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Determinants of financial literacy among Thai undergraduates for digital and adaptive learning design

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ABSTRACT

This study examines the relationship between academic performance and financial literacy among 618 undergraduate students at Rangsit University, drawn from a population of 28,068 students using convenience sampling between June and December 2024. A mixed-methods design was employed, integrating Organisation for Economic Co-operation and Development (OECD-aligned) questionnaires with in-depth interviews of 10 students to capture both quantitative patterns and qualitative perspectives. Statistical analyses at the 0.05 level indicated that academic year, grade point average-cumulative (GPAX), field of study, financial education background, income source, and income level significantly predicted financial literacy outcomes. Students with higher GPAX showed stronger financial knowledge and behavior, although financial attitudes were slightly weaker. Health-science students demonstrated the highest literacy levels, followed by those in business, engineering, and social sciences. Income level influenced financial behavior but showed limited effects on attitudes, while prior financial education modestly improved knowledge with minimal behavioral impact. More than half of participants exhibited weak understanding of compound interest, limiting long-term saving capability. Insights from interpretative phenomenological analysis (IPA) and digital-learning perspectives underscore the need for context-responsive and technology-enhanced financial education. Therefore, the findings highlight how academic and socioeconomic factors shape financial literacy and offer guidance for developing personalized curricula and digital interventions aligned with sustainable development goals (SDGs) 1, 4, 8, and 10.

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1. INTRODUCTION

Thailand is sprinting toward an aged society with little financial armor: household debt is climbing, saving rates lag, and fintech tools remain largely untapped. Recognizing that sound money skills are a linchpin of both prosperity and poverty reduction, the Royal Thai Government has launched a 2023-2027 national action plan to weave financial education into schools, workplaces, and community programs [1], [2]. Moving individuals from theoretical knowledge to practical budgeting, planning, and risk management,

the initiative aims to embed financial literacy in daily behavior, strengthening economic security and supporting sustainable consumption [3]–[5].

Financial literacy is essential for informed decision-making and personal well-being. While Thai students grasp basic concepts like simple interest, overall literacy remains concerning. This mirrors trends across Association of Southeast Asian Nations (ASEAN), where emerging economies face similar challenges in bridging the gap between basic awareness and the required financial skills after graduation and entering the workforce. Recent studies reveal persistent difficulties with more complex concepts, which contribute to weak financial behaviors, including a tendency to spend rather than save. These challenges highlight the need for targeted interventions, even as financial literacy continues to show a positive association with saving intentions [6]–[9]. Furthermore, familial factors, e.g., economic education and parental income significantly influence students' financial literacy and inclusion [10]. These interconnected challenges necessitate the development of targeted educational courses to improve students' overall financial attitudes and practices [6]. Experiential learning and practical financial education programs are recommended to enhance financial literacy and promote positive financial practices [11]. Universities should integrate comprehensive financial literacy courses into their curricula to address gaps in students' financial knowledge, particularly focusing on complex concepts like compound interest [6], [12], [13].

Implementing experiential learning opportunities, e.g., financial simulations and real-life financial management tasks, can help students develop practical financial skills [11], [12]. Integrating financial literacy across curricula is a multifaceted approach that involves embedding financial concepts into various subjects, particularly mathematics and social studies, to enhance students' understanding and application of financial knowledge [14], [15]. Financial literacy education for digital-native learners requires digital pedagogy that matches their interactive, technology-driven preferences. Adaptive platforms, simulations, and mobile budgeting tools can support experiential learning, personalization, and behavioral engagement. Grounded in motivational and behavioral principles, such approaches help develop informed and confident financial decision-makers in the digital economy [16]. These insights show that financial literacy involves knowledge, behavior, and attitudes. This study examines how these dimensions can be strengthened through evidence-based, adaptive, and context-relevant instruction, guided by four key questions as:

- How strongly do students' demographic profiles and academic backgrounds affect their financial literacy levels?
- How do income levels, financial education background, and income sources relate to students' financial knowledge, behaviors, and attitudes?
- How can digital pedagogy enhance financial literacy outcomes through adaptive and technology-supported learning strategies?
- What implications do these findings hold for the integration of digital and psychological components in designing flexible financial literacy curricula?

To address this challenge, the present study assesses financial literacy among Thai university students by examining demographic, academic, and socioeconomic determinants. The methodology, findings, discussion, and conclusion are detailed in the following sections.

2. METHOD

This study employed a mixed-method design, integrating quantitative analysis with semi-structured qualitative interviews to investigate the financial knowledge, behaviors, and attitudes of undergraduate students [17], [18]. As shown in Figure 1, this study adopted a sequential explanatory mixed-methods framework that integrates quantitative and qualitative phases to examine financial literacy among undergraduate students. The design allows quantitative analyses to first identify general patterns of financial literacy, followed by qualitative inquiry to explain and contextualize these patterns via students' lived experiences, providing interpretative depth to support curriculum development and digital learning interventions. Evidence-based learning outcomes aligned with the Organisation for Economic Co-operation and Development (OECD) framework can be developed by specifically tailoring performance benchmarks to address the disparities identified in students' grade point average-cumulative (GPAX), levels, fields of study, and income sources. However, it is expected that this adaptive alignment will replace standardized instruction with a differentiated model, ensuring that students from lower academic tiers receive targeted scaffolding to meet international literacy standards while higher-performing groups are challenged with more complex financial simulations.

2.1. Questionnaire design

This study employed a quantitative approach using a structured questionnaire to assess financial literacy in Thai university students. The two-section instrument, adapted by the Bank of Thailand from

OECD tools, aligns with the OECD/International Network on Financial Education (INFE) 2016 framework to measure financial knowledge, behavior, and attitude [4], [12], [13], [19].

- Part 1: students were requested to provide demographic information, which encompassed their gender, year of study, GPAX, faculty affiliation, as well as personal and parental monthly income and their primary sources.
- Part 2: an evaluation of financial literacy skills was conducted, based on the OECD framework, through a series of questions aligned with the three core dimensions.

Financial competence was measured using an instrument with three components: knowledge (7 multiple choice questions (MCQs) on interest, inflation, and risk), behavior, and attitude (both assessed via 5-point Likert scales). Data were collected using a structured self-administered questionnaire administered via Google Forms, enabling online participation with standardized items, response options, and instructions. Content and construct validity were confirmed through expert review, pilot testing, and index of item-objective congruence (IOC), with reliability supported by a Cronbach's $\alpha > 0.70$.

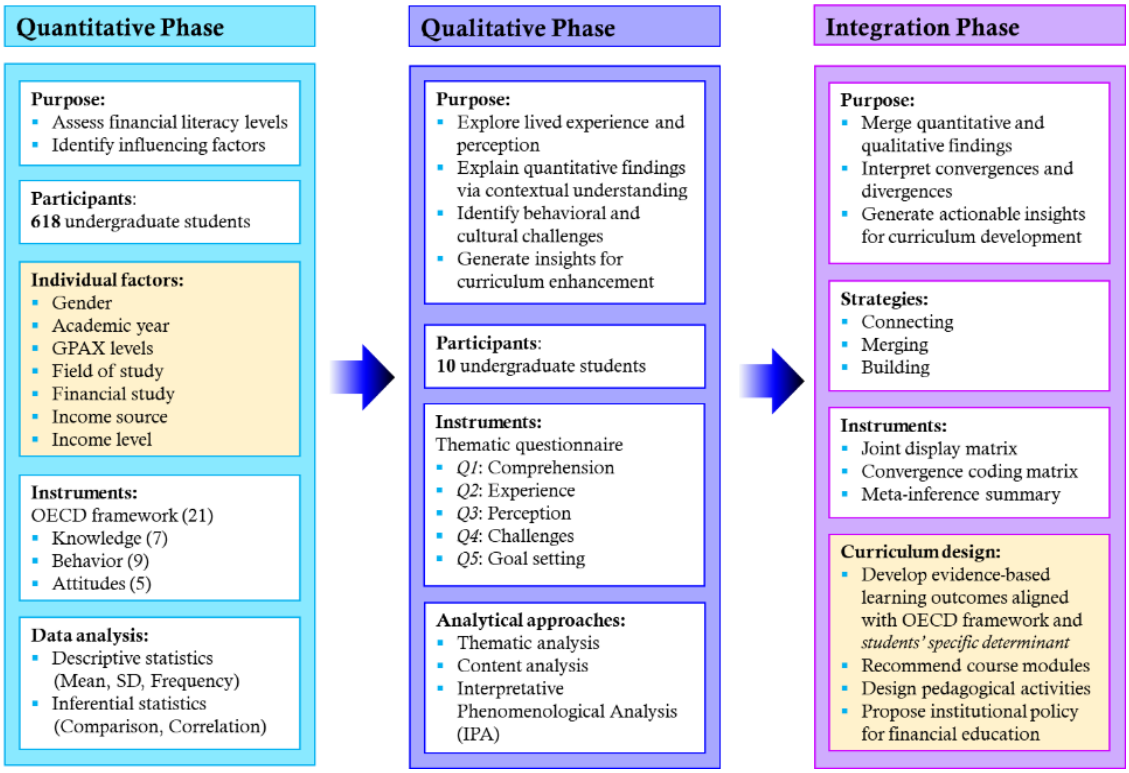

Figure 1. Sequential explanatory mixed-methods framework integrating quantitative and qualitative phases to investigate financial literacy among undergraduates

2.2. Semi-structured interview

To explore the financial knowledge, behaviors, and attitudes of Thai undergraduate students, a semi-structured interview methodology was utilized [20], [21]. Using context-specific questions for Thai students to capture meaningful and accurate data, a total of 10 students were interviewed using five core questions as:

- Q1: how would you define financial literacy, and in what ways does it influence your personal financial decision-making and overall economic understanding?
- Q2: what financial attitudes or beliefs do you and your peers commonly hold, and how do these influence your daily financial decisions and discipline?
- Q3: in your opinion, how do financial habits, e.g., spending, saving, and budgeting reflect your financial behavior, and what role does lifestyle play in shaping these habits?
- Q4: what are the main financial challenges you currently face as a student, and how do you apply financial knowledge or strategies to manage them?
- Q5: how do you plan to manage your finances after graduation, and what financial planning or investment strategies do you intend to adopt as a young professional?

2.3. Data collection

In 2024, the undergraduate population at Rangsit University was $N = 28{,}068$. The minimum required sample size (n) to estimate a population mean ($\bar{x}$) with a specified precision was computed using the normal-theory formula with finite population correction such that:

$$n = \frac{n_0}{1+\frac{n_0-1}{N}}, n_0 = \frac{Z^2\sigma^2}{E^2}$$

Specifically, Z is the standard normal quantile for the desired confidence level, σ is the population standard deviation or SD (estimated from pilot data or previous studies), and E is the desired margin of error [22], [23]. Using $Z = 1.96$ (for a 95% confidence level), $\sigma = 20$, and $E = 2$, the initial estimate yielded $n_0 = 384.16$, and after applying the finite population correction for $N = 28{,}068$, the adjusted minimum sample size was $n \approx 379$. Participants were eligible if they were full-time undergraduate students enrolled at Rangsit University during the 2024 academic year, aged 18 years or older. Students on academic leave, exchange students, and incomplete responses were excluded from the analysis. Data were collected via Google Forms between June and December 2024 using convenience sampling, yielding 618 valid undergraduate responses, which exceeded the minimum required sample size of 379 for representativeness.

2.4. Analytical approaches

Quantitative data were analyzed using descriptive and inferential statistics to assess financial knowledge, behavior, and attitude across demographic variables. Interview data were examined through thematic analysis to capture students lived experiences. This mixed-methods approach enabled both statistical rigor and contextual depth, enhancing the validity and applicability of findings related to financial literacy and its role in sustainable development.

2.4.1. Quantitative analysis

The responses were exported to an Excel spreadsheet for preprocessing and statistical analysis. The data were analyzed using descriptive statistics, including mean ($\bar{x}$) and SD, to summarize students' financial knowledge, behavior, and attitudes. To evaluate the distribution of financial literacy scores, the Kolmogorov-Smirnov normality test was conducted at a significance level of $\alpha = 0.05$. Given that the data did not meet normality assumptions, non-parametric statistical methods were employed. The Kruskal-Wallis test was used to compare financial literacy levels across different groups, while the Wilcoxon rank-sum test was applied for pairwise comparisons. Additionally, χ^2 test was used to examine associations between categorical variables. Cramer's V measured associations between categorical variables, while Spearman's rank correlation assessed monotonic relationships between knowledge, behavior, and attitudes.

2.4.2. Qualitative analysis

To complement the quantitative phase, qualitative data were gathered through semi-structured interviews with ten purposively selected students using five guiding questions on financial understanding, behavior, challenges, perceptions, and future planning. Interviews were conducted with informed consent, recorded, transcribed verbatim, and anonymized. An inductive thematic analysis generated codes and themes that deepened understanding of students' financial knowledge, practices, and attitudes beyond survey findings. Content analysis then aligned these themes with the OECD/INFE dimensions of knowledge, behavior, and attitude, confirming quantitative patterns and revealing a persistent gap between conceptual understanding and practical execution. An interpretative phenomenological analysis (IPA) further explored students lived meanings of financial independence, highlighting tensions between autonomy and parental support, peer and lifestyle influences, and the role of reflective strategies, e.g., budgeting apps. Together, these analyses informed context-sensitive interventions.

3. RESULTS

Surveying 618 university students, overview and descriptive statistics outline key demographics, while subsequent analyses identify factors associated with financial literacy. Jamovi version 2.6.45 was used for all statistical analyses in this study. The investigation emphasizes academic performance, field of study, and financial coursework in shaping financial competence. These numerical findings and interpretation are illustrated.

3.1. Overview and descriptive statistics

The mean ($\bar{x}$) age of surveyed students is 20,286±2,417 years old and their demographics are reported. In Table 1, female respondents dominate (68.285%), with males at 31.715%. The sample includes sophomores (43.528%), followed by freshmen (21.845%), juniors (24.110%), and seniors (10.518%). GPAX scores most commonly fall ≥3.25 (57.767%). Health science is the largest field (31.553%), followed by engineering and technology (22.330%) and business administration (20.388%). Over half (55.305%) have no financial study background, and 72.492% rely on parental support. Most earn ≤10,000 baht, with 11.650% exceeding 15,000 baht monthly.

Table 1. Demographic characteristics of the Thai undergraduate sample ($n = 618$) included in the financial literacy determinant analysis

Variable	Type	Labels	Counts	Percentage (%)
X_1: gender	Nominal	1: male	196	31.715
		2: female	422	68.285
X_2: year	Nominal	1: freshmen	135	21.845
		2: sophomore	269	43.528
		3: junior	149	24.110
		4: senior and higher	65	10.518
X_3: GPAX level	Ordinal	1: GPAX=2.00-2.49	21	3.398
		2: GPAX=2.50-2.99	79	12.783
		3: GPAX=3.00-3.24	161	26.052
		4: GPAX≥3.25	357	57.767
X_4: field of study	Nominal	1: health science	195	31.553
		2: engineering and technology	138	22.330
		3: art and social science	159	25.728
		4: business administration	126	20.388
X_5: financial study	Binary	0: no background	344	55.305
		1: with background	278	44.695
X_6: income source	Nominal	1: parents	448	72.492
		2: loan and others	170	27.508
X_7: income level	Ordinal	1: <5,000 baht	110	17.799
		2: 5,001-10,000 baht	310	50.162
		3: 10,001-15,000 baht	126	20.388
		4: >15,000 baht	72	11.650

3.2. Factors associated with financial literacy

Financial literacy differed significantly across students' academic characteristics (year of study, GPAX, and field), financial background, income source, and income level, indicating that both academic and socioeconomic factors jointly shape variations in financial knowledge, behavior, and attitude. Table 2 summarizes the comparison of financial competence scores across student demographics. Due to non-normal score distributions (Kolmogorov-Smirnov, $p < 0.05$), non-parametric analyses (Mann-Whitney U and Kruskal-Wallis tests) were employed. The results reveal that overall financial competence varies significantly with students' year, GPAX levels, field of study (all $p < 0.001$), prior financial study ($p = 0.018$), income source, and income level (both $p = 0.003$). Based on academic and financial factors, the variation of financial literacy is described.

3.2.1. Academic factors

Academic progression exhibited a significant association with financial competence as shown in Figure 2. Year-1 students scored 16.441±1.910 on the 21-point composite scale, rising modestly in Year-2 (16.500±1.659) but falling in Year-3 (15.953±2.143) and Year-4 (15.354±2.043); the omnibus test was significant ($p < 0.001$). Grade performance exerted the strongest influence: students with a GPAX of 2.00-2.49 averaged only 11.750±1.429, where as those achieving ≥3.25 reached 17.089±1.276; intermediate bands (2.50-2.99 and 3.00-3.24) scored 14.083±1.766 and 15.982±1.453, respectively ($p < 0.001$), indicating a clear dose response gradient. Disciplinary variation was also evident ($p < 0.001$). Health-science majors recorded the highest overall mean ($\bar{x}$) (16.797±1.455), business-administration students followed (16.384±2.007), while engineering and technology (15.927±1.959) and arts and social science cohorts (15.693±2.098) trailed by roughly one point. Financial literacy improves early in university but later plateaus or declines, shaped largely by academic achievement and disciplinary exposure. Consistent with social cognitive theory, skills weaken without reinforcement as students shift focus to major-specific content. These patterns highlight the need for curriculum-embedded and sustainability-oriented interventions in lower-performing fields.

Table 2. Comparison of financial literacy components across demographic and educational factors among Thai undergraduates at a significance level of α=0.05

Factor	Labels	Knowledge (7)		Behavior (9)		Attitude (5)		Overall (21)		Comparison
		$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	Sig.
Gender	1	5.750	1.213	7.070	0.859	3.439	0.771	16.259	1.794	
	2	5.687	1.317	7.051	0.998	3.485	0.771	16.223	1.969	0.864
Year	1	5.741	1.246	7.149	0.962	3.551	0.780	16.441	1.910	
	2	6.022	1.123	7.102	0.900	3.375	0.783	16.500	1.659	
	3	5.409	1.356	7.011	1.004	3.532	0.756	15.953	2.143	
	4	5.015	1.420	6.785	1.016	3.554	0.698	15.354	2.043	<0.001
GPAX levels	1	1.762	0.625	6.591	0.838	3.397	0.935	11.750	1.429	
	2	3.899	0.632	6.737	1.155	3.447	0.736	14.083	1.766	
	3	5.323	0.532	7.042	0.857	3.617	0.789	15.982	1.453	
	4	6.513	0.512	7.162	0.935	3.414	0.754	17.089	1.276	<0.001
Field of study	1	6.190	0.760	7.165	0.921	3.443	0.771	16.789	1.455	
	2	5.536	1.415	6.990	0.952	3.401	0.846	15.927	1.959	
	3	5.233	1.476	6.999	1.031	3.461	0.712	15.693	2.098	
	4	5.746	1.271	7.037	0.907	3.601	0.747	16.384	2.007	<0.001
Financial study	0	5.538	1.344	7.310	0.957	3.280	0.750	16.064	1.964	
	1	5.920	1.174	7.367	0.956	3.295	0.796	16.448	1.830	0.018
Income source	1	5.676	1.302	6.982	0.946	3.429	0.747	16.087	1.902	
	2	5.788	1.236	7.255	0.955	3.580	0.821	16.623	1.854	0.003
Income level	1	5.582	1.302	6.940	0.957	3.494	0.800	16.016	1.867	
	2	5.645	1.268	6.983	0.934	3.472	0.740	16.100	1.872	
	3	5.889	1.208	7.241	0.921	3.460	0.740	16.591	1.866	
	4	5.847	1.431	7.233	1.049	3.444	0.909	16.524	2.151	0.003

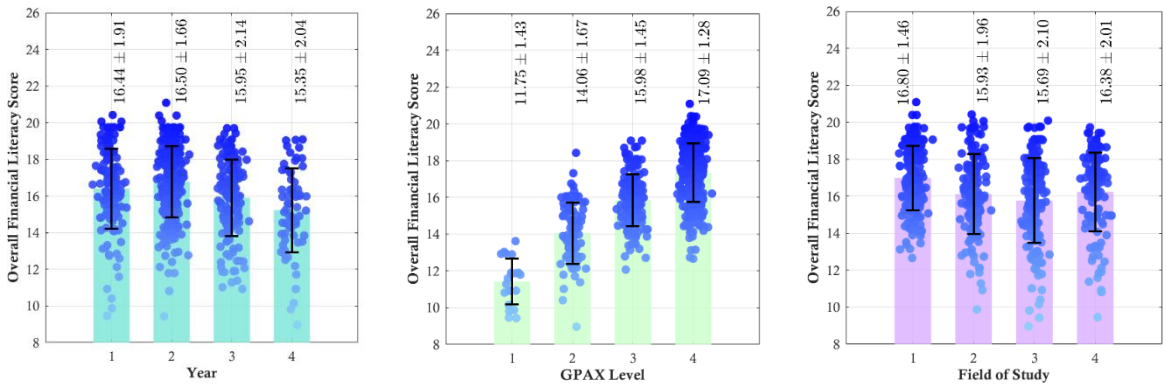

Figure 2. Distribution of overall financial literacy scores across academic year, GPAX level, and field of study among Thai undergraduates in the context of digital and adaptive learning design

3.2.2. Financial factors

Finance-related coursework conveyed a modest edge: students with prior exposure averaged 16.448±1.830 on the 21-point scale, surpassing peers without such training (16.064±1.964; p=0.018), chiefly through richer knowledge. Income provenance also mattered. Respondents supporting themselves via loans or paid work recorded 16.623±1.854, outscoring those reliant on parent allowance (16.087±1.902; p=0.003) and displaying better behavior and attitude. A stepwise gradient by monthly earnings was evident, i.e., competence limbed from ≤THB 5,000 (16.02) to THB 10,001-15,000 (16.59) and stabilized at ≥THB 15,000 (16.524±2.151; p=0.003), with gains concentrated in behavioral facets; the plateau suggests diminishing marginal returns at higher income. Collectively, these financial determinants highlight the role of economic agency and formal instruction in shaping sustainable financial practices. These findings complement academic predictors and offer actionable targets for policy makers and curriculum designers.

3.3. Students' financial competency

The empirical findings on students' financial competence, encompassing financial knowledge, behavior, and attitude are presented, as measured through as structured questionnaire. Drawing on numerical evidence, the analysis reveals patterns and disparities in students' financial understanding, day-to-day money management, and future oriented financial perspectives.

3.3.1. Knowledge

Financial knowledge scores covering core topics, i.e., time value of money, loan interest, simple and compound interest, risk and return trade-offs, inflation, and diversification, vary significantly by academic performance and field of study. As shown in Table 3, the GPAX level demonstrates a statistically significant influence ($p < 0.001$) across all financial knowledge categories, indicating that higher academic performance is consistently tied to better financial literacy. For FK04 (compound interest), students in the highest GPAX tier (≥3.25) achieved a 66.10% correct response rate, a stark contrast to the mere 14.30% recorded for those in the lowest tier (2.00-2.49). The student's field of study significantly influences nearly all financial knowledge areas, e.g., health-science students consistently demonstrate the highest proficiency levels across most categories, though it notably does not have a statistically significant impact on understanding compound interest (p=0.171). Higher academic standing correlates with a significantly greater likelihood of mastering complex concepts like compounding and diversification compared to lower-performing peers. Participation in financial study significantly enhances students' performance in four out of seven categories, i.e., students with financial study background consistently achieved higher correct response rates than those without ($p < 0.05$). This underscores a strong positive correlation between academic achievement and financial literacy. These patterns, supported by significant χ^2 values (e.g., $p < 0.001$ for FK02, FK03, and FK07), affirm that GPAX and field of study are key predictors of financial knowledge. The consistently low scores for FK04 highlight a persistent conceptual gap, necessitating targeted, curriculum-sensitive financial education strategies tailored to diverse academic abilities and disciplinary contexts.

Table 3. Percentage distribution of incorrect and correct responses to financial knowledge questions across demographic and educational factors among Thai undergraduates, with χ^2 test results at $\alpha = 0.05$

Factor	Labels	FK01		FK02		FK03		FK04		FK05		FK06		FK07	
		☒	☑	☒	☑	☒	☑	☒	☑	☒	☑	☒	☑	☒	☑
Gender	1	17.30	82.70	12.80	87.20	19.40	80.60	53.10	46.90	4.10	95.90	8.70	91.30	9.70	90.30
	2	18.70	81.30	12.80	87.20	18.00	82.00	56.60	43.40	4.70	95.30	9.00	91.00	10.90	89.10
	Sig.		0.152		0.105		0.153		0.235		0.078		0.176		0.123
Year	1	13.30	86.70	8.10	91.90	18.50	81.50	61.50	38.50	4.40	95.60	8.10	91.90	10.40	89.60
	2	14.50	85.50	11.90	88.10	13.80	86.20	42.80	57.20	3.00	97.00	4.50	95.50	7.40	92.60
	3	27.50	72.50	15.40	84.60	20.10	79.90	65.10	34.90	6.00	94.00	12.80	87.20	12.10	87.90
	4	23.10	76.90	20.00	80.00	33.80	66.20	73.80	26.20	7.70	92.30	20.00	80.00	20.00	80.00
	Sig.		**0.003**		0.080		**0.002**		**<0.001**		0.284		**<0.001**		**0.025**
GPAX level	1	76.20	23.80	38.10	61.90	100.00	0.00	85.70	14.30	66.70	33.30	76.20	23.80	81.00	19.00
	2	43.00	57.00	39.20	60.80	72.20	27.80	84.80	15.20	10.10	89.90	27.80	72.20	32.90	67.10
	3	25.50	74.50	12.40	87.60	20.50	79.50	85.10	14.90	3.10	96.90	9.30	90.70	11.80	88.20
	4	6.20	93.80	5.60	94.40	0.80	99.20	33.90	66.10	0.30	99.70	0.60	99.40	0.80	99.20
	Sig.		**<0.001**		**<0.001**		**<0.001**		**<0.001**		**<0.001**		**<0.001**		**<0.001**
Field of study	1	10.30	89.70	4.60	95.40	8.70	91.30	49.20	50.80	0.50	99.50	3.10	96.90	3.60	96.40
	2	19.60	80.40	15.90	84.10	21.70	78.30	58.00	42.00	5.80	94.20	11.60	88.40	13.80	86.20
	3	27.00	73.00	18.90	81.10	27.70	72.30	60.40	39.60	8.80	91.20	14.50	85.50	19.50	80.50
	4	18.30	81.70	14.30	85.70	18.30	81.70	56.30	43.70	4.00	96.00	7.90	92.10	6.30	93.70
	Sig.		**0.001**		**<0.001**		**<0.001**		0.171		**0.020**		**<0.001**		**<0.001**
Financial study	1	23.00	77.00	11.60	88.40	19.80	80.20	59.30	40.70	5.20	94.80	11.60	88.40	15.70	84.30
	2	12.40	87.60	14.20	85.80	16.80	83.20	50.70	49.30	3.60	96.40	5.50	94.50	4.00	96.00
	Sig.		**0.001**		0.335		0.343		**0.033**		0.347		**0.008**		**<0.001**
Income source	1	18.10	81.90	12.10	87.90	18.50	81.50	56.90	43.10	5.40	94.60	9.60	90.40	11.60	88.40
	2	18.80	81.20	14.70	85.30	18.20	81.80	51.80	48.20	2.40	97.60	7.10	92.90	7.60	92.40
	Sig.		0.831		0.378		0.934		0.250		0.109		0.322		0.152
Income level	1	24.55	75.45	12.73	87.27	21.82	78.18	53.64	46.36	6.36	93.64	9.09	90.91	13.64	86.36
	2	16.77	83.23	12.26	87.74	19.03	80.97	62.26	37.74	4.84	95.16	10.00	90.00	10.32	89.68
	3	18.25	81.75	12.70	87.30	14.29	85.71	46.83	53.17	3.17	96.83	5.56	94.44	10.32	89.68
	4	15.28	84.72	15.28	84.72	18.06	81.94	44.44	55.56	2.78	97.22	9.72	90.28	9.72	90.28
	Sig.		0.284		0.923		0.501		**0.004**		0.579		0.519		0.870

Note: FK01-time value of money, FK02-interest on loan, FK03-simple interest, FK04-compound interest, FK05-risk and return, FK06-inflation, FK07-diversification.

3.3.2. Behavior

Focusing on financial behavior, several factors exhibit significant associations with students' financial practices. GPAX levels ($p < 0.001$) and financial study experience (p=0.018) are particularly influential. Students with GPAX level ≥3.25 demonstrated the highest behavior mean score (7.162±0.935), while those with financial study experience reported a higher mean (7.068±0.956) compared to those without (7.049±0.957). Additionally, income source (p=0.003) and income level (p=0.003) significantly influenced behavior, with students in the highest income group showing the strongest financial behavior (7.233). However, most undergraduate students are not financially independent. Their financial behavior can be

directly observed from savings. Students with higher GPAX were found to appear to save money before spending (65.05%, χ^2=28.179, $p < 0.001$). The proportion of students who would like to spend before saving and uncertain for 21.20% and 13.75%, respectively. Although basic financial management is widespread, students' saving and investment behaviors remain limited. Most rely on cash or a single bank account, with few using dedicated savings accounts. Advanced investing is rare (<10%), largely due to financial dependence and limited disposable income, which constrain more complex financial activities.

3.3.3. Attitude

The financial attitude of university students is a critical component of their overall financial literacy, which encompasses knowledge, skills, and behaviors necessary for making informed financial decisions. Positive financial attitudes enhance well-being, while poor financial behavior can have adverse effects. In terms of financial attitude, Table 2 reveals significant associations with GPAX levels ($p < 0.001$), financial study experience (p=0.018), and income level (p=0.003). Students with GPAX level 3 (3.00-3.24) demonstrated the most positive financial attitude ($\bar{x}$=3.617), while those with financial study background showed higher attitude scores ($\bar{x}$=3.295) than those without ($\bar{x}$=3.280). Notably, students in the highest income group reported the strongest financial attitude ($\bar{x}$=3.494), indicating a link between financial stability and long-term financial thinking. Additionally, students with positive financial attitudes are more likely to engage in desirable financial behaviors, e.g., saving, budgeting, and prudent spending. In contrast, negative financial attitudes can lead to poor financial behaviors, e.g., overspending and inadequate saving.

3.4. Thematic analysis

To complement the quantitative findings, a thematic analysis was conducted to explore students' perceptions and lived experiences related to financial literacy. Guided by five open-ended questions, the analysis aimed to uncover deeper insights into students' financial knowledge, behavioral patterns, and attitudinal orientations. Thus, 10 university students were further interviewed by Q1-Q5 and their overall perspective on financial literacy is illustrated.

3.4.1. Understanding financial literacy

For Q1, students uniformly defined financial literacy as the capacity to manage resources judiciously. They stressed its everyday utility, encompassing budgeting, disciplined saving, and avoiding unnecessary debt, to distinguish needs from wants, exemplified by the remark, "*financial literacy means knowing how to prioritize and track expenses to avoid overspending*." Students also portrayed it as protection against inflation, fraud, and call center scams, situating financial education as a route to long term security and autonomy. Many reported greater confidences in planning and sharper engagement with macroeconomic issues; one noted, "*it helps me plan better and understand the bigger economic picture*." Overall, the findings cast financial literacy not merely as a technical skill set but as a critical life competence shaping personal decisions and heightening awareness of the economic forces likely to affect students' futures.

3.4.2. Financial attitudes and peer influence

In response to Q2 (financial attitudes shaping daily decisions), most students reported cautious or moderate approaches to both spending and saving. Peer influence emerged as a consistent moderating factor, often disrupting adherence to financial plans; one respondent noted, "*if my friends go out, I feel pressured to join, even if I didn't plan to spend*," highlighting the social dimension of financial self-regulation. Despite this, many expressed strong commitment to long-term financial goals, particularly in investment behavior. These students viewed investing as a gradual, goal-driven process, prompting scrutiny of discretionary spending to sustain regular contributions. Students show basic risk-management awareness through cost-conscious spending and interest in diversification. Although peer influence affects short-term discipline, their financial attitudes remain generally prudent and oriented toward long-term planning.

3.4.3. Financial behavior and lifestyle influences

Q3 responses revealed perceptions of how spending, saving, and budgeting relate to broader financial behavior. Many students identified as cautious spenders, emphasizing frugality and structured planning. One noted that consistent saving and budgeting "mirror a methodical disposition" shaped by financial-literacy education, supporting reflective goal-setting. Others admitted to occasional discretionary spending, particularly in social settings, but described offsetting such expenses through budgetary adjustments. Lifestyle emerged as a key influence on financial behavior, with daily routines, peer interactions, and digital media shaping consumption habits. As one student stated, "*lifestyle plays a crucial role in determining financial habits because it represents our daily way of living*." Students viewed budgeting and expense tracking as vital self-regulatory strategies, reflecting both personal dispositions and broader socio-cultural influences.

3.4.4. Financial challenges and coping strategies

Analysis of Q4 responses revealed four recurring financial stressors: limited monthly income, high living costs, peer-driven spending, and inadequate early financial planning. Students reported that essential expenses, dormitory fees, and unexpected costs often strained their budgets. In response, students employed adaptive strategies. One used a mobile banking app to track and categorize spending, distinguishing needs from wants. Another maintained a monthly income-expense ledger to monitor habits and preempt budget overruns. A third prioritized financial resilience by building an emergency fund equivalent to six months of essential costs, held in an e-savings account for liquidity. Collectively, these accounts show that despite constrained resources, basic tools, e.g., budgeting apps, expenditure logs, and planned savings enhanced students' financial self-regulation and reduced stress during their studies.

3.4.5. Financial planning and post-graduation expectations

Answering Q5, students approaching financial independence adopt a structured, multi-phase financial strategy. First, those with government-subsidized loans prioritize accelerated repayment alongside modest, tax-advantaged retirement contributions. Second, nearly all emphasize risk mitigation by rapidly establishing emergency funds (covering 3-6 months of expenses) and securing comprehensive health and income protection insurance, citing uninsured shocks as primary long-term threats. Third, respondents consistently advocate early, diversified investing through regular contributions to retirement accounts or broad-based portfolios, guided by personal risk tolerance and the principle of compound interest. Peer dialogue shows strong interest in formal financial education, with students prioritizing debt reduction, emergency preparedness, and disciplined investment as key components of early-career financial planning.

3.5. Content analysis

The content analysis integrated quantitative and qualitative evidence to examine determinants of financial literacy among Thai undergraduates, focusing on how academic, demographic, and socioeconomic factors shape knowledge, behavior, and attitudes. Guided by the OECD/INFE framework, responses from 618 survey participants and ten interviewees were organized across the three literacy dimensions. Quantitatively, GPAX, field of study, income source, and prior financial education emerged as significant predictors. Higher-GPAX students showed stronger knowledge and more disciplined financial behavior, while financial coursework improved awareness of budgeting and saving. Health-science students achieved the highest literacy levels, followed by those in business and engineering; social-science students scored lower, particularly in compound interest, long-term planning, and risk diversification. Financial independence also mattered, with students earning supplemental income demonstrating greater discipline than those relying solely on parental support. Qualitative findings enriched these patterns by illustrating how students interpret and enact financial literacy in everyday contexts. Interviewees viewed financial literacy as both cognitive and behavioral, shaped by household expectations, peer influence, and personal routines. Many acknowledged that parental financial support limited autonomy but provided a safe space to practice basic money management. Persistent challenges included lifestyle-driven spending, peer pressure, limited responsibility over financial decisions, and inconsistent saving habits. Despite possessing conceptual financial knowledge, students struggle with consistent application, revealing a significant gap between theory and execution. These findings emphasize the necessity for experiential learning, digital behavior-tracking, and reflective pedagogy to bridge this gap and foster long-term financial competence.

3.6. Interpretative phenomenological analysis

The IPA explored how Thai undergraduates make sense of their financial experiences, emphasizing subjective meaning-making rather than broad generalization. Drawing on 10 semi-structured interviews, financial literacy emerged as a relational and evolving construct shaped by autonomy, security, and continued familial dependence. Students frequently described financial management as "*controlling money before it controls you*," reflecting tension between the desire for independence and reliance on parental allowances that define their financial reality. A central theme of aspiration versus constraint emerged, as students' budgeting and saving efforts were curtailed by restricted income, parental dependence, and pervasive social or lifestyle pressures. Parental provision functioned both as a stabilizing resource and a constraint on developing full financial autonomy. Peer expectations and lifestyle conformity often weakened financial discipline, whereas reflective practices, e.g., expense tracking through mobile applications or journals were adopted as compensatory strategies. Such behaviors reflect experiential learning, enabling students to reinterpret financial responsibility through lived experience. Financial attitudes encompassed emotional and moral dimensions, where gratitude and perceived obligations shaped responsible spending, while overspending triggered guilt and successful saving fostered pride and competence. Anticipation of post-graduation independence produced both anxiety and motivation, prompting students to articulate plans for debt repayment, emergency funding, and future investment.

4. DISCUSSION AND EDUCATIONAL GUIDELINE

Thai university students demonstrate a notable gap between financial knowledge and its application. Academically proficient students often fail to translate conceptual understanding into practical planning [24], [25], while financially stressed students prioritize immediate consumption over saving due to high living costs and limited financial familiarity [9], [12], [26], [27]. The insights into financial competency, key financial challenges and educational guideline are discussed.

4.1. Financial competency

Financial competency encompasses an interplay of knowledge, behaviors, and attitudes that collectively enable individuals to make sound financial decisions. In Thailand, surveys conducted in 2020 and 2022 document a steady rise in proficiency, from 67.4% to 71.4% of the population achieving baseline competency, surpassing OECD benchmarks [12], [13]. Nevertheless, these aggregate improvements mask persistent deficiencies in translating conceptual understanding into everyday practice.

4.1.1. Knowledge acquisition and retention

Empirical evidence confirms that academic performance correlates with financial knowledge: students with higher grade point average (GPAs) score better on literacy assessments and exhibit fewer risky behaviors [24], [25]. Structured financial education programs yield measurable gains, e.g., accounting students receiving targeted instruction saw an 11% improvement in knowledge scores [28]. Moreover, long-term interventions in other contexts, e.g., Peru, demonstrate downstream benefits, with students reducing loan arrears by translating classroom insights into prudent borrowing choices [29]. Despite these successes, knowledge retention remains fragile: without continual reinforcement, conceptual gains erode, and students revert to sub-optimal defaults (e.g., low-yield savings accounts).

4.1.2. Behavioral execution

Possessing knowledge does not guarantee disciplined action. Our findings and supporting literature reveal that many students rely on basic savings mechanisms, typically offering minimal returns-thus prolonging the accumulation of retirement funds and diminishing motivation to save [9], [27], [30]. Behavioral economics research underscores the importance of defaults: automatic transfers into earmarked sub-accounts significantly outpace information alone in boosting savings rates and overcoming present bias [31]. Habit-formation models further suggest that incremental, repeated micro-deposits create feedback loops that reinforce saving routines [32]. Nevertheless, the paucity of effective components (e.g., peer support, gamified challenges, personalized nudges) weakens these mechanisms, preventing knowledge from crystallizing into habitual behavior.

4.1.3. Attitudinal orientation

Attitudes toward saving and spending are shaped by psychological traits and social norms. For instance, Machiavellianism (MACH) correlates positively with a saving mindset, whereas psychopathy (PSY) associates with impulsive spending [30]. Gender differences also emerge: female students typically exhibit stronger saving attitudes, while males often demonstrate higher spending propensities [3], [33]. Regardless of these predispositions, the absence of well-defined financial goals often undermines attitudinal shifts. Goal-setting theory posits that specific, time-bound objectives enhance self-monitoring and persistence, while imagining one's future self can motivate delayed gratification [34]. Without structured guidance to articulate specific, measurable, achievable, relevant, time-bound (SMART) goals, students' abstract attitudinal improvements fail to resonate in daily choices, whereas a proactive, risk-informed mindset is essential for aligning investment strategies with long-term financial resilience.

4.2. Key financial challenges

Beyond competency gaps, students confront intertwined financial challenges that impede both academic success and long-term wellbeing's. Four predominant obstacles were identified; each linked to structural, psychological, and contextual factors warranting targeted attention.

4.2.1. Limited long-term goal-setting

A predominately short-term, consumption-oriented horizon prevails among undergraduates. Over 50% report significant financial stress, and up to 96% experience heightened emotional strain, most acutely among low socio-economic or international students managing tuition payments and precarious employment prospects [6], [12], [26]. Lacking clear, personal long-term financial objectives correlates with greater reliance on high-interest credit lines, diminished academic persistence, and reduced life satisfaction [28]. Goal-setting frameworks advocate coupling SMART worksheets with autonomy-supportive coaching to satisfy core

psychological needs (competence, relatedness, and autonomy) and convert abstract intentions into actionable plans [35]. Behavioral nudges, such as designating sub-accounts for specific goals (e.g., emergency fund or postgraduate tuition), help circumvent present bias by making the future self-more salient [31].

4.2.2. Weak savings discipline

Persistent difficulties in covering daily living and fieldwork expenses erode the capacity to save consistently [7]–[9]. High levels of student debt exacerbate anxiety and undermine precautionary reserves [36], [37]. Although information-based workshops raise awareness of compound interest and diversified investment options, these cognitive gains rarely alter entrenched habits. Interventions that incorporate mechanisms, e.g., peer savings circles and automated micro-saving schemes are demonstrably more effective at establishing consistent saving habits [32], [35]. The "save-before-spend" maxim exemplifies self-control theory: earmarking funds at income receipt leverages mental-accounting heuristics to preempt impulsive consumption [35], [38]. Habit-formation research further reveals that small, regular deposits foster mastery and positive reinforcement, gradually solidifying saving behavior [32]. In Thai and Indonesian contexts, disciplined saving, rather than raw knowledge, predicts reduced debt anxiety and higher life satisfaction, underscoring the need to prioritize behavioral scaffolds over content alone [37].

4.2.3. Inadequate decision-making skills

Navigating complex financial landscapes requires more than textbook definitions; it demands procedural knowledge and evaluative frameworks. Many students encounter hurdles in fee payment processes, remain unaware of alternative financing instruments, and neglect comparative analysis of financial products [13], [39]. These deficits are compounded by present bias including the tendency to overvalue immediate gratification and overconfidence in one's financial acumen [31]. Interactive, digital decision aids (e.g., total repayment calculators, opportunity-cost visualizations) have been shown to mitigate such shortcomings, yet their adoption is limited by low digital literacy and lack of integration into curricula [29], [31], [33]. Without systematic training in procedural and evaluative skills, students remain vulnerable to sub-optimal choices, leaving theoretical knowledge underutilized.

4.2.4. Cultural and social norm pressures

Cultural and social norms significantly influence Thai university students' financial behaviors. In a collectivist society like Thailand, students often prioritize group harmony and social acceptance over personal financial discipline [40]. This is reflected in peer-influenced spending, e.g., group outings, fashion purchases, and celebratory expenses, which are perceived as necessary to maintain social ties and avoid exclusion. The cultural concept of "Kreng Jai", a reluctance to inconvenience others, further reinforces overspending behaviors, as students may feel compelled to contribute to group expenses even when financially constrained. Qualitative findings from the study support this, with students expressing difficulty in resisting peer pressure for fear of appearing stingy or disconnected. Family expectations also shape financial choices [10]. Some students feel pressure to display a lifestyle matching family status, while others conceal financial difficulties to avoid burdening parents. Effective financial education must address these socio-cultural dynamics by supporting assertive budgeting and culturally sensitive financial decision-making [41].

4.3. Educational guidelines for enhancing financial literacy

To establish a robust foundation for the proposed educational guidelines, this study frames financial literacy as a multidimensional construct for fostering a positive financial mindset. Higher financial literacy scores are associated with more favorable financial attitudes and behaviors [42], [43]. Bridging the gap between financial knowledge and action requires a holistic, multi-pronged pedagogical approach. Figure 3 illustrates an integrated fishbone framework that synthesizes interview insights and thematic analysis with OECD-aligned literacy components. Integrating sustainable development goals (SDGs), digital interventions, and interdisciplinary learning, the model's three core curriculum strategies leverage personal, socio-cultural, and pedagogical factors.

4.3.1. Embedding practical financial education

To cultivate enduring financial habits, instruction must transcend theoretical exposition and incorporate authentic, task-based learning [40]. Interweaving conceptual content with hands-on activities, these modules foster both understanding and habitual execution, ensuring that students can apply lessons in real-time contexts. Core curricular components should include:

- Conceptual foundations: students analyze inflation dynamics, risk-return trade-offs, and the time value of money through interactive lectures and problem-solving exercises. Embedding real-world case studies (e.g., evaluating mortgage amortization schedules) reinforces relevance. Linking these concepts to

everyday scenarios, e.g., evaluating mobile phone installment plans, comparing subscription services, or estimating the true cost of student loans makes the content relatable and immediately useful.

- Budgeting and goal-setting exercises: learners construct personal budgets differentiating discretionary from non-discretionary expenditures, set automated savings targets (e.g., allocate 10% of income to emergency funds), and employ SMART planning worksheets to delineate short- and long-term objectives. Practical tasks may include tracking daily expenses via mobile budgeting apps, planning monthly grocery allocations, or setting savings goals for lifestyle purchases such as travel or electronics.
- Product evaluation simulations: through role-playing scenarios (e.g., selecting between mutual funds, government bonds, or fixed deposits), students calculate effective annual interest rates, total repayment costs, and opportunity costs, thereby honing comparative decision-making skills. Everyday extensions could involve comparing credit card offers, evaluating "buy now, pay later" schemes, or analyzing warranty and maintenance packages before purchasing appliances.
- Peer-led challenges: simulated stock-market games and "campus budgeting" competitions encourage collaboration, spark friendly competition, and provide immediate feedback on financial decisions [24], [38]. These can be expanded to include real-world themed challenges, e.g., planning a low-cost social event, designing a weekly meal plan within a fixed budget, or competing to find the most cost-effective transportation options in the local area.

Figure 3. Fishbone diagram illustrating the key determinants to improved financial literacy

4.3.2. Integrating financial literacy across curricula

Diffusing financial literacy across disciplines allows institutions to utilize existing courses, minimize curricular burden, and emphasize the universal value of financial decision-making. Table 4 outlines guidelines for designing curricula and learning platforms tailored to gender, academic year, GPAX, and income factors, using context-relevant examples, adaptive pathways, and self-directed modules to enhance engagement and learning effectiveness. Rather than isolating finance as a standalone topic, embedding personal-finance competencies within existing disciplinary frameworks offers multiple benefits:

- Interdisciplinary synergy: incorporate financial-decision scenarios into courses such as engineering ethics (evaluating cost vs. safety trade-offs), public-health economics (budgeting for community health interventions), and environmental science (assessing the economic viability of sustainable technologies) [12]–[14]. This integration aligns with SDG 4 (quality education) and reinforces relevance across domains.
- Low-stakes "money moments": introduce brief, daily prompts such as recording the previous day's discretionary spending or reflecting on a recent purchase to cultivate mindful financial awareness. Repetition of these micro-reflections embeds reflective practice into students' routines.
- Collaborative content development: foster inter-faculty working groups to develop shared financial wellness language and reduce redundancy. Such collaboration enhances scalability and ensures consistency in messaging [19]. Integrating evidence linking literacy to financial well-being with data on specific student determinants, institutions can co-create adaptive curricula that translate academic performance into sustainable, real-world financial resilience [5], [12].
- Real-world applications and appropriateness: to enhance engagement and practical understanding, real-life relevance in financial literacy should be embedded into curricula. When content reflects students' daily experiences, e.g., budgeting, saving, or managing debt, it becomes more impactful.

Individual factors act as diagnostic inputs to customize the curriculum. High GPAX and specific fields of study dictate the complexity of modules, ensuring students receive appropriate cognitive challenges. Income levels and sources provide the context for relatable financial scenarios, moving beyond abstract theory. By integrating these determinants, the adaptive learning design evolves from a static syllabus into a dynamic pathway, providing targeted scaffolding for complex topics, e.g., compound interest to bridge the gap between academic background and professional financial readiness.

Table 4. Seven key factors informing curriculum and learning platform customization to improve financial literacy education for Thai undergraduate students

Determinant	Curriculum customization	Learning platform customization
Gender	Use gender-relevant cases (e.g., savings goals, risk preferences, peer influence); highlight diverse role models and career/finance trajectories; include wage-negotiation, pay-gap literacy, and financial autonomy modules; integrate content on safety nets, caregiving finances, and inclusive imagery	Adaptive tip streams with message framing tuned by user preferences; avatar/persona options (pronouns, identity settings); community spaces with strong moderation and opt-in anonymity; privacy controls for sensitive topics and contextual micro-nudges
Year	Years 1-2: goal-setting, budgeting, banking, simple interest/credit basics; Years 3-4: loans, taxes, insurance, investing, retirement/benefits, contracts; capstone projects (e.g., first-job financial plan) and internship-linked tasks	Progression maps and milestone checklists; graduation planner (tax/benefit onboarding, re location budgets); calendar-linked reminders; micro-credentials/badges; push notifications for key deadlines
GPAX levels	Lower GPAX: scaffolded practice, mastery learning, decision heuristics, metacognitive checklists; Higher GPAX: case studies, simulations, portfolio/risk modeling, optional honors track; differentiated assessment pathways	Diagnostic pretests to set starting level; spaced repetition for fundamentals, adaptive feedback and hints; "challenge mode" for advanced learners; learner-controlled pacing with progress analytics
Field of study	Discipline-specific threads; Health Sciences: shift-based income and licensing costs; Engineering and Tech.: cost-benefit analysis and risk assessment; Arts and Social Sciences: economy considerations and ethics of debt; Business Admin.: portfolio theory and valuation	Major-tagged learning paths and case libraries; dataset/APIs relevant to each discipline; interactive sandboxes (budget/invest simulators); domain glossaries; cross-major peer discussion and peer review
Financial study	No prior exposure: FL101, numeracy for money, compound interest, practical budgeting; Prior background: electives in investing, taxation, housing/loans, retirement; project-based learning and peer-teaching opportunities	Placement tests to route learners; fast-track/ skip options and targeted refreshers; unlock advanced labs/ simulations; just-in-time help (tooltips, explainers); transparent, explainable recommendations
Income source	Job-based: payroll, tax withholding, benefits, emergency funds; Parent/scholarship: allowance management, needs vs. wants, compliance/reporting; Side-hustle/entrepreneurship: invoicing, irregular income smoothing, basic accounting	Templates per income stream (paycheck analyzer, allowance scheduler); invoicing generator; irregular-income cash-flow visualizer; simple tax estimation widgets and savings-rate calculators
Income level	Low income: benefit navigation, fee minimization, food/housing resources, micro-savings; Middle: debt management, credit building, emergency fund scaling; High: diversification, risk tolerance, long-term planning, philanthropy basics	Budget presets by bracket; goal dashboards with progress bars; behavioral nudges (over spend alerts, save-more prompts); risk-profiling quiz for scenario calculators and auto-calibrated targets

4.3.3. Leveraging digital and behavioral tools

Digital tools are increasingly vital for financial literacy education due to their accessibility, interactivity, and scalability. They enable personalized learning, real-time feedback, and gamified experiences that enhance engagement and retention. With students' high digital engagement, tools like mobile apps, simulators, and e-learning platforms bridge knowledge gaps effectively, making complex financial concepts more relatable, timely, and actionable in everyday contexts [44], [45].

- Massive open online courses (MOOCs) and e-learning: leading the charge in providing localized and relevant financial education is the Stock Exchange of Thailand (SET) through its comprehensive SET e-learning platform [44], [46]. Providing free Thai-language courses, the platform covers financial planning, investment in stocks, bonds, and mutual funds, alongside specialized topics, e.g., tax planning and derivatives. Additional resources include Thai-MOOC, SkillLane, Start to Invest, Finnomena, and the SET App, which offers mobile access to market updates and financial insights.
- Short-form educational media: produce concise videos (2-3 minutes) illustrating cognitive biases such as present bias or overconfidence and corresponding pre-commitment strategies (e.g., automated savings). Dissemination through widely used channels (Facebook, YouTube, Line, TikTok, and Instagram) ensures accessibility and repeat exposure [31].
- Gamified mobile applications: develop smartphone apps that award points or symbolic badges for meeting weekly saving or debt-repayment targets. Gamification increases motivation and social comparison to sustain engagement, while real-time feedback fosters accountability. Examples of mobile games for improving financial skills include Cashflow, Financial Football, Money City, Savings Spree, and Bankaroo.
- Personalized push notifications: implement push messages that summarize month-to-date spending relative to predefined thresholds, remind users of upcoming savings transfers, or alert them to potential overspending. Such behavioral nudges support habit formation and encourage timely course correction. Applications such as Money Manager, Spendee, and Toshl Finance complement this approach by offering real-time digital budgeting, expense tracking, and personalized financial alerts.
- Interactive decision aids: deploy web-based calculators and simulators (e.g., "Click2Win" for low-risk stock-market exploration) to deepen understanding of investment mechanics, risk management, and long-term planning. When embedded within learning management systems, these tools provide seamless integration into coursework [29], [33]. Tools such as Jitta, Morningstar and Finnomena also provide market analytics and investment simulators for more advanced learners.

4.4. Limitation and future study

While this study exceeded the minimum required sample size of 379, ensuring robust statistical power, certain limitations must be acknowledged. The use of convenience sampling at a single institution may limit the generalizability of these findings to the broader Thai undergraduate population, as institutional culture and regional demographics vary. Future research should employ nationwide stratified random sampling to enhance external validity. Furthermore, longitudinal studies tracking financial knowledge evolution throughout academic careers would provide deeper insights into intervention effectiveness, extending beyond this cross-sectional snapshot. Given that the identified determinants, specifically GPAX and academic discipline, align with broader regional socioeconomic patterns, this adaptive learning framework serves as a scalable, evidence-based model applicable to other ASEAN universities seeking to standardize financial competencies. Leveraging personalized digital platforms to dynamically calibrate content complexity according to real-time student performance, institutions can implement adaptive interventions that effectively bridge the critical knowledge gaps identified in this study.

5. CONCLUSION

Financial literacy is an essential competency for university students as they progress toward financial independence. This study examined how academic performance, financial background, and disciplinary context relate to financial literacy among Thai undergraduates. Although students showed adequate financial knowledge, notable gaps in behavior and attitude persisted, underscoring the need for targeted support. GPAX was strongly associated with literacy, with higher-achieving students demonstrating better knowledge and more responsible financial behaviors. However, insufficient comprehension of compound interest continued to restrict students, diminishing their long-term saving potential. While financial education improved attitudes and behaviors, inconsistencies across academic levels indicated that knowledge alone does not ensure sound decision-making. Disciplinary differences were also evident, with Health-science students outperforming those in business, engineering, and social sciences. Persistent challenges included setting financial goals, maintaining savings discipline, and making informed comparisons. A multifaceted approach is therefore needed. Universities should embed financial literacy within curricula through experiential learning such as simulations, budgeting exercises, and case-based applications. Digital tools, including gamified platforms and mobile budgeting apps, can reinforce positive behaviors, particularly for Gen Z learners. Successful implementation also requires well-prepared educators, making financial literacy training an essential component of teacher development. Although this study

provides robust insights within a single institutional setting, future research should employ longitudinal designs across multiple universities to enhance generalizability and track the development of financial literacy trajectories. Financial concepts should be integrated across disciplines and tailor experiential learning to students' real-life contexts. Educators should promote reflection, support long-term financial goal-setting, and adapt instruction to diverse needs. These efforts can strengthen financial literacy, encourage sustainable behaviors, and enhance graduates' long-term financial resilience.

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AUTHOR CONTRIBUTIONS STATEMENT

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C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
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O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

ETHICAL APPROVAL

This study was conducted with ethical approval from Rangsit University (RSUERB2023-112) and in accordance with the American Association for Public Opinion Research (AAPOR) guidelines.

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author, [CN], upon reasonable request.

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