

Support For Generative Artificial Intelligence (GAI) Assessment in Malay Language Teaching through Financial Literacy Knowledge and Management

Siti Haryanti Osaman, Mohd Effendi @ Ewan Mohd Matore*

Faculty of Education, National University of Malaysia, Selangor, Malaysia

Email: P147924@siswa.ukm.edu.my, effendi@ukm.edu.my

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Abstract

Generative Artificial Intelligence (GAI) is increasingly influencing teaching and assessment practices in Malay language education. However, effective use of GAI requires students to possess adequate financial literacy, particularly in managing access to digital tools, platforms and learning resources. Financial literacy refers to the knowledge, skills, and ability to make informed and responsible financial decisions. Students with stronger financial literacy are more capable of selecting appropriate GAI tools and using them effectively for learning and assessment purposes. Despite its relevance, the conceptual relationship between financial literacy and GAI supported assessment in Malay language education remains underexplored. Therefore, this concept paper aims to examine issues related to students' financial literacy in Malaysia and its potential role in supporting GAI based assessment. A qualitative approach was used through narrative analysis of ten selected documents to understand students' financial knowledge and management practices. The findings indicate that financial literacy is associated with positive financial behaviors, including saving and budgeting. Furthermore, three strategic approaches are proposed to strengthen financial literacy as a supporting factor for GAI assessment. These insights may assist educational institutions and policymakers in developing structured financial literacy initiatives to enhance responsible and effective GAI use in Malay language assessment.

Keywords: Assessment, Financial Literacy, Generative Artificial Intelligence, GAI, Malay Language

Introduction

UNESCO defines digital literacy as the ability to access, understand, evaluate, and create information safely using digital technologies, enabling individuals to think critically and use digital tools responsibly (UNESCO, 2025). Literacy is a continuous learning process that enables individuals to achieve their goals, develop their knowledge and potential, and participate fully in society (Chew Fong Peng & Saidatul Aliah Amir, 2023). Financial literacy can be understood as the ability to manage financial resources effectively through informed

decision-making. In addition, financial literacy refers to the ability to understand and use basic financial skills such as money management, budgeting, and investing. From the past until now, financial literacy has been very important for society in Malaysia in facing various financial challenges such as daily expense management, tuition fees, and financial loans.

In the context of students at Institutions of Higher Learning, if students are capable of managing their finances wisely, this can help them reduce financial stress while studying. Md Zeni et al. (2021) explain that most students have the ability and a positive perception of financial management and recognize its importance in life. Despite the growing emphasis on financial literacy and digital competencies, current educational research tends to treat these domains separately. In reality, the rapid advancement of Generative Artificial Intelligence (GAI) has transformed students from passive recipients of information into active decision-makers who must evaluate, select and utilize digital tools responsibly. Without adequate financial literacy, students may lack the ability to make informed decisions regarding the use of AI technologies, potentially leading to ineffective learning practices and misuse of digital resources. This issue becomes more critical when considering the financial decision-making challenges faced by students.

Moreover, there are still a small number of students who are weak in managing their personal finances. This is evidenced in Abdul (2020) study, which reported that the lack of financial literacy and awareness among students can lead to weaknesses in financial management and decision-making. To address the high level of financial mismanagement among students, this issue is further exacerbated by the rising cost of living and insufficient financial literacy (Jamlus Rafdi et al., 2023). This indicates that financial knowledge or literacy is the understanding of money and its use in daily life. Furthermore, students' competence in managing finances has a positive relationship with financial management practices (Zulkefly & Mohd Rosdi, 2022). With the increased access to financial instruments and digital banking, society needs to be equipped with sufficient financial literacy to make informed decisions and avoid unwanted financial risks. Financial literacy encompasses knowledge and practices to help students manage personal finances, especially in the context of high living costs.

Contemporary society increasingly relies on GAI to support teaching, learning, and assessment processes in educational institutions, as the technology can enhance feedback, automate content generation, and reshape assessment practices (Giannakos et al., 2025). However, the integration of GAI in language assessment, particularly in Malay language contexts, remains limited and requires further research and competency development (Cui et al., 2025). However, existing studies have largely focused on the technical and pedagogical aspects of AI integration, with limited attention given to the role of financial literacy as a supporting competency in AI assisted assessment. This creates a significant research gap, as students are required not only to understand AI outputs but also to make strategic decisions regarding access to platforms, evaluation of digital tools, and responsible usage, all of which are closely linked to financial literacy.

The Malay language is distinctive and functions as an important linguistic identity and medium of communication within Malaysia and the wider Malay Archipelago, supporting unity and intercultural interaction among diverse communities (Nor et al., 2022). Furthermore, the Malay language has evolved through multiple historical stages, from

Proto-Malay to modern Malay, reflecting its dynamic linguistic development (Abdul Wahab, 2024). This continuous evolution presents challenges for integrating artificial intelligence technologies, particularly in language evaluation and assessment contexts. To support GAI in the assessment of the Malay language, individuals require strong financial literacy knowledge and management skills, particularly in understanding digital systems, evaluating information, and making informed decisions in AI supported learning environments (Kasneci et al., 2023; Dwivedi et al., 2023).

The integration of AI into educational assessment increasingly enables self-assessment and peer assessment through automated feedback and intelligent evaluation systems, which require learners to possess adequate literacy and critical decision making competencies (Holmes et al., 2019; Zawacki-Richter et al., 2024). Financial literacy contributes to the development of analytical thinking, responsible technology use, and informed judgement, which are essential when interacting with AI-generated content and digital assessment tools (Morgan et al., 2019; Aassouli & Ahmed, 2023). Therefore, this concept paper discusses the knowledge and practices of financial literacy management within the community and examines the extent to which strong financial literacy knowledge and management can support the effective and ethical use of GAI in Malay language assessment. This discussion is expected to provide guidance to educational institutions and policymakers in designing more effective financial and digital education programs that align with the rapid advancement of AI-based educational assessment (Tlili et al., 2023).

Therefore, this study is significant as it provides a conceptual understanding of how financial literacy can function as a foundational competency in supporting the effective and ethical use of GAI in Malay language assessment. The findings are expected to benefit educators in designing meaningful AI-integrated assessments, assist students in developing critical and responsible technology usage, and support policymakers in strengthening the integration of financial and digital literacy within educational frameworks.

The outlined objectives of the study is:

- a) Exploring the issue of financial literacy knowledge among students in Malaysia.
- b) Exploring the issues of financial literacy management practices for students in Malaysia.
- c) Proposing strategies for financial literacy in supporting Generative Artificial Intelligence (GAI) for the assessment of the Malay language.

Related Model

Financial Planning Integration Model (FPIM)

The selection of these models is based on their relevance in explaining both financial decision-making behavior and ethical considerations in AI-supported assessment environments. One of the financial planning models is the Financial Planning Integration Model (MIPK), by Chieffe and Ganas K. Rakes (1999). MIPK uses a 2x2 matrix to explain the position of the individual financial planning field based on two main elements: terms and reality. The time period, which is on the horizontal axis, is divided into the current period and the future period. Meanwhile, the existence of financial matters on the vertical axis is divided into planned and unplanned financial matters. This matrix helps to illustrate and understand various positions in individual financial planning. This model identifies four main aspects of financial planning, namely, money management, emergency planning, goal-oriented investing, and transfer

planning. Money management emphasizes the need for individuals to manage expected financial matters in the current timeframe. This model offers a simultaneous economic level in all forms of conflict within this group, but is useful for investors and financial planners participating in free finance, and also covers a wide and expanding field of investment that can be practiced personally and in family finances (Chieffe & Rakes, 1999).

The financial planning model		
	Current period	Future period
Planned financial events	<u>Money management</u>	<u>Investing for goals</u>
	Budgeting ^a Income Living expenses Savings Credit	Investment planning ^a (education planning ^a and other LT or IT goals): Stocks and bonds Mutual funds Real estate
Unplanned financial events	Income tax planning ^a : Gifts Taxes	Retirement planning ^a : Pension funds IRAs & annuities 401Ks and 403Bs
	<u>Emergency planning</u>	<u>Transference planning</u>
	Risk Management ^a : Emergency fund Line of credit Insurance: Property Health Liability	Estate planning ^a : Wills Tax planning Trusts Life insurance Business agreements Charitable bequests

^a Major areas as defined by the CFP Board.

Fig 1 The financial planning model (Chieffe & Rakes, 1999).

Artificial Intelligence Ethics Model by Laine, Minkkinen & Mäntymäki (2025)

This study is based on the Artificial Intelligence Ethics Model by Laine, Minkkinen & Mäntymäki (2025), which emphasis’s six main principles to ensure the ethical use of technologies such as Generative Artificial Intelligence (GAI) in the context of education, particularly in assessment (Laine et al., 2025). This model serves as the foundation for constructing the conceptual framework of this study because it encompasses a broad dimension that is relevant to teachers' needs in evaluating and applying technology responsibly (UNESCO, 2023). Respect for intellectual property refers to the need to ensure that content generated using AI technologies does not violate copyright, ownership rights or involve plagiarism without proper attribution (Dwivedi et al., 2023). In the context of education, teachers must be aware of the limitations of AI-generated content and guide students to uphold academic integrity and originality in their assignments (Kasneji et al., 2023). The principle of truthfulness emphasizes that information generated or supported by AI must be accurate, reliable, and verifiable. Teachers therefore need the ability to critically evaluate AI-generated information and prevent the dissemination of inaccurate or misleading content during teaching and assessment processes (Tiili et al., 2023).

Robustness refers to the stability, consistency, and reliability of the AI system used in educational environments. AI systems applied in assessment must demonstrate dependable performance, transparency, and resilience to errors to ensure fairness and accuracy in evaluating student learning outcomes (Daly et al., 2021; OECD, 2025). Teachers therefore need to ensure that the technology used is reliable and does not introduce bias,

inconsistency, or unintended risks that may compromise assessment validity and student learning (Laurie, 2023). Detection of misuse refers to the capability to identify unethical or inappropriate use of AI, such as data manipulation, academic dishonesty, or misuse of AI tools during assessments. Recent studies highlight that generative AI can be exploited for cheating or producing unauthorized academic work, requiring educators to implement monitoring strategies, ethical guidelines, and digital literacy interventions (Cotton et al., 2024). Human-centered design emphasizes that AI technologies should be developed and implemented with careful consideration of human needs, values, and well-being. In educational settings, AI should support teachers' professional judgement and enhance student learning rather than replace human interaction, pedagogical relationships, and ethical responsibility (UNESCO, 2023).

Sociocultural responsibility refers to awareness of the social, cultural, and ethical implications of technology use in educational settings. Artificial intelligence systems may reflect biases embedded in their training data, which can influence fairness, inclusivity, and representation in educational assessment, particularly in language-based contexts closely linked to culture and identity (Bender et al., 2021). Teachers must therefore ensure that the use of AI aligns with educational values, cultural sensitivity and ethical teaching practices to avoid reinforcing inequities or misrepresentations in student assessment (Zawacki-Richter et al., 2024). By utilizing this model as a conceptual framework, this study aims to develop an instrument to assess teachers' understanding of the ethical use of GAI in Malay language assessment. These six ethical principles will serve as the main constructs in the development of questionnaire items and provide a theoretical foundation for analyzing findings and proposing improvements in teacher professional development related to ethical AI integration in educational assessment (Dwivedi et al., 2023),

Methodology

This study uses a narrative literature analysis approach to identify and discuss issues related to financial literacy knowledge and practices, as well as its relationship with the use of Generative Artificial Intelligence (Gen-AI) in the assessment of the Malay language. The narrative approach is suitable for synthesizing and critically interpreting findings from various previous studies, particularly in rapidly developing fields that involve the integration of multiple disciplines such as education, technology, and financial literacy (Creswell & Creswell, 2018). The selection of articles was conducted through a systematic search using several major academic databases such as ScienceDirect and Google Scholar. The keywords used include financial literacy, financial literacy in education, digital literacy, artificial intelligence in education, AI and assessment, dan technology-supported assessment.

The selected articles meet several inclusion criteria, namely: (i) published between 2019 and 2024 to ensure relevance to current developments; (ii) peer-reviewed journal articles; (iii) focused on financial literacy, education, or the use of technology and artificial intelligence in the context of learning or assessment; and (iv) written in English or Malay. Articles that are not directly related to the context of education or do not discuss aspects of financial literacy or technology are excluded from the analysis. A total of ten of the most relevant journal articles were selected after the screening process based on the title, abstract and full content of the articles. The selection of ten articles was deemed sufficient to provide an in-depth

conceptual understanding, as the study focuses on thematic synthesis rather than statistical generalization.

Each article was analyzed in depth to identify the main themes, issues, challenges and implications related to the level of knowledge, financial literacy practices, and the role of technology in supporting the learning and assessment process. The analysis involved coding key themes, identifying recurring patterns, and conducting inductive thematic classification to synthesize findings across studies and construct a conceptual linkage between financial literacy and AI-supported assessment. This approach enables the construction of a comprehensive conceptual understanding and supports the proposal for the integration of financial literacy in the context of technology-based education.

Findings and Discussion

The analysis of past studies related to financial literacy highlights several issues, namely the financial knowledge and practices of students in Malaysia.

First objective finding: Exploring the issue of financial literacy knowledge among students in Malaysia.

Researcher	Year	Exploration of financial literacy knowledge issues
Jamlus Rafdi et al	2023	Although students have a positive attitude toward financial management, they still face challenges such as rising prices of goods and spending freedom. Knowledge and skills in financial management are important to help them plan their finances better.
Baba et al.	2022	The increasing cost of living and the need to work part-time disrupt students' academic focus and negatively affect their performance. Therefore, good financial management and financial literacy knowledge are important to help students overcome financial problems and pressure.
Nurul et al.	2019	Low financial literacy levels are associated with a lack of financial education, highlighting the need for early financial education to improve literacy.
Ruslan & Sapir	2021	Basic financial knowledge is important for Gen-Z to engage in higher-risk investments and better financial planning.
Md Zeni et al.	2021	Students need to pay attention to spending patterns and better financial planning to manage financial problems in the future.
Abdul	2020	Although students show interest in learning financial knowledge, they require deeper exposure through courses that should be offered to all students. This is important to ensure students can make accurate financial decisions and avoid financial problems in the future.

Based on these findings, it is clear that although students face various financial challenges that affect their well-being, there remains an interest and positive outlook towards financial management. All six journals indicate a lack of early financial education, emphasizing the need for further exposure to financial literacy. If there is no knowledge in managing finances, they will face financial problems due to the rising cost of living. This puts significant pressure on them and disrupts their academic performance. A basic understanding of finance is important to help students plan their finances effectively, participate in investment activities,

and avoid future financial problems, as financial literacy has been shown to improve investment decision-making, financial planning, and long-term financial outcomes (Wang et al., 2024). Furthermore, structured financial education programs, including formal courses and training, are essential to strengthen financial knowledge, confidence, and decision-making skills, ultimately supporting individuals' lifelong financial well-being. (Salas-Velasco, 2022). These findings suggest that financial literacy is not only associated with financial outcomes but also plays a critical role in shaping students' cognitive readiness to engage with AI-supported learning environments.

Second objective finding: Exploring the issues of financial literacy management practices for students in Malaysia.

Researcher	Year	Exploration of financial literacy management practices issues
Rafidah & Nuraisyah Alia	2024	Good financial management practices help prevent future financial problems and improve financial stability and well-being.
Baba et al.	2023	Although students have a positive attitude toward financial management, financial management practices are important to help them plan their finances more effectively.
Zulkefly & Mohd Rosdi	2021	The study found a positive relationship between financial capability and financial management practices, although the relationship was at a moderate level.
Noranizah Johari, & Dicky Wiwattan Toto Ngadiman	2024	Although students are already somewhat effective, there is a need for further exposure to financial management through internal and external courses. This highlights the importance of financial education in helping students achieve lifelong financial well-being.
Hairunnizam Wahid & Siti Aisyah Zahari	2020	Most students do not plan their spending well due to the perception that money is easily obtained through financial support such as scholarships and loans.

For the issue of financial literacy management practices, the findings show that good financial management is an important factor in ensuring financial stability and well-being, especially for students. While there is a positive awareness of financial management, poor financial practices still affect students' ability to manage their finances effectively. Exposure to financial education through courses and support programs can help students improve their financial management practices. Therefore, they will be able to avoid financial problems in the future, ensuring stability and well-being while fostering a stronger financial culture among the younger generation.

First objective finding: Proposing strategies for financial literacy in supporting Generative Artificial Intelligence (Gen-AI) for the assessment of the Malay language.

The strategy of integrating financial literacy into the assessment of the Malay language using Generative Artificial Intelligence (Gen-AI) demands a balance between language skills and the wisdom of managing digital resources. These strategies are derived from the synthesis of literature and aligned with current educational practices integrating AI and financial literacy competencies. Here are the five strategies:

The first strategy, teachers can implement essay writing assessments guided by budget simulations through AI prompts. Students are required to input basic financial data into Gen-

AI tools like ChatGPT to generate spending scenarios, then they need to produce critical reviews or persuasive essays themed around spending priorities. This strategy not only tests financial vocabulary in Malay but also trains students to logically evaluate AI output based on financial literacy principles learned through official portal resources.

Secondly, the production of digital creative works (e-Books or Drama Scripts) themed around smart money management allows for project-based assessment. Students use Gen-AI as a brainstorming partner to outline a story plot that incorporates good financial values. The students' ability to edit the AI draft into a grammatically correct and soulful Malay language style demonstrates a high level of language proficiency and a deep understanding of the financial implications in everyday life.

Thirdly, the use of AI for the construction of interactive financial vocabulary modules can enhance grammatical aspects. Through prompt engineering techniques, students can ask AI to create dialogues of buying or investment situations within the context of Malaysian culture. Assessment is conducted when students correct the financial terminology errors generated by AI, thereby reinforcing their understanding of terms such as 'inflation', 'dividend', and 'liquidity' in the correct context according to the Malay Language Reference Center (PRPM).

Fourth, the strategy of critically analyzing digital financial advertisements using AI image or text generators can enhance user literacy. Students are assigned to generate examples of loan or investment advertisements using AI, then analyze the content to detect elements of language manipulation or financial scams. This assessment tests the students' speaking and listening skills while presenting their findings, in line with Bank Negara Malaysia's financial safety awareness initiative.

Fifth, teachers can use AI to personalize real-time financial assessment feedback. When students' complete assignments related to financial literacy, AI tools can be programmed to provide feedback on the accuracy of economic terminology used in Malay. This provides students with the opportunity to quickly reflect on their mistakes. Quality feedback helps students connect linguistic skills with real-world applications, ensuring they are financially and communicatively prepared in the digital era.

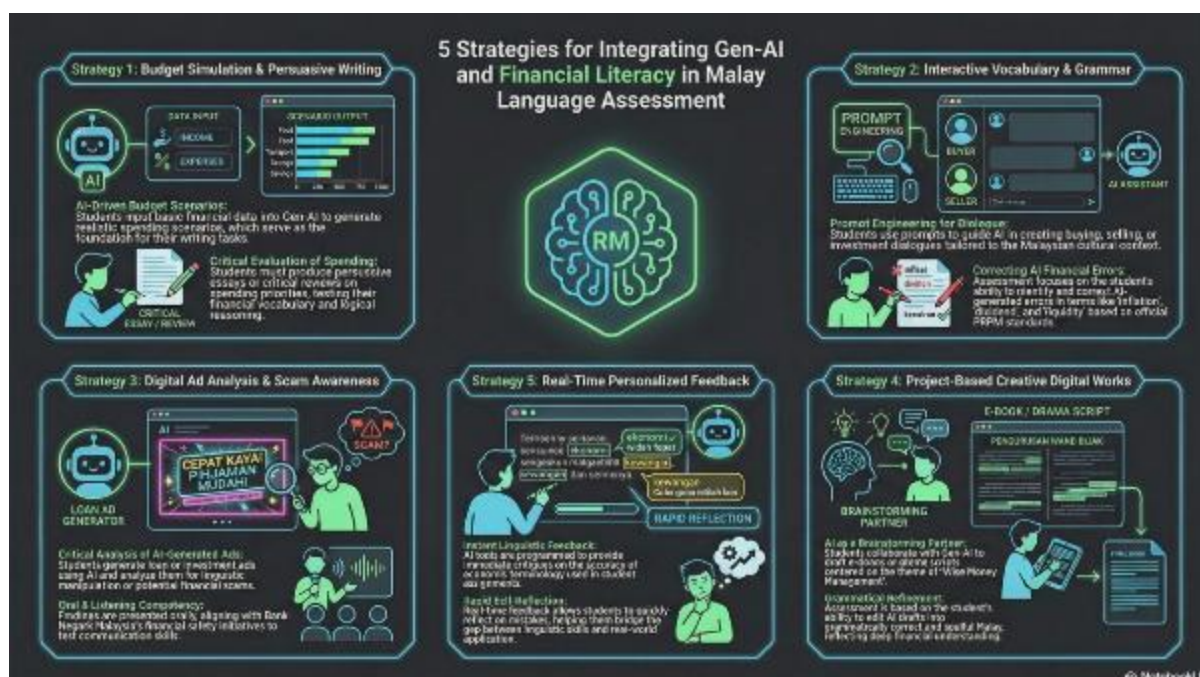


Fig 2 Strategies for financial literacy in supporting Generative Artificial Intelligence (GAI) for the assessment of the Malay language.

Conclusion

The research findings have explored the issues of knowledge and practices in financial literacy management among students in Malaysia. Among the main issues identified are the limited level of financial knowledge, weaknesses in budgeting, and the lack of exposure to systematic financial education through formal courses and practical training. Although students show interest and a positive attitude towards financial management, there is still a gap between knowledge and actual practice, particularly in making wise financial decisions and facing the challenges of rising living costs. This situation indicates that strengthening financial literacy is crucial to support financial well-being and long-term stability. More importantly, this study highlights that financial literacy should not be treated as an isolated skill, but as a critical competency in navigating AI-driven educational environments. Without sufficient financial literacy, students may be exposed to risks such as over-reliance on AI, poor decision-making in selecting digital tools, and superficial engagement with AI-generated content.

In the context of educational technology development, financial literacy also plays an important role in supporting the ethical and responsible use of Generative Artificial Intelligence (Gen-AI), particularly in the assessment of the Malay language. A good understanding of the concepts of management, planning, and information evaluation enables students to use technology more critically, make rational decisions, and avoid the misuse of technology in the learning and assessment process. Therefore, the integration of financial literacy along with digital literacy and AI literacy in the higher education system is crucial for shaping individuals who are not only technologically savvy but also capable of making ethical, rational, and responsible decisions in the era of artificial intelligence-based education. In practical terms, this study provides a useful reference for teachers in designing AI-supported assessment activities that integrate financial reasoning, ethical considerations, and language

proficiency. It also supports teachers' professional judgement in evaluating the appropriateness and reliability of AI-generated outputs in classroom assessment.

Additionally, strategic recommendations for financial literacy in supporting Generative Artificial Intelligence (Gen-AI) for Malay language assessment have also been obtained, such as teachers implementing essay writing assessments guided by budget simulations through AI prompts, the creation of digital creative works using AI for the construction of interactive financial vocabulary modules, and critical analysis strategies for digital financial advertisements using AI image or text generators. The integration of financial literacy within AI-supported assessment is considered effective because it simultaneously develops students' cognitive (decision-making), linguistic (Malay language proficiency), and technological (AI usage) competencies. This holistic approach ensures that students are not only capable of using AI tools but are also able to evaluate and apply them responsibly.

Based on issues in previous studies related to financial literacy, several recommendations have been implemented to address problems in student financial management. Among them, creating interactive modules using digital technology, such as financial simulation applications. Next, there needs to be an integration in the higher education curriculum, making financial literacy a mandatory course at universities. Finally, organizing programs for the local community such as financial literacy workshops to enhance understanding of financial management within the local community. With good financial literacy, the assessment of the Malay language with AI can be effectively implemented. Good financial knowledge and practices are closely related to more efficient financial management, including saving habits, budgeting, and prudent investing. Therefore, to enhance financial knowledge and practices among students, it involves all parties, namely students, parents, educational institutions, and the community.

At the policy level, the findings of this study can support curriculum developers and educational policymakers in integrating financial literacy, digital literacy, and AI literacy into a more comprehensive educational framework. This is particularly important in ensuring that students are well-prepared to function effectively in an AI-driven society. This is essential to minimize financial vulnerability among students and ensure sustainable financial well-being throughout their educational journey. Additionally, strategies to integrate financial literacy into the assessment of the Malay language using Generative Artificial Intelligence (Gen-AI) are greatly needed to support the balance between language skills and the wisdom of managing digital resources. AI requires investment not only in terms of skills but also in direct and indirect support. Future research should explore empirical validation of these conceptual relationships to further strengthen the practical implementation of financial literacy in AI-supported assessment contexts.

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