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Research on the Design Demand of Financial Education Board Games for Children in China

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Abstract

With the advancement of globalization and the heightened financial uncertainty brought on by the pandemic, the importance of financial literacy education for children has become increasingly evident. However, the current Framework for Financial Literacy Education Standards in China lacks cognitive alignment for children aged 7–12. To bridge this gap, this study presents a gamification-centered framework for children's financial education, delivered through a board game format. A four-phase methodology was employed: (1) semi-structured interviews with banking professionals were conducted to construct age-appropriate financial knowledge content and assessment tools; (2) guided by Bloom's taxonomy, a tiered knowledge framework incorporating gamification elements was designed to align with varying levels of cognitive complexity; (3) a prototype of the board game was subsequently developed; and (4) semantic analysis and semantic differential (SD) scales were applied to evaluate learning outcomes and design feasibility. The key innovation of this study lies in the systematic integration of cognitive taxonomy theory and semiotic metaphor design into the development process, addressing cognitive adaptation challenges in financial education and enhancing both knowledge transmission efficiency and learner motivation.

Keywords: school-aged children, financial literacy, board game design, gamified instruction

1. Introduction

With the increasing diversity and complexity of financial products, the importance of financial literacy has become more pronounced than ever. Under the active promotion of international organizations such as the Organization for Economic Co-operation and Development (OECD), the G20, and the World Bank, financial education for children has been recognized as a key strategy to enhance national financial capability in many countries. However, data from the Cognitive Survey on the Implementation of Financial Literacy Education in Primary and Secondary Schools suggest that financial literacy education for children in China remains underdeveloped (Hong, 2022). Specifically, three major issues persist:

First, at the conceptual level, there is a lack of shared understanding among students, parents, and teachers regarding the definition and scope of financial literacy. It is often narrowly interpreted as education about money or consumption, while neglecting the development of financial reasoning, value-based judgment, and long-term attitudes toward wealth.

Second, at the institutional and environmental levels, although stakeholders may differ in their emphasis on specific content, there is a general lack of attention to the broader educational ecosystem and policy framework necessary to support financial literacy. Many respondents believe that recent reforms in the educational environment have not significantly improved children's financial capabilities.

Third, at the implementation level, misperceptions among educational administrators have hindered effective integration. Financial literacy is often treated as an isolated subject rather than being embedded within the existing educational system. This lack of top-down planning has led to systemic fragmentation, such as misaligned curricula and instructional time, insufficient teacher training, and disjointed program execution.

In response to these challenges, gamified instruction has emerged as an innovative approach in recent

years. Among various formats, board games have gained attention for their low technological barriers, high interactivity, and strong contextual engagement, making them particularly suitable for helping young children understand abstract financial concepts. However, most existing financial board games for children lack a scientifically grounded knowledge structure and fail to address the specific cognitive and experiential needs of local learners. This results in a disconnect between the game content, children's developmental stages, and real-life scenarios.

To address this gap, the present study aims to design a financial literacy board game tailored to the cognitive characteristics of Chinese children. By employing gamification as a pedagogical strategy, the game seeks to enhance children's understanding of fundamental financial concepts. Grounded in Bloom’s taxonomy of educational objectives and Piaget’s theory of cognitive development, and informed by expert interviews and Kano model-based needs analysis, this study proposes an age-specific knowledge transformation framework and develops a validated, actionable design model. The outcomes aim to provide both theoretical and practical foundations for the future innovation and refinement of financial education products for children.

2. Literature Review

This section focuses on the theoretical foundations relevant to the three core research objectives of this study. For Research Objective 1—developing instructional content and validation tools—literature on financial literacy knowledge systems for children is reviewed. For Research Objective 2—constructing a design model—studies on gamified instructional design are summarized. For Research Objective 3—design and development of the game model—research on tabletop game design methods is analyzed and compared.

2.1 Research on Children’s Cognitive Development

2.1.1 Bloom’s Taxonomy of Educational Objectives

Bloom’s taxonomy provides a hierarchical classification of educational goals, typically divided into three domains: cognitive, affective, and psychomotor. The cognitive domain includes six categories: knowledge, comprehension, application, analysis, synthesis, and evaluation. With the exception of "application," each of these categories includes subcategories that range from concrete to abstract and from simple to complex, reflecting a cumulative and layered structure of learning. From an

instructional perspective, these categories represent increasingly demanding levels of student performance. Since its introduction, Bloom's taxonomy has been widely adopted across different countries as a guideline for setting educational objectives in various disciplines (Wu, 2018).

The age-related stages in children's understanding of financial concepts, as mentioned earlier, correspond closely with the cognitive levels outlined in Bloom's taxonomy. As a comprehensive competency, financial literacy must be cultivated through behavioral and instructional tools aligned with each level of the taxonomy. Lower levels such as "remember," "understand," and "apply" support the development of concrete knowledge and skills, while progression through all six levels facilitates the development of advanced competencies. Learners' attitudes toward knowledge and skills are gradually internalized throughout the learning process, as illustrated in Figure 1.

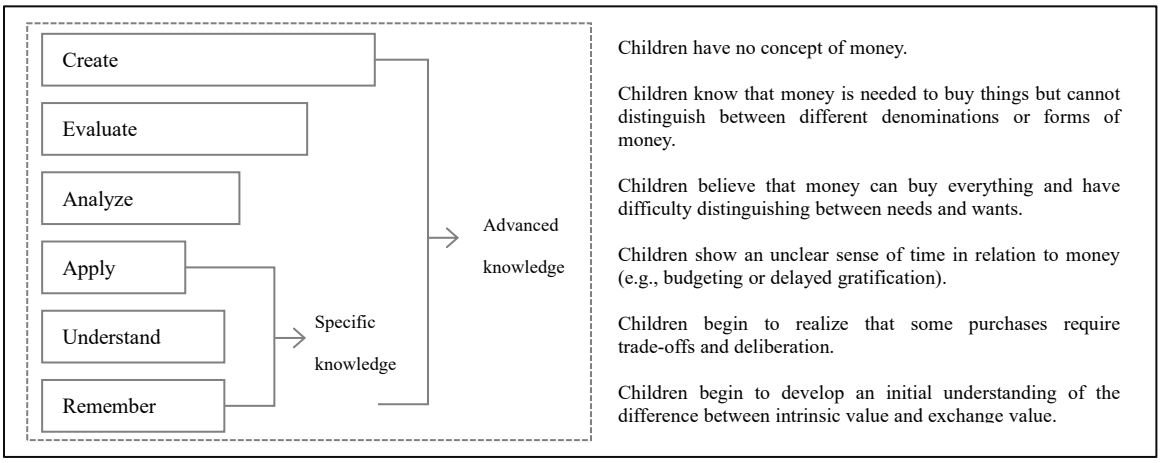

Figure 1. Illustration of the Relationship Between Bloom's Taxonomy and Levels of Financial Knowledge.

2.1.2 Piaget's Theory of Cognitive Development

Jean Piaget's four-stage theory of cognitive development identifies children aged 7–12 as being in the transitional phase between the "Concrete Operational" and "Formal Operational" stages. At this stage, children begin to develop abstract reasoning, rule comprehension, and causal inference, providing a cognitive foundation for understanding financial concepts and participating in rule-based games.

In the context of educational games, Piaget emphasized the alignment between types of play and stages of cognitive development. He identified three types of play that correspond to developmental stages: practice play, symbolic play, and games with rules (Wang, 2013). According to Piagetian

theory, play is primarily a process of assimilation over accommodation, in which children integrate external experiences into existing cognitive frameworks. The gaming process serves as a typical manifestation of this mechanism. Moreover, Piaget emphasized that children are emotionally and cognitively engaged during play, deriving both interest and affective satisfaction from the activity (Zhang, 2016).

Previous studies have applied Piaget's theory to age-appropriate educational game design across diverse domains. For instance, Wang (2012) proposed a Flash-based game model aligned with cognitive development stages, highlighting the integration of educational and entertainment value. Jiang (2019) optimized visual expression based on children's drawing characteristics, while Zhao (2018) explored the role of game-based mechanisms in emotional regulation and cognitive improvement in the context of music education.

In summary, Piaget's cognitive development theory not only offers a staged framework for designing educational games but also affirms the suitability of tabletop games for children aged 7–12. These games align well with children's abilities in rule comprehension, contextual simulation, and hands-on engagement, forming a key theoretical foundation for the design framework proposed in this study.

2.2 Framework and Process of Board Game Design

In recent years, board games have been increasingly validated as effective learning tools by numerous studies (Chiarello, 2016). Unique features of board games—such as turn-taking mechanics and face-to-face group interaction—have been shown to promote reflection and peer discussion. Compared to digital games in gamified instruction, board games resemble instructional materials in both form and function, offering a more inherently educational character.

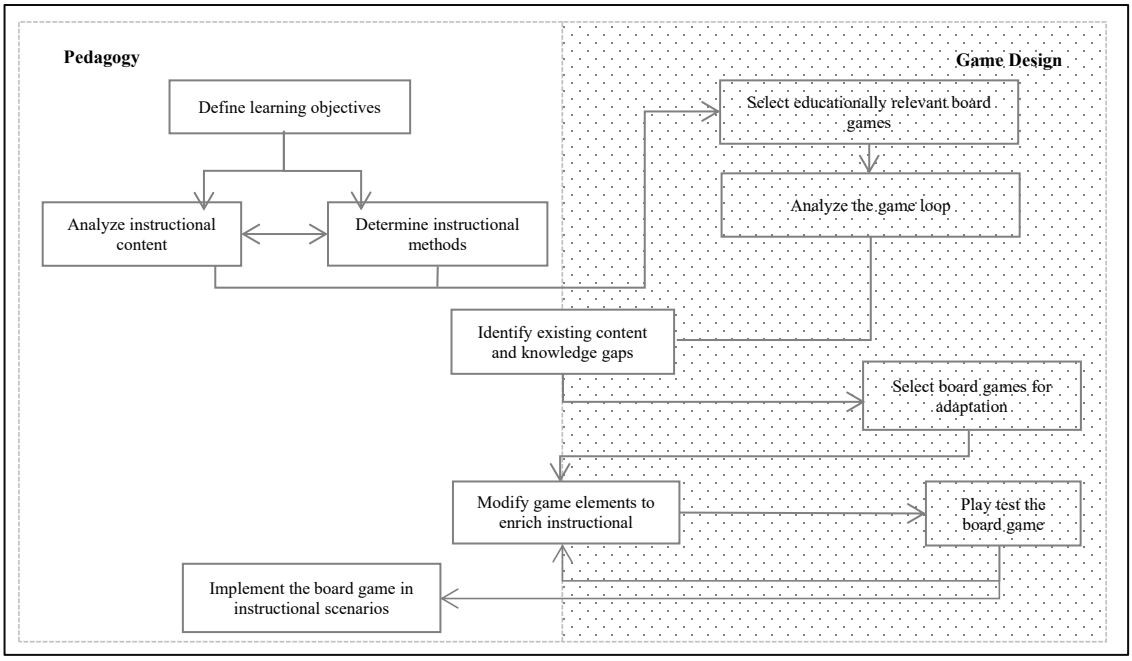

Figure 2. Process of modifying commercial board games for instructional use.

Source: Compiled from publicly available online materials.

Among existing board game design frameworks, one of the most widely adopted and foundational models is the Mechanics–Dynamics–Aesthetics (MDA) framework. Within this framework, mechanics refer to the underlying rules and systems that govern the game; dynamics describe the interactive behavior between players and the game system—typically represented by cards, tokens, maps, dice, and other components; and aesthetics denote the emotional responses and experiential feedback generated in players through gameplay (Zhang, 2022).

Take the classic board game Monopoly as an example: players roll dice, move across the board, and acquire assets through trading in order to win. During the game, some players may accumulate assets rapidly due to good luck, triggering a positive feedback loop that enhances their strategic advantage and game satisfaction. Conversely, other players may suffer repeated penalties or rent payments due to poor luck, eventually going bankrupt, thereby experiencing a negative feedback loop. These contrasting emotional outcomes are core to the aesthetic dimension of board games and play a central role in player engagement.

From a design perspective, game designers exert direct control over mechanics and gameplay. These mechanics generate specific dynamic behaviors, which in turn shape player experiences. Therefore, considering the emotional feedback from both the designer's and the player's perspectives is crucial

during the design and development of board games (Hunicke et al., 2004).

For educational board games adapted from classic commercial games, Abbott (2019) proposed a structured design process based on the Learning Mechanics–Game Mechanics (LM-GM) model. As illustrated in Figure 2, the early and implementation phases of the design primarily emphasize educational considerations, whereas the middle and later stages focus on game design principles as well as the integration of pedagogical and game-based elements.

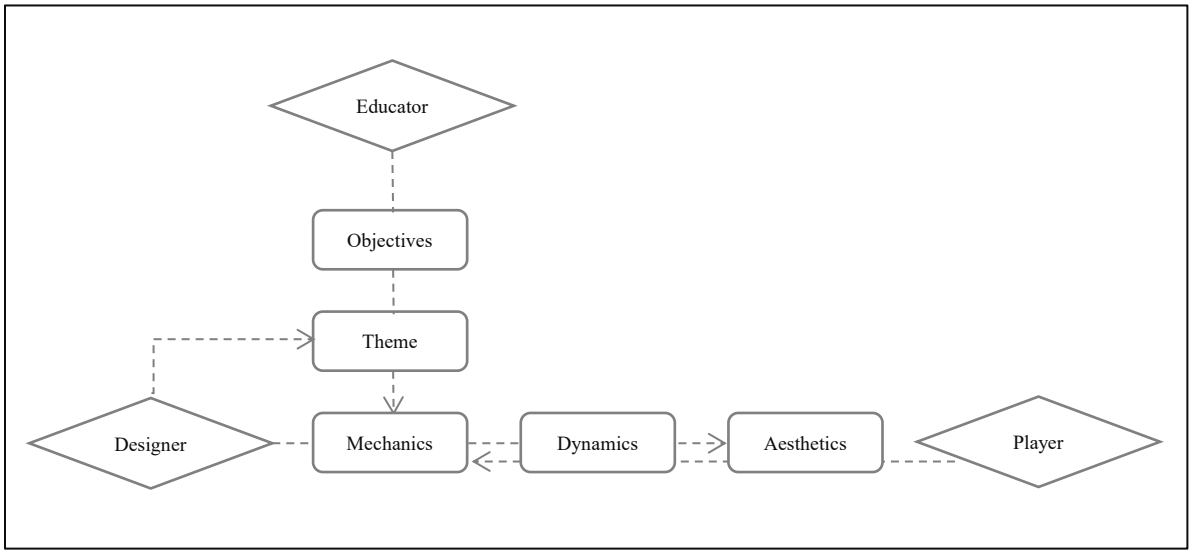

Figure 3. The OTMDA Framework for Educational Board Game Design.

Source: Compiled from publicly available online materials.

While the MDA framework (Mechanics–Dynamics–Aesthetics) is widely applicable in the design of classic entertainment-oriented board games, its original structure primarily addresses two stakeholders: designers and players. To address the additional complexity introduced by educational objectives, Zhang et al. (2022) proposed an extended framework known as OTMDA (Objectives–Theme–Mechanics–Dynamics–Aesthetics), specifically tailored for the design of educational board games (see Figure 3).

In educational contexts, the pedagogical nature of board games introduces a third critical stakeholder: the educator. Even in cases where the designer and educator are the same individual, their cognitive approaches often differ. Game designers typically aim to maximize enjoyment, challenge, and victory for players. In contrast, educators prioritize the development of learners' competencies and conceptual understanding during gameplay (Hunicke et al., 2004). The OTMDA framework thus emphasizes the alignment between instructional goals, game themes, and the emotional experiences

evoked during learning-based play, offering a more pedagogically sound structure for serious game design.

3. Methodology

3.1 Extraction of Financial Literacy Content for Children

To address Research Objective 1—the development of instructional content and assessment instruments—this study employed expert interviews as the primary research method. Compared to surveys, interviews provide more detailed and context-rich information, and allow researchers to probe for deeper insights and adjust participant selection based on relevance and expertise.

As identified in the literature review, current educational board games in the domain of financial literacy often lack a well-defined knowledge transformation phase. To fill this gap, this study began by conducting a preliminary extraction of financial concepts based on the Framework for Financial Literacy Education Standards in China, targeting age-appropriate content for the primary participant group of this study (see Table 1).

Subsequently, semi-structured interviews were conducted with professionals from both the education and banking sectors. The purpose of these interviews was to validate the relevance, appropriateness, and completeness of the extracted financial literacy concepts, ensuring alignment with both pedagogical needs and domain expertise.

Table 1. "Extracted Financial Knowledge Based on the 'Framework for Financial Literacy Education Standards in China'"

Financial Knowledge	Educational Objectives
Income and Consumption: Personal Income	
Identify and name familiar types of labor or occupations.	Understand the relationship between labor and personal income
Understand the general job responsibilities and income disparities across various occupations.	Recognize the differences in labor effort and earnings across various occupation.
Develop a correct understanding of earned income and be able to cite counterexamples involving illegal income.	Acquire lawful income through honest labor.
Income and Consumption: Personal Spending	
Identify different types of goods and estimate their approximate value.	understand basic classifications of goods.

Understand various modern payment methodsUnderstand the various payment methods used in modern society.	Recognize multiple forms of payment.
Prioritize personal needs based on urgency and reasonableness.	understand key factors in rational consumption.
Develop a personal financial allocation plan based on the prioritization of individual needs.	Formulate a reasonable financial budget according to the urgency of different needs.
Understand how government investment in public goods affects individual quality of life.	Understand the structure of government revenue and expenditure.
Understand the role of taxation in society and identify public goods related to individual daily life.	Understand the relationship between taxation and personal income.
Interpret tax information on receipts and develop a lawful	Responsible tax-paying mindset.
Saving and Investment: Currency and Exchange Rates	
Recognize the currencies and exchange rates of different countries.	Currency Awareness
Understand the basic concepts of interest and interest rates.	Concepts related to interest and interest rates.
Perform basic currency conversions and simple interest calculations.	Perform simple interest calculations.
Saving and Investment: Saving and Credit	
Understand different types of savings offered by banks.	Basic banking operations.
Recognize the fundamental terms and documentation required for borrowing.	Conditions for borrowing.
Develop a simple savings plan for a specific financial goal.	Planning a basic savings scheme.
Understand the importance of credit and the consequences of poor credit history.	Importance of credit.
Saving and Investment: Investment and Returns	
Classify items that can be considered as investment assets.	Investment targets.
Evaluate and compare the investment value and risk of different financial products.	Assessment of investment value and risk
Understand differences in appreciation potential across assets and formulate a corresponding investment plan.	Understanding asset appreciation potential and investment planning.

Source: Compiled and illustrated by the author.

To further validate the selected body of financial knowledge for children, expert interviews were conducted. A semi-structured interview approach was adopted, primarily because the researcher does not have a formal background in education or finance. Given that educational games emphasize the balance between instructional content and playability—as well as the pathways for knowledge

gamification—this method allowed interviewees' professional insights to supplement theoretical gaps in the design process. It also provided a foundational understanding from the perspectives of education and knowledge transformation, crucial for the development of an educational board game.

Interviewees included professionals from both the financial industry and the field of childhood education. The first round of interviews targeted banking practitioners to clarify the structure and content of financial knowledge. The second round involved elementary school teachers, focusing on strategies and conceptual models for effectively transforming financial knowledge into educational content suitable for children. Their input served as a reference for designing gamified instructional methods.

After outlining the key interview topics and objectives, space was intentionally left for interviewees to contribute additional insights and relevant content. The resulting data were thematically coded and synthesized to create a draft financial knowledge framework and a corresponding assessment tool for evaluating learning effectiveness.

Interview dates, locations, and durations (ranging from 30 to 45 minutes) were mutually agreed upon. Interviews were conducted either face-to-face or via online platforms. Transcriptions and summaries of the interviews were subsequently analyzed to inform the construction of the knowledge structure used in the next stage of the study.

3.2 Transformation of Children's Financial Knowledge

To address Research Objective 2—the establishment of a design model—this study adopts Bloom's Taxonomy of Educational Objectives as its theoretical foundation. In Bloom's cognitive domain, six hierarchical levels of learning are defined: Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation. These levels are arranged from simple to complex and from concrete to abstract, emphasizing the cumulative and progressive nature of learning (Wu Shufang, 2018).

This study applies Bloom's taxonomy to classify both the key knowledge points found in existing financial literacy education frameworks and the categories of financial knowledge identified through

expert interviews. The classification is guided by three core principles:

Hierarchical Progression: Learning objectives are sequenced from lower to higher levels of cognitive complexity. For example, learners must first “remember” facts before they can “analyze” or “create” new ideas.

Operationalizability: Each level is associated with specific action verbs such as “list,” “explain,” or “design,” which facilitate the development of observable and assessable learning activities for educators.

Universality: The taxonomy is applicable across disciplines and age groups, focusing on the development of thinking skills rather than rote knowledge transmission.

In addition, the classification of financial knowledge was informed by children's cognitive developmental characteristics and relevant guidelines in financial education. A detailed framework of age-appropriate financial knowledge was developed (see Table 2) to support the subsequent design and structuring of the game model. This ensures both appropriate difficulty levels and logical coherence in the knowledge structure.

Table 2. Hierarchical Classification of Financial Literacy Concepts Based on Bloom’s Taxonomy

Domain	Hierarchical Classification		Knowledge Item	Learning Objective
Cognitive Domain Hierarchy	Progression from Lower to Higher Levels	Remembering	Basic concepts of currency, definition of interest rate, and terminology of saving and investment.	Students are able to identify types of currency, recite the formula for interest rate calculation, and list common investment instruments.
		Understanding	The relationship between consumption and saving, the principle of compound interest, and the balance between risk and return.	Students are able to distinguish between "needs" and "wants," and explain the effect of compound interest in their own words.
		Applying	Interest rate calculation, budget planning, and basic investment decision-making.	Students are able to calculate deposit interest and formulate a weekly allowance spending plan.

		Analyzing	Breakdown of investment risks, factors influencing consumer behavior, and causal relationships in economic phenomena.	Students are able to analyze the risk structure of various investment products and compare actual discounts in promotional activities.
		Evaluating	Rationality of financial decision-making and criteria for evaluating the authenticity of financial information.	Students are able to assess the security of financial transactions and evaluate the credibility of financial advertisements.
		Creating	Financial instrument innovation and long-term financial planning strategies.	Students are able to design a basic household emergency savings plan and propose anti-fraud awareness strategies for school campuses.
Affective Domain Hierarchy	Progression from Lower to Higher Levels	Receiving	The necessity of financial security; social responsibility associated with wealth.	Students demonstrate concern for anti-fraud cases and manage pocket money responsibly.
		Response	Participation in financial practice activities; articulation of consumer perspectives.	Students have experience in simulated shopping games and can share savings practices.
		Value Appraisal	The importance of honest transactions; the concept of green consumption.	Students recognize the value of sustainable consumption and support charitable donations.
		Construction of Value Concepts	The relationship between wealth and well-being; balancing individual and societal interests.	Students integrate savings habits with a sense of family responsibility to form sustainable consumption views.
		Formation of Value Systems	Long-term financial self-discipline; ethical considerations in financial decision-making.	Students consciously resist impulsive spending and reinforce awareness of financial security in daily life.
Psycho-motor Domain	Progression from Lower to Higher Levels	Perception	Identifying security features of currency; navigating electronic payment interfaces.	Students can distinguish tactile features (e.g., raised intaglio printing) on banknotes and recognize icons/functions in digital payment apps.
		Guided Response	Simulating deposit and withdrawal procedures at a bank; completing a simple financial ledger.	Under guided instruction, students can complete virtual deposit transactions and develop the habit of recording daily expenses.

Mechanism	Calculating interest using a calculator.	Students are able to independently compute interest using a calculator.
Complex Overt Response	Multi-step investment simulations, such as stock trading decisions.	Students can perform basic market analysis and execute simulated investment transactions.
Adaptation	Responding to unexpected financial issues, such as counterfeit currency handling.	Students are able to adjust their spending plans based on situational changes.
Origination	Designing personal or family budgeting tools.	Students demonstrate a sufficient understanding of wealth management and the ability to apply budgeting tools properly.

Source: Compiled by the author

Furthermore, the extracted financial literacy content was preliminarily mapped into gamified formats (see Table 3) as a foundation for gameplay design. In the next phase of the research, these initial designs will be refined and validated through additional rounds of expert interviews.

Table 3. Gamification Design of Financial Literacy Knowledge

Financial Knowledge	**Gamified Instructional Process**
Income and Expenditure: Personal Income	
Identify familiar occupations Gain an understanding of the typical job responsibilities and corresponding income differentials among diverse professions. Develop a correct understanding of legitimate income sources and identify examples of illegal earnings	Players assume various "roles" within the game, simulating different professional identities. They experience divergent game paths based on their roles and engage in personal financial planning and strategic decision-making to maximize savings and ultimately achieve victory.
Income and Expenditure: Personal Consumption	
Be able to list different types of goods and estimate their approximate value Understand various payment methods in modern society Prioritize personal needs based on necessity and urgency Students are able to develop a budget allocation plan based on the urgency and importance of their personal needs.	Players engage in wealth exchange through digital payment mechanisms, such as "card swiping," to simulate real-world financial transactions. Players accumulate wealth by strategically purchasing items. Timing and quantity of purchases are left to players' discretion, encouraging decision-making based on prioritization of needs.

Income and Expenditure: Personal Consumption	
Understanding the government's investment in public goods and its impact on individual life. Understanding the role of taxation in society and identifying public goods related to personal life. Ability to interpret tax information in invoices and comply with tax regulations.	Through the use of "Chance Cards" in the game, players are introduced to the importance and necessity of taxation, along with relevant knowledge such as recognizing official invoices, understanding tax rates and thresholds, and comprehending the impact of taxation on public goods and individual daily life.
Savings and Investment: Currency and Exchange Rates	
Understanding the currencies and exchange rates of different countries Grasping the basic meaning of interest rates and interest Performing exchange rate conversions and calculating simple interest	In the game, players can purchase items from other players using various exchange rates, allowing them to experience the concept of interest rates and the differences between currencies through simulated transitional practice.
Savings and Investment: Savings and Credit	
Understand the various types of savings products offered by banks. Recognize the fundamental conditions and documentation required for borrowing and lending. Be able to develop a basic savings plan for a specific goal. Understand the importance of credit and the consequences of poor credit history.	Players can take out loans from the “bank” within the game to obtain additional “funds,” and are required to repay both the principal and interest as the game progresses. This process encourages players to develop sound financial plans to avoid “bankruptcy,” which would result in the termination of the game.
Savings and Investment: Investment and Returns	
Identify and categorize items that are suitable for investment purposes. Demonstrate the ability to conduct comparative and integrative assessments of the investment value and risk profiles of various financial instruments. To comprehend the varying appreciation potential of different asset types and to develop corresponding investment strategies based on this understanding.	In the game, elements such as “real estate,” “construction resources,” and the “market” are conceptualized as investment assets. Players are allowed to make autonomous investment choices based on their interests, facilitating experiential learning in wealth accumulation and portfolio diversification.

Source: Compiled by the author

3.3 Gratification-Oriented Needs Identification and Analysis

In the design of financial literacy board games for children, identifying and prioritizing key financial knowledge points along with their corresponding cognitive levels is essential to enhance both instructional effectiveness and gameplay experience. Therefore, this study combined insights from expert interviews and literature reviews to construct a Kano questionnaire, aiming to explore users' perceptions of the importance and focus of various financial literacy topics.

The Kano model, which integrates both qualitative and quantitative dimensions of user analysis, categorizes user needs into five types:

Must-be Needs: Basic expectations that users consider self-evident; their absence leads to dissatisfaction, while their presence does not increase satisfaction.

One-dimensional Needs: User satisfaction increases proportionally with the degree to which these needs are fulfilled.

Attractive Needs: When fulfilled, these needs significantly increase user satisfaction; however, their absence does not necessarily cause dissatisfaction.

Indifferent Needs: These needs have little to no effect on user satisfaction, regardless of whether they are fulfilled.

Reverse Needs: These are features or content not desired by users; fulfilling them may actually lead to a decrease in user satisfaction.

Currently, the extent to which users—particularly children and their guardians—demand specific financial knowledge content in the context of board games remains under-explored and invalidated. To address this gap, the present study employed the Kano questionnaire to classify the knowledge points identified in the earlier test paper according to user-perceived importance. The survey targeted

two main groups: educational practitioners and parents of school-aged children. This classification aims to clarify which financial knowledge elements should be emphasized and gamified during the design process.

The Kano questionnaire was designed with paired functional and dysfunctional questions for each knowledge point, offering five answer options: I like it very much, It should be that way, I am indifferent, I can tolerate it, and I dislike it very much, corresponding to scores of 5, 4, 3, 2, and 1, respectively. A sample item from the questionnaire is shown in Table 4.

Table 4. Example of Kano Questionnaire Design

<table>
<tr><th colspan="2">Question</th><th colspan="2">Options</th><th colspan="2">Associated Knowledge Point</th></tr>
<tr><td colspan="2" rowspan="4">What is the total amount of 1 × 50-yuan bill + 3 × 10-yuan bills + 5 × 1-yuan coins?</td><td colspan="2">A. 85 yuan</td><td colspan="2" rowspan="4">Basic Currency Recognition:
Simple calculations involving mixed denominations</td></tr>
<tr><td colspan="2">B. 75 yuan</td></tr>
<tr><td colspan="2">C. 80 yuan</td></tr>
<tr><td colspan="2">D. 90yuan</td></tr>
<tr><td>If this question is included, your opinion is:</td><td>I like it very much
☐</td><td>It should be included
☐</td><td>I am indifferent ☐</td><td>I can tolerate it
☐</td><td>I dislike it very much
☐</td></tr>
<tr><td>If this question is not included, your opinion is:</td><td>I like it very much
☐</td><td>It should be included
☐</td><td>I am indifferent ☐</td><td>I can tolerate it
☐</td><td>I dislike it very much
☐</td></tr>
</table>

Source: Compiled by the author

In this study, a total of 150 Kano questionnaires were distributed. Upon collection, the data were processed using the Kano model to identify and categorize representative user demands. The goal was to extract financial literacy components—categorized by knowledge levels and priority—that are suitable for application in educational board game design, thereby providing a foundation for subsequent game development.

4. Results and Analysis

Out of the 150 questionnaires distributed, 142 valid responses were collected. The collected data were organized and analyzed using SPSS software to construct the Kano model. To ensure the reliability and validity of the dataset and confirm its suitability for further information extraction, a reliability and validity analysis was conducted prior to model construction.

The results indicated a high level of reliability and validity: the Cronbach's alpha coefficient for internal consistency was 0.804, and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.954. These metrics suggest that the questionnaire data possess strong psychometric properties and are suitable for Kano model application. Detailed results of the reliability and validity analysis are presented in Table 5.

Table 5. Reliability and Validity Analysis of the Kano Questionnaire

Sample Missingness Analysis		
Valid Samples	142	94.67%
Excluded Invalid Samples	8	5.33%
Total	150	100%
Cronbach's Alpha Reliability Analysis		
Sample Size	Cronbach's Alpha Coefficient	
142	0.804	
Kaiser-Meyer-Olkin (KMO) and Bartlett's Test of Sphericity		
Kaiser-Meyer-Olkin (KMO) Measure	0.954	
Bartlett's Test of Sphericity	Approximate Chi-square	6655.948
	df	1540
	P value	0.000

Source: Compiled by the author

After completing the reliability and validity analysis of the research data, the statistical software SPSS was further utilized to construct the Kano model. Prior to model construction, in order to facilitate the modeling process and ensure clarity in subsequent presentation, the questionnaire items and their corresponding financial knowledge points were reclassified and organized. The results of this classification are presented in Table 6.

Table 6. Simplification and Categorization of Test Questions

Category	Subcategory	Original Item
Monetary Knowledge Points	Currency Cognition 1	What is the total monetary value of 1 banknote of 50 yuan, 3 banknotes of 10 yuan, and 5 coins of 1 yuan?
	Currency Cognition 2	Which of the following denominations is not issued as paper currency?
	Currency Cognition 3	Based on the exchange rate of 1 Euro ≈ 8 RMB, how much RMB can be obtained by exchanging 50 Euros?
	Currency Cognition 4	Which of the following is the correct conversion of 150 cents into yuan and jiao?
Savings Knowledge Points	Savings Cognition 1	What is the primary purpose of saving money?
	Savings Cognition 2	Which of the following practices is correct regarding savings security?
	Savings Cognition 3	If Xiaoming saves 50 yuan per month, how much will he save in one year?
	Savings Cognition 4	Xiaohong wants to buy a bicycle for 600 yuan. If she saves 100 yuan each month, how many months will it take?
	Savings Cognition 5	If a deposit of 1000 yuan earns 3% annual interest, what is the interest after six months?
	Savings Cognition 6	Is it appropriate to share your bank card PIN with a friend for safekeeping?
	Savings Cognition 7	Is it advisable to save part of your New Year's money and use the rest for school supplies?
	Savings Cognition 8	Buying a winter coat is a "need", while buying a game console is a "want". Is this statement correct?
	Savings Cognition 9	If 100 yuan is deposited in a bank for one year at an annual interest rate of 2%, will the interest earned be 2 yuan?
	Savings Cognition 10	Is interest considered free money given to customers by the bank?
	Savings Cognition 11	Is spending all of one's pocket money the most reasonable way to manage money?
	Savings Cognition 12	Does money kept in a piggy bank generate interest just like a bank deposit?
Financial Investment Knowledge Points	Financial Cognition 1	What typically accompanies high-return investments?
	Financial Cognition 2	Which of the following actions is considered an "investment"?
	Financial Cognition 3	Is it guaranteed to earn a large profit by purchasing stocks or other investment products?
	Financial Cognition 4	The saying "Don't put all your eggs in one basket" reminds people to diversify their investments. Is that correct?
	Financial Cognition 5	Does "compound interest" mean that interest can continue to generate additional interest?

Practical Financial Application Knowledge Points	Practical Application 1	Financial	If a piece of clothing originally costs 120 yuan and is sold at a 30% discount, what is the final price?
	Practical Application 2	Financial	A book is originally priced at 60 yuan and now costs 45 yuan. What is the discount rate?
	Practical Application 3	Financial	A supermarket offers a promotion: "Second item at half price." If two drinks each cost 10 yuan, how much should be paid for both?
	Practical Application 4	Financial	When making a mobile payment of 28.6 yuan, which of the following statements is correct?
	Practical Application 5	Financial	Which of the following is a similarity between electronic payment (e.g., WeChat Pay) and traditional paper money?
	Practical Application 6	Financial	Xiaoming buys three notebooks priced at 24.5 yuan each with 100 yuan. How much money does he have left?
	Practical Application 7	Financial	When receiving a "prize-winning" message while shopping online, should you click the link to claim the prize immediately? Is this correct?

Source: Created by the author

Based on the knowledge point classification in the previous table, the Kano model was further constructed in the SPSS data analysis software. The results of the model are shown in Table 7, and the Better-Worse coefficient chart of the model is presented in Figure 7.

Table 7. Kano Model Construction of Knowledge Points from the Questionnaire

Knowledge Point	A	O	M	I	R	Q	Final	Better-Worse Coefficient
Currency Cognition 1	20	75	10	27	18	0	One-dimensional Attribute	71.97%，-64.39%
Currency Cognition 2	17	78	11	24	20	0	One-dimensional Attribute	73.08%，-68.46%
Currency Cognition 3	37	20	22	50	21	0	Indifferent Attribute	44.19%，-32.56%
Currency Cognition 4	17	66	20	28	19	0	One-dimensional Attribute	63.36%，-65.65%
Savings Cognition 1	26	12	61	33	18	0	Must-be Attribute	28.79%，-55.30%
Savings Cognition 2	26	12	61	33	18	0	Indifferent Attribute	26.02%，-34.96%
Savings Cognition 3	8	10	85	28	19	0	Must-be Attribute	13.74%，-72.52%
Savings Cognition 4	22	12	70	38	8	0	Must-be Attribute	22.67%，-60.00%

Savings Cognition 5	35	55	12	34	14	0	Must-be Attribute	60.34%，-57.76%
Savings Cognition 6	24	11	65	37	13	0	Must-be Attribute	25.55%，-55.47%
Savings Cognition 7	6	22	66	38	18	0	Must-be Attribute	21.21%，-66.67%
Savings Cognition 8	17	8	21	82	22	0	Indifferent Attribute	19.53%，-22.66%
Savings Cognition 9	5	7	77	34	27	0	Must-be Attribute	9.76%，-68.29%
Savings Cognition 10	8	1	5	76	60	0	Indifferent Attribute	10.00%，-6.67%
Savings Cognition 11	6	2	62	55	25	0	Must-be Attribute	6.40%，-51.20%
Savings Cognition 12	3	1	10	86	50	0	Indifferent Attribute	4.00%，-11.00%
Savings Cognition 1	11	3	70	51	15	0	Must-be Attribute	10.37%，-54.07%
Savings Cognition 2	34	40	26	34	16	0	One-dimensional Attribute	54.55%，-48.48%
Savings Cognition 3	5	23	69	29	24	0	Must-be Attribute	22.22%，-73.02%
Savings Cognition 4	70	8	17	34	21	0	Attractive Attribute	60.47%，-19.38%
Savings Cognition 5	23	13	14	79	21	0	Indifferent Attribute	20.16%，-13.18%
Practical Financial Application 1	10	26	59	42	13	0	Must-be Attribute	26.28%，-62.04%
Practical Financial Application 2	3	38	16	70	23	0	Indifferent Attribute	32.28%，-42.52%
Practical Financial Application 3	19	72	16	28	15	0	One-dimensional Attribute	67.41%，-65.19%
Practical Financial Application 4	8	5	71	36	30	0	Must-be Attribute	10.83%，-63.33%
Practical Financial Application 15	28	13	23	64	22	0	Indifferent Attribute	32.03%，-28.13%
Practical Financial Application 6	36	13	55	38	8	0	Must-be Attribute	34.51%，-47.89%
Practical Financial Application 7	5	29	58	37	21	0	Must-be Attribute	26.36%，-67.44%

Source: Compiled by the author

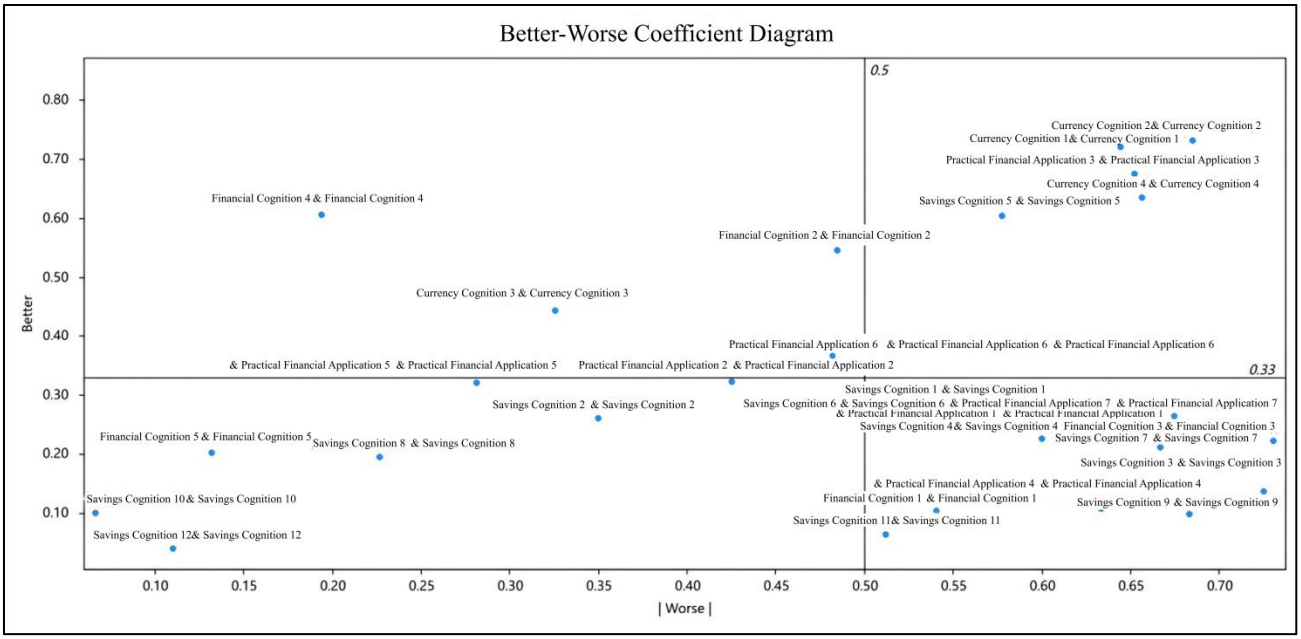

Figure 7. Kano Model Construction of Knowledge Points from the Questionnaire

Source: Compiled by the author

Based on the construction of the Kano model outlined above, the demand levels of financial knowledge in educational board games were identified. These are represented in the four quadrants of the Better-Worse coefficient chart as follows:

First Quadrant (One-dimensional Attributes): High Better value and high absolute value of the Worse value. In this quadrant, as the functionality and service levels improve, user satisfaction increases; conversely, if the service or feature is lacking, user satisfaction decreases. The corresponding knowledge points in this study are Currency Cognition 1, Currency Cognition 2, Currency Cognition 4, Savings Cognition 5, Financial Literacy 2, and Practical Application 3.

Second Quadrant (Attractive Attributes): High Better value and low absolute value of the Worse value. In this quadrant, when functionality and service quality improve, user satisfaction rises significantly; however, a decrease in satisfaction is less noticeable if the feature is absent. The corresponding knowledge point in this study is Financial Literacy 4.

Third Quadrant (Indifferent Attributes): Low Better value and low absolute value of the Worse value. In this quadrant, the functionality and services are not significantly related to user satisfaction. The corresponding knowledge points in this study are Currency Cognition 3, Savings Cognition 2, Savings Cognition 8, Savings Cognition 10, Savings Cognition 12, Financial Literacy 5, Practical Application 2, and Practical Application 5.

Fourth Quadrant (Must-be Attributes): Low Better value and high absolute value of the Worse value. Features in this quadrant are core functionalities. When these services or features improve, user satisfaction does not significantly increase; however, if these features are absent or inadequate, user satisfaction will decrease significantly. The corresponding knowledge points in this study are Savings Cognition 1, Savings Cognition 3, Savings Cognition 4, Savings Cognition 6, Savings Cognition 7, Savings Cognition 9, Savings Cognition 11, Financial Literacy 1, Financial Literacy 3, Practical Application 1, Practical Application 4, Practical Application 6, and Practical Application 7.

In the prioritization of the demand levels for financial knowledge, Must-be Attributes take the highest priority, followed by One-dimensional Attributes and Attractive Attributes, with Indifferent Attributes being the least prioritized. Thus, based on the results of the Kano model analysis, both the extraction of financial knowledge content and the demand levels for financial knowledge in board games have been quantified and prioritized. This provides support for the subsequent design of game rules, content, and mechanics. The summarized and categorized demand levels for the financial knowledge points in this study are presented in Table 8.

To further clarify the application priorities of financial knowledge in children's educational board games, this study, based on the Kano model analysis, categorized the knowledge points and ranked them by demand intensity. By mapping the various financial knowledge points from the cognitive questionnaire to Must-be Attributes, One-dimensional Attributes, Attractive Attributes, and Indifferent Attributes, this systematized classification identifies which content must be included in the game, which will enhance the user experience, and which can be added as optional supplementary content. Based on this, Table 8 categorizes all knowledge points according to their demand intensity, serving as a crucial reference for the construction of game mechanics, task design, and content difficulty progression.

Table 8 will provide a comprehensive summary of the demand levels, serving as a foundational reference for future game development.

Table 8. Categorization and Prioritization of Financial Knowledge Points Based on the Kano Model

Demand Level	Corresponding Attribute Classification	Knowledge Point	Corresponding Knowledge Content
The demand levels of attribute categories and knowledge points arranged from high to low.	Must-be Attributes	Savings Cognition 1	What is the primary purpose of saving money?
		Savings Cognition 3	Xiaoming saves 50 yuan each month. How much will he have saved after one year?
		Savings Cognition 4	Xiaohong wants to save money to buy a bicycle (600 yuan).

		If she saves 100 yuan each month, how many months will it take?
	Savings Cognition 6	Is it correct to share your bank card PIN with a friend for safekeeping?
	Savings Cognition 7	Is it correct to save part of your New Year's money and use the rest to buy school supplies?
	Savings Cognition 9	If you deposit 100 yuan in the bank for one year at an annual interest rate of 2%, will you earn 2 yuan in interest after one year?
	Savings Cognition 11	Is spending all your pocket money the most reasonable way to manage your finances?
	Financial Literacy 1	High-return investments typically come with what?
	Financial Literacy 3	High-return investments typically come with what?
	Practical Financial Application 1	A piece of clothing is originally priced at 120 yuan. What is the price after a 30% discount?
	Practical Financial Application 4	When paying 28.6 yuan with a mobile phone, which of the following statements is correct?
	Application 6	Xiaoming buys 3 notebooks priced at 24.5 yuan each with 100 yuan. How much money does he have left?
	Application 7	When receiving a "prize-winning" text message while shopping online, should you click the link to claim the prize immediately? Is this correct?
One-dimensional Attributes	Currency Cognition 1	What is the total amount of 1 × 50 yuan bill, 3 × 10 yuan bills, and 5 × 1 yuan coins?
	Currency Cognition 2	Which of the following denominations is not issued as paper currency?
	Currency Cognition 4	Which of the following is the correct conversion of 150 cents into yuan and jiao?
	Savings Cognition 5	If you deposit 1000 yuan in the bank at an annual interest rate of 3%, what is the interest after six months?
	Financial Literacy 5	Does "compound interest" mean that interest can continue to generate additional interest? Is this correct?
	Practical Financial Application 3	A supermarket promotion offers the "second item at half price." If you buy two 10 yuan drinks, how much should you pay for both?
Attractive Attributes	Financial Literacy 4	Does the saying "Don't put all your eggs in one basket" advise people to diversify their investments? Is this correct?

	Currency Cognition 3	Based on the exchange rate of 1 Euro ≈ 8 RMB, how much RMB can be obtained by exchanging 50 Euros?
	Savings Cognition 2	Which of the following practices is correct regarding savings security?
	Savings Cognition 8	Buying a winter coat is considered a “need,” while buying a game console is considered a “want.” Is this statement correct?
Indifferent Attributes	Savings Cognition 10	Is interest considered free money given to customers by the bank? Is this correct?
	Savings Cognition 12	Does money kept in a piggy bank generate interest just like a bank deposit? Is this correct?
	Financial Literacy 5	Does “compound interest” mean that interest can continue to generate additional interest? Is this correct?
	Practical Financial Application 2	A book is originally priced at 60 yuan and now costs 45 yuan. What is the discount rate?
	Practical Financial Application 5	Which of the following is a similarity between electronic payment methods (e.g., WeChat Pay) and traditional paper money?

Source: Compiled by the author

Table 8 not only categorizes the demand levels of financial knowledge points but also reflects the logic of content selection in this study, which is based on the "cognitive fit for children" principle and emphasizes a "learning-centered" approach. In contrast to the traditional financial education design path, which tends to focus on "content accumulation" and "concept-first" strategies, this study, through the Kano model, identifies that the most urgent financial knowledge children need to acquire is foundational financial behaviors and security judgments closely related to their life experiences, rather than abstract terms or system frameworks. This finding corroborates the earlier issue raised in the study—current children's financial education is disconnected from practical experience and misaligned with developmental cognitive stages, leading to limited educational effectiveness. Therefore, the significance of Table 8 lies not only in its categorization but also in its provision of a knowledge screening standard based on real user needs and cognitive development patterns. This ensures that every aspect of game content serves the cognitive transformation path of "understanding—application—internalization." This is the goal this study seeks to achieve: to construct a well-structured, motivation-driven, and perceptible financial education game system for children.

5. Conclusion

This study focuses on the existing gaps and developmental needs in children's financial literacy education in China,

based on Piaget's theory of cognitive development. It primarily examines the cognitive characteristics of children aged 7 to 12, who are in the "concrete operational stage." Children at this stage already possess basic logical reasoning and rule-understanding abilities, making them suitable for financial literacy education through images, operations, and contextual guidance. Based on this, this study explores the design approach of embedding foundational financial knowledge (such as savings awareness, risk judgment, fund flow, and asset allocation) into board games, adhering to the principles of "low threshold, high participation, and strong guidance," creating an age-appropriate, heuristic, and operable learning experience.

Through analyzing the structures and mechanisms of existing educational board games, this study extracts key elements for children's financial education and uses these to design a prototype game system with a modular structure. The game mechanics, through modular connections, transform abstract concepts like "compound interest" and "risk diversification" into interactive behaviors such as card earnings, resource allocation, and strategic choices, helping children develop an intuitive understanding of financial logic in a simulated environment. This lays the foundation for achieving the "learning through play" design goal.

In the future, this game prototype can be further expanded into a desktop-digital hybrid version that incorporates electronic technology. By introducing electronic bank cards, 3D models, visual feedback, and data management systems, the game’s immersion and user experience can be enhanced. Moreover, the game can simulate real-world financial behaviors, establishing a more layered growth system and feedback mechanism, making the game applicable beyond educational settings. As a feasible approach to children's financial education, this study aims to provide methodological support and design ideas for constructing a forward-looking financial literacy education system.

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