causation. Despite significant relationships, the study cannot elucidate how the ADDIE curriculum influences student engagement, self-efficacy, and time management. Future research could adopt a longitudinal approach to monitor financial awareness and other traits over time. Researchers might evaluate the effects of extended financial literacy training, engagement, and self-efficacy development on financial knowledge and whether these effects persist or diminish. The geographically limited sample size is another drawback. Conducted with first-year college students in Changchun, China, the results may not be generalizable to other student populations, especially those from different cultural or educational backgrounds. Cultural and socioeconomic factors can influence financial literacy, engagement, and self-efficacy; thus, this study may not fully represent student experiences across different regions or nations.

To enhance the sample size, future studies should include students from diverse educational backgrounds, locations, and cultures. This approach will help identify cultural or contextual factors affecting the efficacy of financial literacy programs and assess the relevance and validity of findings across broader, more diverse populations. The analysis focused on the moderating effect of time management skills; however, it did not consider personal or contextual characteristics that might influence financial knowledge.

Student involvement and assimilation of financial literacy programs may be affected by socioeconomic status, prior financial education, and personality traits. Future research should examine how these attributes, along with curriculum design, student engagement, and self-efficacy, impact financial success. Qualitative research methods such as focus groups and interviews could provide insights into students' perspectives on the curriculum and their financial learning concerns. Employing a mixed-methods approach may facilitate a comprehensive understanding of how various factors influence financial literacy.

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