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Students' financial literacy in math classroom: Insights into financial awareness

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Abstract

The current generation of young people faces significant financial challenges in an increasingly volatile global economy, highlighting the need for enhanced financial literacy education. While the OECD has recommended the integration of financial literacy into school curricula, a notable gap exists in the development of age-appropriate financial literacy content that aligns with students' cognitive and developmental stages. This study addresses this gap by evaluating students' financial literacy knowledge, with a particular focus on integrating financial concepts into mathematics education. Specifically, the research targets financial topics that are accessible and relatable to upper elementary school students, exploring how these concepts can be integrated into existing mathematics curricula. The study involved students from grades 4, 5, and 6, with data collected through interviews that were transcribed and analyzed using NVIVO software. Findings indicate that topics such as exchange rates, foreign currencies, cash transactions, and digital payment systems resonate with students' existing knowledge and personal experiences. Furthermore, the study underscores the importance of introducing foundational personal financial management skills, such as distinguishing between needs and wants and promoting saving habits, from an early age. However, it also highlights that more complex financial concepts, including regulatory frameworks, consumer protection, and data security risks, are not developmentally appropriate for elementary students. The results of this research offer valuable insights into the practical integration of financial literacy into mathematics classrooms, with potential implications for curriculum development. These findings contribute to the growing body of knowledge on financial literacy education, providing a basis for selecting relevant financial topics for school curricula and fostering a more financially literate future generation.

Keywords: Financial Activities, Financial Literacy, Integrative Mathematics Education, NVIVO

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The current cohort of children and adolescents, aged 6 to 18, is growing up in an era characterized by unparalleled financial challenges and instability (Mancone et al., 2024). Given the evolving nature of the global financial environment, it is imperative to implement early financial education programs targeted at this demographic (Coda Moscarola & Kalwij, 2021). Sharif and Naghavi (2020) underscore the critical role of financial literacy among adolescents and young adults, particularly due to their increasing involvement in economic decision-making in modern society. Such educational initiatives provide individuals with the necessary knowledge and skills to make informed financial decisions, such as

effectively managing complex financial situations, making prudent choices, and contributing to both personal and communal economic well-being (Mancone et al., 2024). Financial literacy fosters the ability to manage expenditures in a systematic manner, enabling individuals to adhere to budgetary constraints. A robust understanding of financial principles empowers individuals to make rational, goal-oriented decisions, free from impulsive behaviors or societal pressures. As noted by Coda Moscarola and Kalwij (2021), early exposure to financial literacy equips individuals with essential competencies to navigate intricate financial scenarios, thereby supporting both personal and societal financial stability. Empirical studies by Eniola and Entebang (2017) and Hussain et al. (2018) further illustrate that early financial education positively impacts economic understanding and financial behaviors, ultimately contributing to enhanced financial stability.

The research conducted by Marchetti et al. (2021) underscores the significance of incorporating financial concepts and skills into children's education in a structured and engaging manner. This approach is essential for establishing a solid foundation for the development of financial literacy. In a similar vein, Gardynia and Syaodih (2021) advocate for the inclusion of financial literacy education in early childhood curricula, drawing upon cognitive learning theory. This method not only enhances children's understanding of basic financial principles but also equips them with crucial money management skills at an early stage of development, facilitating the practical application of these skills in real-world situations. Early exposure to financial education has a profound impact on children's attitudes and behaviors toward money management, thereby laying the groundwork for their financial well-being in adulthood (Mancone et al., 2024).

One effective approach to teaching financial literacy is its integration into mathematics instruction. By incorporating financial contexts into mathematics lessons, students simultaneously strengthen their mathematical skills while gaining a deeper understanding of fundamental economic concepts. These include the value of money (Ozkale & Aprea, 2023), budgeting and savings calculations (OECD, 2017), and the application of discounts (Sagita et al., 2023). The OECD (2019) identifies three critical areas for the development of educational frameworks that incorporate financial literacy: context (which sets the foundation for the problem), content (which focuses on the selection of relevant concepts), and process (which emphasizes demonstrating students' problem-solving capabilities).

Various frameworks have been established to facilitate the integration of financial literacy into mathematics education. In their 2020 study, Ozkale and Erdogan (2022) explored the relationship between mathematical literacy (ML) and financial literacy (FL) within the academic context, focusing on the framework developed by the Programme for International Student Assessment (PISA). This analysis examines both the theoretical and practical integration of financial literacy components into mathematics instruction, particularly through the development and application of the Interaction Model of Mathematical and Financial Literacies (IMMFL). This model integrates financial literacy within the mathematics curriculum by aligning mathematical content with real-world financial contexts and emphasizing critical process skills. The IMMFL provides a systematic approach for embedding these literacies into teaching practices. In a similar vein, Savard and Calvante (2021) introduced the Three Dimensions of Teaching Financial Numeracy, a conceptual framework aimed at incorporating financial numeracy into mathematics education. While both frameworks offer valuable strategies for integrating financial literacy into mathematics instruction, they lack detailed guidance on age-appropriate content that aligns with students' developmental stages.

The analysis of age-appropriate financial literacy content is essential, especially in ensuring that financial literacy aligns with mathematics materials suitable for students' cognitive and experiential levels.

This challenge is particularly evident in elementary education, where students exhibit varying levels of familiarity with personal financial activities (Barrot et al., 2024). Yeo (2016) incorporated financial concepts such as saving, managing, and sharing money into mathematical tasks. Similarly, the financial education organization JumpStart has developed a comprehensive financial literacy curriculum targeting elementary, middle, and high school students (Mandell, 2008). However, this curriculum requires further examination regarding how mathematical concepts are integrated with financial literacy content. Instead of using financial concepts merely as contexts for teaching mathematics, financial literacy should contribute to a deeper understanding of financial principles (Savard, 2022).

Promoting financial literacy is essential within mathematics education. In accordance with the evolving objectives of mathematics education, there has been an increasing emphasis on applying mathematical concepts to real-world contexts, particularly in problem-solving situations (Gravemeijer, 1994). However, prior research has identified the need for the integration of financial literacy into the foundational mathematics curriculum in Singapore. Yeo (2016) found that many students lacked a clear understanding of financial situations, especially when solving arithmetic problems involving financial transactions. For example, when confronted with a double-discount problem—where students must apply two consecutive discounts to an item's price—students often erroneously add the two discount rates, failing to comprehend the true concept of a double discount (Sagita et al., 2023). Incorporating financial literacy into mathematics education could help students gain a more profound understanding of financial scenarios and enhance their ability to solve arithmetic problems related to financial transactions. A persistent challenge in this integration is that some students tend to focus more on the financial practice activities rather than the underlying mathematical principles (Amirullah et al., 2022; Savard & Calvante, 2021). This issue arises from the inherent complexity of financial concepts, which often require higher-order cognitive skills, such as critical reasoning and problem-solving, to align effectively with mathematical models (Cortez et al., 2023).

Despite the global movement to integrate financial literacy into mathematics education, there is still a lack of empirical evidence regarding effective teaching strategies and measurable learning outcomes in the Indonesian context, particularly at the elementary and secondary education levels. Caplinska and Ohotina (2019) emphasize that a well-structured financial education curriculum is crucial in equipping individuals with the skills necessary to navigate economic and financial challenges. Such a curriculum not only fosters adaptability and productivity but also nurtures an understanding of fundamental financial concepts and develops essential money management skills from an early age. In Turkey, Ozkale and Aprea (2023) designed tasks based on students' daily lives to ensure that financial literacy instruction was both relevant and accessible. This approach enabled teachers to effectively teach financial concepts by helping students connect financial theory with real-life situations, making the learning experience more meaningful. Similarly, there is an urgent need to examine financial literacy content within the Indonesian education system to ensure its relevance to students' everyday experiences and its applicability in real-world contexts. This study is essential for the development of financial education practices that are tailored to the local context, while simultaneously fostering practical, lifelong financial skills.

The OECD (2019) has outlined common dimensions of financial literacy content for 15-year-old students, which include money and transactions, risks and rewards, planning and managing, and the financial landscape. Additionally, organizations such as the Council for Economic Education (CEE) and JumpStart have developed financial literacy frameworks tailored to specific grade levels, including grades 4, 8, and 12 (Mandell, 2008; CEE, 2016). Amagir et al. (2022) conducted an experimental study

evaluating the “SaveWise” financial education program for grade 9 students in the Netherlands, focusing on three key financial literacy domains: earning income, purchasing goods and services, and saving. The results indicated that the "SaveWise" program significantly enhanced students' financial knowledge. Similarly, Ozkale and Erdogan (2020) proposed four dimensions of financial literacy content within the Interaction Model of Mathematical and Financial Literacies (IMMFL) framework for school-level mathematics education. These dimensions include financial management and planning, earning, spending, investing, and saving. While these studies provide valuable insights, the financial literacy content discussed is based on socio-economic and cultural contexts that differ significantly from Indonesia. Therefore, further research is necessary to design financial literacy content that is contextually relevant to Indonesian students. This aligns with the perspective of Mancone et al. (2024), who emphasized that financial literacy content in education must take into account students' age, socio-economic background, and lived experiences to ensure its relevance and effectiveness.

In Indonesia, several studies have explored various aspects of financial literacy. For instance, Kusumawati et al. (2023) developed a social arithmetic learning design based on Islamic financial literacy, referred to as Math-Based Islamic Financial Literacy (MIFL), for Islamic schools. This study utilized the Hypothetical Learning Trajectory (HLT) framework to enhance students' numeracy and Islamic financial literacy (IFL) skills by incorporating Islamic financial contexts into mathematics assignments. In contrast, Sagita et al. (2022) examined the relationship between financial literacy and mathematical literacy as essential 21st-century skills. Their study, which included bibliometric analysis and surveys of mathematics teachers in Yogyakarta, highlighted the need for teachers to strengthen their knowledge of financial terms and concepts. The study advocated for a project-based learning approach to ensure that the integration of financial literacy into mathematics instruction is both relevant and applicable. It also called for further research to develop learning models that directly impact students' financial literacy skills. Ramadhan et al. (2024) focused on vocational high school students, using financial mathematics tasks based on PMRI (Pendidikan Matematika Realistik Indonesia)-based learning. By incorporating real-world contexts, such as gold and stock market scenarios, they aimed to improve students' financial mathematics and decision-making skills. The study encouraged teachers to adopt more active and contextual approaches to teaching financial mathematics, underscoring the importance of integrating real-life financial contexts into mathematics learning. Despite these contributions, a notable gap remains in exploring financial literacy content specifically tailored for upper elementary school students. Kusumawati et al. (2023) focused on Islamic financial literacy for Islamic schools, limiting the generalizability of their findings. Similarly, Sagita et al. (2022) concentrated on the teacher perspective rather than the design of content specifically for students. Meanwhile, Ramadhan et al. (2024) targeted vocational high school students, particularly in the contexts of gold and stocks. This gap highlights the need for further research focused on designing and implementing financial literacy activities suitable for upper elementary school students, especially within the broader context of developing countries like Indonesia.

The findings of this study have the potential to significantly contribute to the effective integration of financial literacy into mathematics education, aiming to improve students' financial literacy knowledge from an early age. The financial literacy content dimensions explored in this study are designed to align with students' daily activities and are influenced by their cultural contexts, which shape their understanding and perceptions of financial literacy. This integration of financial literacy into elementary school mathematics is expected to bridge educational content with students' personal and cultural experiences, fostering a deeper understanding and practical application of financial concepts. Ultimately,

this approach can empower students to critically assess financial behaviors, make informed decisions, and enhance their financial literacy. Furthermore, this foundational knowledge may promote long-term economic mobility. These findings are supported by the work of Gibert et al. (2024).

METHODS

Research Design

This study investigates students' financial activities, with a particular focus on age-related (grade-level) differences. A qualitative research approach was adopted, employing an exploratory methodology to gather a comprehensive understanding of the factors influencing students' financial behaviours and their practice of financial literacy in daily life. The research process is outlined in Figure 1.

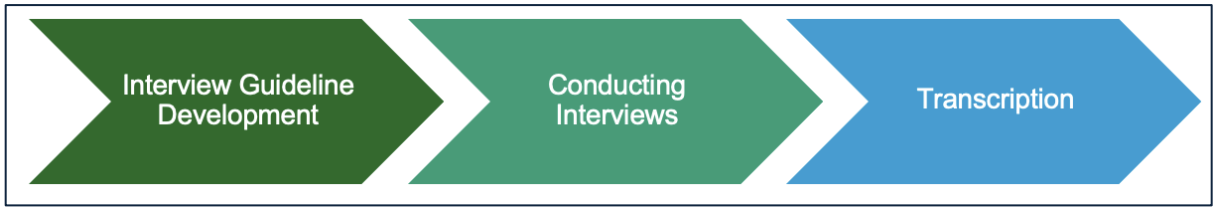

Figure 1. Research procedures

A flexible interview guide was developed to facilitate open-ended discussions, allowing participants to freely share their experiences and perspectives. Interviews were conducted either in person or via video conferencing, with each session recorded for later analysis. The recordings were transcribed verbatim, enabling a more efficient analysis and interpretation of the data. Following the transcription, insights into the study's themes were drawn, and conclusions were formulated based on the data.

Research Participants

The study targeted upper elementary school students to examine the variation in financial activities across different grade levels. Participants were purposively selected based on their grade and age as follows:

1. Participant 1-DZW: Grade 4 student, approximately 10 years old.
2. Participant 2-NR: Grade 5 student, approximately 11 years old.
3. Participant 3-FHM: Grade 6 student, approximately 12 years old.

The participants were chosen to explore differences in financial knowledge and activities across these age cohorts.

Research Instrument

The data collection tool was specifically designed to gain in-depth insights into the financial activities of students. The interview questions were developed based on the four dimensions of financial literacy as outlined by the OECD (see Table 1).

The inclusion of the OECD's financial literacy content dimensions in the instrument was aimed at providing a detailed overview of students' financial activities and behaviours. These dimensions, as outlined in Table 1, are expected to offer a comprehensive view of students' financial knowledge and skills, with particular attention to the mathematical aspects of their financial decision-making.

Table 1. Financial literacy content, definition, and description

Financial Literacy Content	Definition	Financial Literacy Knowledge Indicator
Money and transactions	Money and transactions content covers a person's awareness and ability to distinguish and manage money and monetary transactions (OECD, 2019).	• Knowledge of foreign currency • Use of payment instruments (cash or digital) in daily activities • Changes in the value of money or goods (example: comparison of the value of money 5 years ago and the current value) • Financial documents such as Receipts, Check and Giro Bilyets.
Planning and managing finances	The content of planning and managing finance includes a person's ability to monitor, manage, and plan income and expenses, as well as increase wealth and financial well-being (OECD, 2019).	• Credit • Savings • Wealth management
Risk and reward	This content area domain includes knowledge of the risks inherent in financial behaviours, strategies and types of products used to protect oneself from negative consequences (OECD, 2019).	• Knowledge of the impact of using insurance services, credit • Knowledge of savings products • Knowledge of investment risk and reward potential
Financial landscape	Financial landscape content includes awareness of financial consumer regulation and protection, knowledge of financial consumer rights and responsibilities, and contractual implications of financial services (OECD, 2019).	• Knowledge of regulatory and consumer protection roles, rights and responsibilities of financial actors/consumers • Knowledge of the financial risks of personal data protection • Knowledge of short- and long-term impact of financial decisions • Knowledge of the influence of internal and external economic factors, • Awareness of financial crimes, such as identity theft and data theft

Data Collection

Data were gathered through individual interviews designed to explore students' financial practices and their understanding of financial literacy. Interviews were conducted between September 13 and 20, 2024. Each interview lasted approximately 15 to 20 minutes. The interviews were conducted both in person and via telephone. All interviews were recorded, and the recordings were transcribed verbatim. To maintain consistency, an interview guide was used to direct the conversation, though it was flexible enough to allow participants to express their thoughts freely, providing a more natural discourse.

Data Analysis

The collected data were analysed using thematic analysis, supported by NVIVO software, which facilitated the identification of key themes based on the frequency of keyword occurrences. NVIVO, developed by QSR International, is widely used in qualitative data analysis due to its ability to manage large volumes of qualitative data efficiently, promote collaboration, and enhance research outcomes (Phillips & Lu, 2018; Limna, 2023). The analysis process involved verbatim transcription, coding of the data, and interpretation of the findings. The interview transcriptions were input into MS Word without alteration to ensure that respondents' statements were accurately captured. Following transcription, the data were coded to identify the core themes of financial literacy, such as money and transactions, financial planning, investment, and financial awareness.

RESULTS AND DISCUSSION

To enhance students' financial literacy from an early age, the findings of this study will be utilized to develop financial literacy materials suitable for integration into the mathematics curriculum. The data analysis, conducted using NVIVO software, led to the categorization of the research findings. Figure 2 presents the word cloud generated by NVIVO, illustrating the terms most frequently identified during the interview coding process.

Figure 2. The results of the word cloud from NVIVO

As depicted in Figure 2, a word cloud has been utilized to highlight a selection of finance-related terms. The most frequent terms, such as 'money', 'thousand', 'credit', and 'insurance', reflect the dominant themes of money management, transactions, and financial services. Other terms, including 'saving', 'borrow', and 'investment', represent various financial activities, while references to 'GoPay', 'DANA', and 'QRIS' demonstrate the role of technology in the modern financial landscape. Additionally, cultural elements are evident, with words such as 'angpau', 'Eid', and 'dinar' emphasizing the influence of tradition in financial practices. In summary, this comprehensive visualization provides a holistic view of finance, incorporating individual, technological, and socio-cultural dimensions.

The findings were analysed in alignment with the OECD's financial literacy content indicators, which cover key areas such as money and transactions, financial planning and management, investment, and financial awareness (see Table 2).

Table 2. Financial literacy content, code, and description

Financial Literacy Content	Competency Indicator
Money and Transaction	Knowledge of currency exchange rates
	Cash or digital payment in daily activities
Planning and Budgeting	Saving, credit, and investment as part of personal financial management
Investment	Insurance as investments
Financial Awareness	Regulation of consumer rights and responsibilities in financial services

Money and Transaction

The content related to money and transactions is designed to provide individuals with the knowledge and skills necessary to identify and manage money and financial transactions effectively. This includes student activities such as understanding foreign currencies, utilizing various payment methods (both cash and digital) for everyday transactions, recognizing fluctuations in the value of money or goods (e.g., comparing the value of money from five years ago to its current value), and familiarizing students with financial documents such as receipts, checks, giro transfers, and promissory notes.

Knowledge of Money Exchange Rates

Regarding student activities related to understanding currencies, the respondents demonstrated knowledge of both the Indonesian currency and various foreign currencies. In an interview with FHM, the exchange was as follows:

Researcher : "Do you know the name of our country's currency?"
FHM : "Rupiah."
Researcher : "Yes, that's correct. Do you know the name of any foreign currencies?"
FHM : "Of course."
Researcher : "What are they?"
FHM : "Dollar, Peso, Euro."
Researcher : "Euro, Dollar, Peso… anything else?"
FHM : "Dinar" (September 14, 2024).

This conversation indicates that upper-grade elementary school students are already familiar with both Indonesian and foreign currencies. Further interviews revealed that students could identify additional currencies, including the Dollar, Euro, Ringgit, Riyal, Peso, Singapore Dollar, US Dollar, among others.

In addition to recognizing the Indonesian currency, students demonstrated an understanding of the differences in currency values between countries. This understanding was illustrated in an interview with DZW:

Researcher : "Where is the Rupiah from?"
DZW : "Indonesia"
Researcher : "Can a thousand Rupiah in Indonesia be used in America? Can ten thousand Rupiah in Indonesia buy snacks in America?"
DZW : "No"
Researcher : "Why?"
DZW : "Because it's not the currency there" (September 15, 2024).

This exchange reveals that upper-grade elementary school students are aware of the value differences between currencies. They understand the exchange rate of the Indonesian Rupiah relative to other currencies. Additionally, students exhibited an awareness of fluctuations in currency values over time, as well as the current value of currency. All respondents acknowledged the decline in currency value. For example, FHM described the increased cost as a natural result of fluctuating currency values, saying, "It's more expensive, so what? I can't buy many snacks." FHM further illustrated this by noting that the price of a glass of ice had risen from 2,000 Rupiah to 3,000 Rupiah. DZW also supported this view, citing the price increase of iced Milo from 1,000 Rupiah to 3,000 Rupiah.

These findings align with the research of Takeuchi (2018), who noted that school-aged Filipino transnational children were able to apply their understanding of international currency conversions and ratios. Similarly, Williams et al. (2022) observed that children typically recognize their country's currency by the age of 5–7 years. According to Piaget's cognitive development theory, children in the 5–7-year age group are in the concrete operational stage, where they can grasp simple concepts, such as recognizing numerical values. Therefore, it can be inferred that children aged 10–12 years, as observed in this study, are capable of understanding concepts related to currency and utilizing money for transactions.

Cash or Digital Payment in Daily Activities

The respondents demonstrated familiarity with both cash and digital payment methods, utilizing both forms of payment. In an interview with FHM:

Researcher : "Mas FHM, if you buy something in this shop, do you pay more often with cash or an app on your mobile phone?"
FHM : "Cash."
Researcher : "Okay, Mas FHM. …Then, have you ever seen receipts, Mas FHM?"
FHM : "Not yet."
Researcher : "Oh, okay, not yet. Have you seen a check?"
FHM : "Not yet."
Researcher : "Never heard of checks, huh? What do you know about non-cash payment methods?"

FHM : "Dana. QRIS. GoPay. Gojek, Grab."
Researcher : "Is there one that you have used?"
FHM : "Usually use Dana" (September 14, 2024).

This conversation suggests that upper-grade elementary school students primarily use cash for transactions but are aware of non-cash payment methods, such as digital payment platforms. In a separate interview with NR:

Researcher : "If you're buying something in a shop, you're more likely to pay with cash or an app?"
NR : "Use the app."
Researcher : "What is it?"
NR : "BNI App" (September 14, 2024).

NR's response indicates the use of a bank application, BNI, linked to a debit card. Follow-up interviews revealed that NR's mother's bank account is associated with the app, aligning with Vygotsky's theory, which posits that children learn financial concepts through guided participation with adults (Mancone et al., 2024). This suggests that the respondent is familiar with banking applications that involve debit cards.

While upper-grade elementary school students predominantly use cash for transactions, they are well-informed about non-cash payment methods, including e-payment platforms like DANA, GoPay, ShopeePay, Grab/OVO, and debit cards. This finding aligns with research by Williams et al. (2022), which indicates that children aged 8–10 are familiar with various payment methods, including both cash and non-cash options. According to Piaget's cognitive development theory, children in the 8–10-year age range transition from the concrete operational stage to the early stages of formal operational thought, enabling them to grasp abstract concepts such as different payment methods and their applications.

However, it is noteworthy that upper elementary school students appear to have limited exposure to financial documents such as receipts, checks, giro transfers, or promissory notes. Interviews with all participants confirmed that they had minimal to no knowledge or experience with these documents. This finding contrasts with the study by Savard (2022), which revealed that grade 4 students in a different context understood checks as financial documents and recognized them as alternatives to physical money. Savard (2022) emphasized this as an interesting example of how children conceptualize financial tools like cash and credit cards.

Budgeting Plan

The content on budgeting plans, which focuses on the planning and management of finances, is designed to equip individuals with the knowledge and skills necessary to monitor, manage, and plan their income and expenses effectively. Financial literacy materials related to budgeting can help individuals develop a comprehensive approach to achieving financial stability. This includes understanding how to allocate resources, anticipate financial needs, and make informed decisions. Practical examples of such skills can include creating a budget, analysing spending habits, setting financial goals, and adjusting plans to ensure long-term financial health and success.

A key competency that can be taught in relation to social competence is the ability to manage financial resources in ways that contribute to the happiness and well-being of one's family while fostering empathy and care for others in need. The interview results suggest that participants, such as NR, already

demonstrate these competencies. NR shared: "Saving some of it. Then the rest is for alms." This response reflects NR's value of financial independence while also emphasizing social responsibility through prioritizing savings and charitable giving. Similarly, respondent FHM indicated that if he were to accumulate significant wealth, his primary goal would be to ensure his parents' happiness. This response underscores FHM's strong familial values and sense of responsibility toward his family's well-being.

Knowledge of Saving, Credit, and Investment as Components of Personal Financial Management

A key component of financial literacy is understanding the principles of saving, credit, and investment. All participants demonstrated an awareness of financial management, particularly in the areas of saving, credit, and investments, even though most were not directly involved in these practices. Participants' financial management activities were primarily supported and guided by their parents, such as opening and maintaining savings accounts in banks.

In an interview, NR explained that she often requested money from her mother, not for immediate spending but for saving purposes. When asked about the benefits of saving, NR stated: "Saving money can be used in case we run out of money. We can take the savings." NR further elaborated that her savings could also be used for school-related expenses. Similarly, another respondent, FHM, emphasized that saving money helps ensure its safety. A particularly illustrative example came from DZW, who proudly shared that his savings had recently enabled him to purchase a mobile phone, showcasing the tangible benefits of consistent saving practices.

Another important aspect of financial literacy for upper elementary school students is understanding credit. Students aged 10-12 years demonstrated familiarity with the concept of credit and instalment-based purchasing systems. For instance, FHM explained: "Yes, you have to be careful because I'm afraid you won't pay it off, and you will end up in debt." This exchange indicates that FHM understands the risks associated with credit, particularly the potential for falling into debt if payments are not managed properly. He also expressed concerns about the consequences of unpaid debts, such as those associated with online loans. Furthermore, regarding online loans, DZW expressed a similar understanding to FHM. In an interview, DZW explained:

Researcher : "Did you know about loans? What's an example? How did you know?"
DZW : "Online loans, so there will be a loan application, then pay through the account."
Researcher : "Okay, then you know that. You can get loans online. How is it if you get a loan from the bank?"
DZW : "Don't know."
Researcher : "If you buy goods on credit, have you heard of it? Credit means buying the goods in instalments."
DZW : "Of course."
Researcher : "Like how?"
DZW : "I know we pay in instalments if we don't have enough money."
Researcher : "Is the price different from the cash one?"
DZW : "Different."
Researcher : "Different, how?"
DZW : "More expensive."
Researcher : "Which one is more expensive?"
DZW : "More expensive in instalments" (September 15, 2024).

This exchange indicates that DZW is familiar with the concept and mechanics of online loans, such as using loan applications and making payments through accounts. However, DZW admitted to being unfamiliar with the process of borrowing from a bank. Additionally, DZW demonstrated a clear understanding of purchasing goods on credit, recognizing that credit involves instalment payments when funds are insufficient. He also understood that items purchased on credit are more expensive than those paid for in cash.

Another participant, FHM, explained that he does not save money in the traditional sense but instead focuses on growing his money. When asked how he accomplishes this, FHM explained that he engages in buying and selling accounts and items within online games. FHM elaborated that when he wants to save for a toy or something he desires, he purchases game accounts at a lower price and sells those accounts at a higher price, thereby accumulating enough money to buy what he wants. This demonstrates that FHM does not save money in the conventional manner but instead uses entrepreneurial strategies to grow his financial resources.

In summary, all respondents displayed an understanding of their personal needs and wants. However, their skills in personal financial planning varied and can be categorized into three distinct groups. The first group, represented by FHM, demonstrates the ability to distinguish between needs and wants, with financial resources derived from pocket money and the profits of buying and selling online game accounts. The second group, NR, has not yet developed personal financial planning skills, as her parents continue to meet all her financial needs. Furthermore, NR does not receive pocket money regularly (e.g., daily, weekly, or monthly), which limits opportunities to practice financial management independently. The third group, DZW, shows knowledge of personal needs and wants but lacks adequate financial planning skills. Although DZW regularly receives pocket money and sets aside funds, this is done without clear financial goals or systematic allocation. His spending is need-based rather than guided by a structured plan.

The analysis indicates that participants employ diverse approaches to short- and medium-term financial management, with activities often directed toward purchasing items such as bicycles, shoes, and skincare products. However, the findings suggest that individuals aged 7–15 still require guidance to develop proficiency in long-term financial planning. Parents play a critical role in shaping their children's financial knowledge and skills. Differences in parental conditions and the level of children's involvement significantly influence their financial understanding and management abilities. Parents can support their children's mathematical identity in various ways, including: Pragmatic, by emphasizing financial literacy and basic life skills; Aspirational, by promoting math-intensive careers; and Affirming, by sharing words of encouragement (Cunningham, 2021). Moreover, improving students' financial literacy in school mathematics requires a holistic approach to teaching economic calculations. This process should account for factors such as students' interest in learning, reading ability, quality of knowledge acquisition, and capacity for financial literacy development (Abylkassymova et al., 2020).

Investment

Investment education aims to provide individuals with the knowledge and skills necessary to distinguish between various investment products based on their associated risks and returns, thereby enabling them to make informed investment decisions. The "Risk and Reward" content within financial literacy focuses on developing the ability to identify, assess, and balance potential risks and rewards in financial management. This includes understanding financial instruments such as insurance and savings as forms of investment.

Insurance as a Form of Investment

The interviews revealed that participants had limited knowledge of insurance as a financial instrument. For example, in an interview with NR, she remarked, "Insurance seems to have been heard of, but I don't know," indicating that while she had heard of insurance, she lacked a clear understanding of its purpose or mechanisms. Similarly, FHM offered a basic explanation, saying, "Insurance? I know, for example, if someone buys insurance, and we pass away, the family will get money, if I'm not mistaken." FHM's response demonstrated a rudimentary understanding of life insurance, specifically its role in providing financial support to beneficiaries after the policyholder's death. However, the discussion highlighted the participants' limited awareness of the broader range of insurance products, such as health insurance, property insurance, and investment-linked insurance plans, and the various benefits these products offer. In an interview with DZW, the following exchange occurred:

Researcher : "Are you familiar with insurance?"
DZW : "No."
Researcher : "What about BPJS?"
DZW : "Yes."
Researcher : "What is BPJS?"
DZW : "It's for paying medical expenses when people are sick." (September 15, 2024)

DZW acknowledged that he was not familiar with the general concept of insurance but recognized BPJS, a government health insurance program in Indonesia, which he described as a system designed to cover medical expenses when individuals fall ill.

The interviews with all participants revealed a notable gap in their understanding of insurance, including its specific functions and benefits. While the term "insurance" may be vaguely recognized, the nuances of how insurance operates and the advantages it provides remain unclear. However, specific programs like BPJS are better understood due to their tangible, practical applications in healthcare.

Saving as Investments

The participants' understanding of investments varied significantly, reflecting differences in awareness among 10- to 12-year-old students. In an interview with DZW (10 years old), the following exchange occurred:

Researcher : "What is an investment? Maybe, for example?"
DZW : "I don't know yet." (September 15, 2024)

DZW admitted that he was unfamiliar with the concept of investments, demonstrating no prior exposure to or understanding of the term. This highlights the limited knowledge of financial concepts at younger ages and the need for targeted education on investment fundamentals. In contrast, NR (11 years old) demonstrated some knowledge of investment. During the interview with NR, the following exchange took place:

Researcher : "Did you use your savings to buy something?"
NR : "Yes."
Researcher : "What is it?"
NR : "Gold." (September 14, 2024)

NR mentioned that she had used her savings to purchase gold, indicating her engagement in investment-like activities, even if she did not explicitly label them as such. FHM (12 years old) demonstrated a more developed understanding of investments, associating them with the concept of value appreciation over time:

Researcher : "When it comes to investment, do you know about investment?"
FHM : "Sure."
Researcher : "What is it?"
FHM : "It's like gold anyway. The value rises over time." (September 14, 2024)

The interviews highlighted varying levels of awareness and engagement with investment concepts among participants, indicating a need for educational interventions to teach investment to children aged 10–12 years. The integration of financial literacy content into mathematics learning, particularly in the context of investments, can be enhanced by adopting contextual approaches, such as PMRI. For example, financial mathematics assignments contextualized around gold and savings for vocational high school students have shown positive outcomes, including improved decision-making abilities in financial contexts (Ramadhan et al., 2024). Similarly, Merry et al. (2022) found that project-based learning activities involving budgeting and savings planning helped children apply financial knowledge to real-life scenarios.

Financial Awareness

Financial awareness aims to equip individuals with the knowledge and skills necessary to understand the regulation of consumer rights and responsibilities within financial services, as well as the influence of internal and external economic factors on financial decision-making. It includes the ability to consider various financial information and technological aspects related to finance, such as consumer protections, financial service contracts, and regulatory frameworks.

An essential concept that children need to grasp is the danger of sharing personal information. In an interview with NR, the following exchange took place:

Researcher : "If personal information such as your phone number or home address is dangerous to share, what about strangers on the internet?"
NR : "Very dangerous."
Researcher : "Why?"
NR : "It could be that the person can come to our house. We don't know what to do."
Researcher : "Yes."
NR : "They can rob."
Researcher : "Can they rob you like that? Dangerous, yes. This can happen if someone gets your confidential information, such as a password or bank account number."
NR : "Report to the police."
Researcher : "What happens if people know your confidential information?"
NR : "We fall into poverty." (September 14, 2024)

This exchange highlights NR's understanding of the dangers of sharing personal information with strangers online, such as phone numbers or home addresses. NR recognizes that this could lead to physical risks, like a stranger coming to their house and causing harm, such as robbery. Furthermore,

NR is aware that such incidents could result in severe financial consequences, such as falling into poverty. This demonstrates NR's awareness of the significant risks and potential financial harm associated with the loss of private information.

FHM displayed a similar understanding of the risks associated with sharing personal information online. In an interview, FHM responded:

> *Researcher : "When it comes to personal information, if we give personal information to strangers, isn't it dangerous on the internet?"*
> *FHM : "It's very dangerous because our account can be accessed by other people."*
> *Researcher : "I see. The account can be accessed by others. What could happen if someone gets your confidential information, such as a password or bank account number?"*
> *FHM : "That's dangerous. The problem is that our account can be accessed, sold, or misused." (September 14, 2024)*

FHM emphasized the risks of unauthorized access to personal accounts, including the potential for misuse, theft, or even the sale of account details. His responses reflect an understanding of identity theft and the serious consequences of unauthorized access to personal financial accounts.

The participants demonstrated varying levels of knowledge regarding the regulation of consumer rights in financial services, particularly concerning the confidentiality of personal data, such as passwords for digital accounts (e.g., Grab accounts) and personal identity information, such as telephone numbers. They were also aware of their consumer responsibilities, such as paying administrative or service fees for financial transactions. The interviews revealed that the participants recognized the importance of protecting personal data and were aware of the risks associated with sharing sensitive information, particularly when sourced from their parents. However, FHM exhibited a deeper understanding of the potential consequences when providing personal data to others.

Regarding the influence of internal and external economic factors, only four of the six participants provided responses. The discussion included topics such as the changing value of money over time, currency exchange rates, and the impact of managing personal finances when making purchasing decisions. However, this content appeared to have limited direct relevance to the financial activities of participants aged 7 to 15 years.

Mathematics Content Relevant to the Financial Activities of Elementary School Students

Financial activities should be integrated into mathematics instruction to promote early financial literacy, especially in elementary school. When integrated into mathematics education, financial literacy encompasses the use of financial contexts, an emphasis on understanding financial terminology, and the development of decision-making skills (Sagita et al., 2022). Several researchers offer an alternative approach by incorporating financial literacy contexts into mathematics lessons through practical problems that students can relate to (Sawatzki, 2017; Sawatzki & Sullivan, 2018). Moreover, factors such as family financial management, social status, advertisements, social media, and the students' social environments significantly influence their financial literacy knowledge (OECD, 2019; Gudmunson & Danes, 2011; Van Campenhout, 2015; Oehler & Wendt, 2017). Contexts like using e-commerce services (Sagita et al., 2023) and cultivating saving habits (Yeo, 2016) are particularly relevant in this regard.

Fostering saving habits in children is a critical step in initiating their financial literacy journey. Most spending and saving behaviours are formed at a young age, and research suggests that providing solid

financial education as early as kindergarten remains one of the most effective ways to instil this essential life skill (Mandell, 2008). Students often express interest in real-world financial practices, products, and services, and using these real-life contexts to teach mathematics helps bridge abstract mathematical concepts with tangible applications, making mathematics more meaningful (Savard & Calvante, 2021). By referencing everyday financial situations, we can study the application of mathematics and explore how mathematical concepts are derived from these practices, enhancing the overall learning experience.

Sound financial decisions require basic knowledge of money and essential mathematical skills, including the ability to calculate, analyse, and make informed choices. This intersection of financial literacy and mathematical literacy is crucial. According to the OECD (2019), the connection between mathematics and financial literacy involves arithmetic operations such as addition, subtraction, multiplication, and division of whole numbers, decimals, and percentages. However, while financial activities are often utilized by mathematics teachers as a context for social arithmetic, the financial knowledge and attitudes embedded in mathematics learning activities have not been optimally taught in the classroom (Sagita et al., 2022). The specific connections between financial activities and primary school mathematics content are outlined in Table 3.

Table 1. Mathematics in the financial activities of 8 - 10 years old

Financial Literacy Content	Competency Indicator	Financial Activity	Mathematics Content in Elementary School
Money and Transaction	Knowledge in of money exchange rates	Value of money	Basic mathematical operations (addition and subtraction within natural numbers up to one million)
		Currency denominations	- Place value - Ordering whole numbers
	Cash or digital payment in daily activities	- Online transactions - Buying snacks at the school canteen - Buying food at the store - Purchasing goods with cash and credit	- Discount - Basic arithmetic operations on fractions, decimals, and percentages
Budgeting Plan	Saving, credit, and investment as part of personal financial management	- Interest in bank - Pocket money - Piggy bank	- Basic arithmetic operations on fractions, decimals, and percentages - Place value - Ordering whole numbers
Investment	Insurance as investments	- Gold investment - Insurance	- Basic arithmetic operations on fractions, decimals, and percentages - Place value - Ordering whole numbers
Financial Awareness	Regulation of consumer rights and responsibilities in financial services.	- Data privacy - Online loan - Tax - Bank service fees	Basic arithmetic operations on fractions, decimals, and percentages

This study underscores the relevance of e-commerce services and saving habits as critical contexts for teaching financial literacy in relation to money and transactions. It further emphasizes the importance of introducing concepts such as saving and financial management early in children's education, laying a strong foundation for their financial literacy development. Teaching students about the impact and use of financial products, such as savings accounts and insurance, is also essential for helping them understand the dimensions of risks and rewards. However, the study found that knowledge of the broader financial landscape, including aspects like regulation, consumer protection, and the financial risks related to personal data protection, was not directly relevant to the daily classroom experiences of elementary school students.

These findings have significant implications for the integration of financial literacy content within the school curriculum. The study identified various financial contexts that are directly aligned with mathematics content, making them applicable in mathematics lessons for upper elementary school students. Financial literacy programs focusing on budgeting, saving, investing, and responsible borrowing have been shown to improve students' understanding of essential financial concepts (Amagir et al., 2018). Furthermore, comprehensive financial education plays a vital role in preparing young individuals for financial independence and resilience, ultimately contributing to their long-term financial well-being. On a broader scale, the study's findings offer valuable guidance for selecting financial literacy content to be integrated into school mathematics education.

Effective financial literacy programs not only aim to impart theoretical knowledge but also focus on fostering behavioral changes that ensure individuals develop positive financial habits (Yanto et al., 2021). Additionally, experiential learning and practical applications have been shown to significantly enhance financial behaviors (Bhandare et al., 2021). These findings align with a previous study by Amagir et al. (2018), which demonstrated that the integration of financial literacy into the school curriculum significantly improves students' financial management skills. More broadly, the results of this study provide practical insights into incorporating financial literacy into mathematics education. These findings serve as a valuable reference for selecting and designing relevant financial literacy content that can be seamlessly integrated into the school curriculum.

CONCLUSION

This study investigates the financial literacy activities of upper-grade elementary school students aged 10 to 12 years, examining their understanding of various financial concepts and personal experiences within their daily lives. The research specifically highlights students' financial habits, shaped by their family environments, and their comprehension of money-related concepts such as currency denominations, online transactions, purchasing behaviors at school canteens, and pocket money management. The study also explored topics such as savings, investment in gold, insurance, online loans, taxes, and bank service fees. The findings underscore the relevance of financial literacy education in shaping students' understanding of financial concepts from an early age, enabling them to make informed financial decisions in their daily lives.

Despite the valuable insights gained, this study has several limitations. The scope of the research was limited to a specific age group (10 to 12 years old), and the sample size may not fully represent the diverse financial literacy experiences of students from different socio-economic backgrounds. Additionally, the study focused on understanding financial habits within family environments, but it did not explore the broader impact of external influences, such as peers or media, on students' financial literacy.

The research also primarily relied on qualitative data, which, while rich and insightful, may not capture the full spectrum of financial literacy levels across a larger population. These limitations suggest that further studies could address these gaps by including a more diverse sample and exploring the broader societal and external factors influencing financial literacy.

In light of these limitations, future research should focus on developing and testing practical learning activities that can be integrated into elementary mathematics classrooms to further enhance students' financial literacy skills. Research could also explore age-appropriate strategies for teaching financial planning and management, ensuring that students are equipped with the tools to manage money effectively. Furthermore, studies could investigate the role of digital literacy in financial education, given the increasing use of online platforms for financial transactions. By expanding the scope of research to include diverse populations and incorporating various learning strategies, future studies can provide more comprehensive frameworks for integrating financial literacy into elementary education, helping students build a solid foundation for their financial futures.

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