



Exploring the need for augmented reality in financial literacy materials for early childhood learners

Nurlaeli Fitriah¹, Luthfiya Fathi Pusposari², Sandy Tegariyani Putri³, Ferdinandus Arifin Sulaiman⁴, Herlina⁵

Correspondence:

nurlaily.fitriah@uin-malang.ac.id

Affiliation:

Department of Islamic Early Childhood Education, Faculty of Tarbiyah and Teacher Training, Universitas Islam Negeri Maulana Malik Ibrahim Malang, Indonesia¹

nurlaily.fitriah@uin-malang.ac.id

Department of Social Science Education, Faculty of Tarbiyah and Teacher Training, Universitas Islam Negeri Maulana Malik Ibrahim Malang, Indonesia²

luthfiya@pips.uin-malang.ac.id

Department of Islamic Early Childhood Education, Faculty of Tarbiyah and Teacher Training, Universitas Islam Negeri Maulana Malik Ibrahim Malang, Indonesia³

sandytegariyaniputri@uin-malang.ac.id

Department of Teacher Training of Early Childhood Education, Unika Santu Paulus Ruteng, Indonesia⁴

ferdinandussulaiman@unikastpaulus.ac.id

Community Education, Faculty of Education and Psychology Mandalika University⁵

herlina@undikma.ac.id

Abstract

This study explores the needs of Augmented Reality (AR) integrated in financial literacy materials for early childhood learners. Financial literacy is an essential life skill and introducing it at an early age can foster better decision-making and long-term financial well-being. However, existing financial literacy materials for young children are often limited to basic concepts such as money and spending. This research utilizes *The Define Stage* of the 4D model to assess current financial literacy understanding and identify key concepts that should be introduced to young learners. A series of analytical activities, including Front-End Analysis, Learner Analysis, Task Analysis, and Concept Analysis, were conducted with parents, teachers, and young children to gather data. The findings reveal that while children's understanding of money and spending is adequate, concepts like sharing remain underemphasized. Additionally, the study identifies that AR technology can provide an interactive learning for children and engaging learning experiences. The concept map developed in this study outlines essential financial literacy concepts, which can be further enriched through AR to promote a deeper understanding of topics like saving, decision-making, and distinguishing between needs and wants.

Keywords:

Need Assessment; Augmented Reality; Financial Literacy; Early Childhood

A. INTRODUCTION

More than 60% of adults worldwide don't understand the basics of simple financial concepts like compound interest, inflation, or investment risk. This is due to the increasingly complex global financial landscape, not only in developing countries but also in developed countries with sophisticated financial markets (Klapper & Lusardi, 2020). Many people don't realize the importance of financial literacy as a life skill. This skill is often overlooked and not considered a crucial competency that needs to be taught. They assume that an understanding of individual finances will emerge naturally without needing to be taught (Holkova et al., 2023).

Furthermore, another common misconception is that financial literacy isn't something that can be easily taught to individuals. This is because people assume that understanding finance requires a specific field of study, requiring specialized skills and interests, but not many people are interested in these areas (Lucaci & Năstase, 2023). They imagine having to study economics, accounting, and other related disciplines. For some people who aren't interested in these fields, this can be a complex matter.

Ironically, the roots of this low level of financial literacy often begin in childhood, a golden age rarely touched upon in systematic financial education. This fact highlights the urgency of instilling the fundamentals of financial literacy from an early age (Pyanova et al., 2025). Children are not only fast learners but also lifelong habit builders. Unfortunately, this period is often overlooked due to misunderstandings about when financial literacy is necessary.

Financial literacy constitutes an essential competency that significantly impacts the decision-making processes and overall financial well-being of individuals across their lifespan. The early childhood stage represents a pivotal interval for establishing the groundwork of financial comprehension, as it profoundly influences attitudes and behaviors regarding monetary matters and financial stewardship. Nevertheless, numerous early childhood education programs frequently neglect the incorporation of fundamental financial concepts, which may impede children's capacity to effectively manage financial issues as they mature.

The increasing acknowledgment of the significance of financial literacy among young children has prompted a heightened interest in the creation of suitable educational resources tailored to this demographic. With the progressions in educational technology, Augmented Reality (AR) has surfaced as a promising instrument to augment learning experiences. By supplying interactive and engaging methodologies for young learners, AR has the potential to render abstract concepts more concrete and comprehensible. However, a discernible gap persists in the integration of AR within financial literacy resources intended for early childhood education.

While individual approaches to using augmented reality (AR) media in early financial education exist, there is currently no systematic needs assessment that specifically examines the concrete requirements of preschool children regarding financial education with AR. For example, a study on the development of an AR financial education book for preschool children shows that media are indeed capable of development and receive positive feedback, but the needs of children and educators have not yet been fully systematically assessed (Murdy & Wilyanita, 2023; Sari et al., 2022; Suzanti et al., 2023).

This research explores the need for incorporating Augmented Reality into financial literacy programs for young children. Through comprehensive needs assessment, including front-end analysis, learner analysis, task analysis, and concept analysis, this study identifies the essential financial concepts that need to be introduced to early learners. The research also examines the current state of financial literacy education for young children and investigates educators' and parents' perspectives on the effectiveness and importance of financial literacy materials. By addressing the gaps in current financial literacy education for early childhood learners, this study aimed to contribute valuable insights into the potential of AR in enhancing children's financial understanding and promoting better financial decision-making from a young age.

B. METHODS

This research employs a systematic approach to explore the need for Augmented Reality (AR) in financial literacy materials for early childhood learners. The study adopted 4D Model as a primary framework, focused on define stage, to assess the needs of augmented reality and material of financial literacy for early childhood (Thiagarajan et al., 1974). The research design includes several key phases: Front-End Analysis, Learner Analysis, Task Analysis, Concept Analysis, and Specifying Instructional Objectives. Each phase was conducted to gather data on children's financial literacy needs, their understanding of financial concepts, and the appropriate instructional methods for introducing these concepts. The research design utilized a mixed-methods approach combining both qualitative and quantitative techniques to gather comprehensive data. Qualitative data was collected through open-ended surveys and interviews with teachers and parents, which provided insights into the current state of financial literacy education and the types of financial concepts that need to be addressed. Quantitative data was collected through a game-based assessment to evaluate children's initial understanding of financial literacy concepts.

Data collection involved several methods to ensure a holistic understanding of the learners' needs and the effectiveness of financial literacy materials. The key data collection methods included: 1) Surveys and Questionnaires: Surveys were administered to parents and educators to gather information on their perceptions of children's financial understanding and the media they prefer for learning. Open-ended questions were used to assess the concepts of money, income, spending, saving, and sharing; 2) Game-Based Assessment: A game-based approach was designed to assess the children's understanding of financial concepts. This interactive method aimed to engage the children while providing a clear measure of their financial literacy skills; 3) Literature Review: A comprehensive review of existing literature related to financial literacy for early childhood learners was conducted to inform the development of instructional content and AR integration. This review provided foundational knowledge for aligning the research with global best practices in early childhood financial education.

The participants in this study included early childhood educators (17), parents of children (32), and young learners (47) from a local early childhood education institution (TK Muslimat NU 2 Singosari Malang). The data obtained from surveys and questionnaires were analyzed using descriptive statistics to identify trends and patterns in the perceptions of parents and educators. Responses from the open-ended questions were coded and categorized to identify key financial literacy concepts that need to be addressed. The results of the game-based assessments were analyzed to determine the learners' initial financial understanding and their proficiency in key concepts such as money, income, saving, and sharing.

C. RESULT & DISCUSSION

Several analytical activities are conducted at this stage, including Front-End Analysis, Learner Analysis, Task Analysis, Concept Analysis, and Specifying Instructional Objectives. The analytical activities carried out in this study adopt one of the stages from the 4D model (Thiagarajan et al., 1974).

1) Front-End Analysis

Front-end analysis is conducted to identify the current conditions of the research subjects. In the context of this study, front-end analysis is performed to assess the level of financial literacy understanding among children and to determine whether the existing materials sufficiently provide children with an understanding. Data collection is carried out to obtain information related to this by surveying educators and parents of young children.



Figure 1: Teachers' perceptions of children's financial understanding

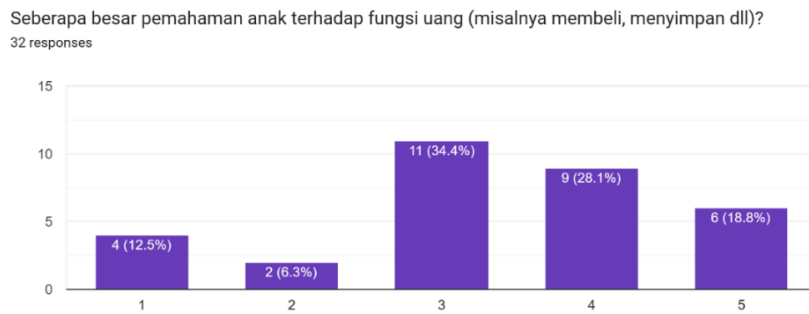


Figure 2: Parents' perceptions of children's financial understanding.

Figures 1 and 2 show that, according to teachers and parents, children's understanding of finance predominantly falls under the 'sufficient' category, with percentages of 29.4% and 34.4%, respectively. This indicates that both teachers and parents consider children's understanding of financial concepts to be adequate.

Meanwhile, data regarding the sufficiency of the content covered with the students was obtained through a questionnaire addressed to teachers and parents. The data gathered from the questionnaire, which included an open-ended question, 'Please specify the boundaries of children's understanding of money concepts,' revealed four important concepts that should be conveyed to children, although with varying response frequencies: 1) the concept of money (25.00% from 32 parents), 2) the concept of spending/using money (46.88% from 32 parents), 3) the concept of saving (21.88% from 32 parents), and 4) the concept of sharing (9.38% from 32 parents).

In contrast, responses from teachers identified two key concepts that should be conveyed to children: 1) the concept of money (52.94% from 17 teachers), and 2) the concept of spending/using money (35.29% from 17 teachers).

Below is a summary of the open-ended question regarding the boundaries of children's understanding of money concepts:

Tabel 1. Summary of the open-ended question regarding the boundaries of children's understanding of money concepts

No	Concept	Parents (32)	Teacher (17)
1.	Money and income	25,00%	52,94%
2.	Spending	46,88%	35,29%
3.	Saving	21,88%	-
4.	Sharing	9,38%	-

Source : Analyzed Data

This indicates that important concepts have been identified by both parents and teachers as crucial to be taught to the students. However, when examining the percentage of responses for each concept, there is considerable variation, with the concept of sharing receiving the lowest response and still not being considered an important concept by parents. In fact, the concept of sharing has not yet been recognized as something that needs to be taught by teachers. This aligns with the findings shown in Figures 1 and 2, as the scope of the material, according to the overall opinions of both parents and teachers, is mainly limited understanding money and how to spend it.

2) Learner Analysis

Leaner analysis is an analysis conducted to identify and understand the characteristics of the learners who will be the users of this development product. In the context of this research and development, the analysis aims to gather information regarding the learners' prior

knowledge, attitudes towards financial literacy, and the media most preferred by children. Data collection was carried out through a questionnaire to assess the characteristics of the children, gathered from educators and parents.

Data on the learners' understanding of finance was obtained through a test designed using a game-based approach (game-based assessment). The data processing results show the initial capabilities of the learners as follows:

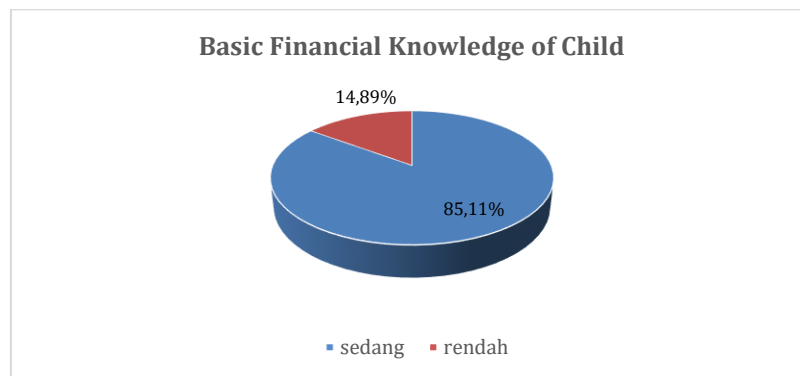


Figure 3: Description of the learners' initial understanding.

Figure 3 shows that, overall, the learners' initial financial understanding falls into the low (14.89%), moderate (85.11%), and high (0.0%) categories. None of the learners fall into the high category. This information aligns with the data provided by teachers and parents in Figures 4.1 and 4.2. The average knowledge score of the learners based on the test results is 56.43.

Figure 4 displays the average financial knowledge score of the learners at TK Muslimat NU 2 Singosari Malang, broken down by financial indicators/concepts for early childhood

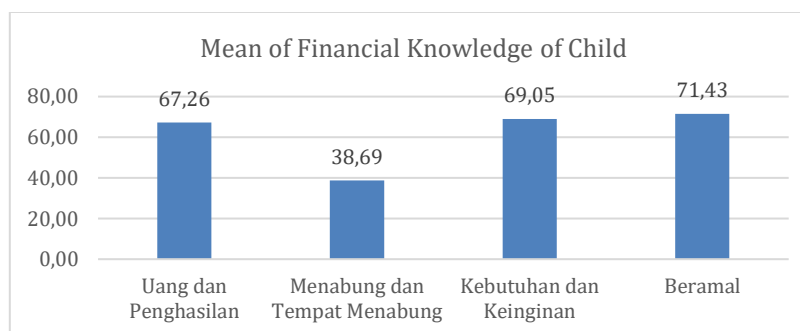


Figure 4: Description of the learners' initial understanding by indicator

In addition to exploring the learners' prior knowledge, information about the media most preferred by children for learning was also obtained from surveys conducted with parents and teachers. Figures 5 and 6 illustrate the perceptions of parents and teachers regarding the media preferred by children for learning.

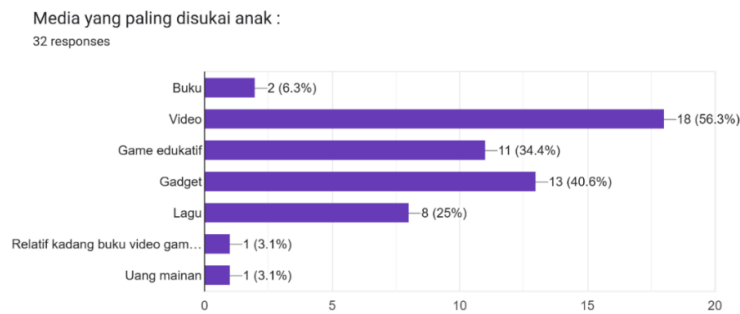


Figure 5: Parents' perceptions of the media are most preferred by children for learning.

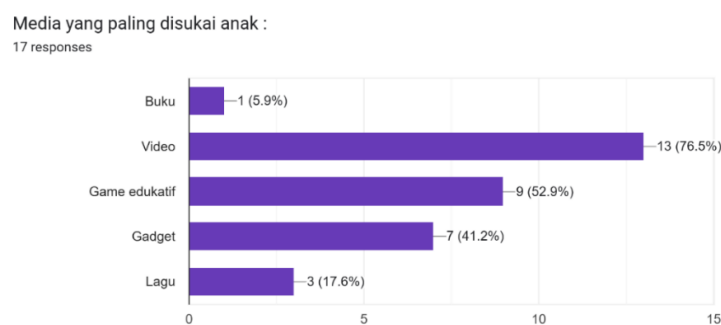


Figure 6: Teachers' perceptions of the media are most preferred by children for learning.

3) Task Analysis

Task analysis is conducted to identify the skills (scope of material) that are necessary and should be included in the product to be developed. In the context of this study, it involves identifying the scope of basic financial literacy content that is appropriate for children and should be learned by them.

Data collection for this analysis was carried out through a survey using a questionnaire targeted at educators. Additionally, the researcher conducted a literature review related to the scope of financial literacy material, which will serve as a reference for developing the content in the product.

The results of the data collection were then processed and can be presented as follows:



Figure 7: Task analysis based on teachers' opinions.

The results of the survey based on the opinions of the teachers serve as a consideration for the research team in determining the skills that students should acquire after using the developed product.

The next step involves the research team conducting a review of references related to financial literacy for early childhood. There are two primary references used in this study that are related to financial literacy content for young children. The first reference is an article written by Holden and colleagues (2017). This article states that financial literacy content for preschool children includes the following concepts: numbers, thinking about the future (time), money and income, markets and exchange, financial institutions, decision-making skills (choice), social values, and exchange and value (Holden et al., 2017).

Next, this financial literacy concept is simplified in the second reference used by the research team, which is the book titled *Menumbuhkan Literasi Keuangan Pada Anak Usia Dini* (Otoritas Jasa Keuangan, 2020) into the following:

- Knowledge of the concept of money and the ability to recognize various types of money.
- Knowledge of the uses of money in daily life and the ability to differentiate between needs and wants.
- Knowledge and skills to save money for future use.
- Awareness of sharing with others or friends in need.

4) Concept Analysis

At the concept analysis stage, a concept map was developed to connect relevant and important financial literacy topics that should be introduced to young children. The creation of this concept map was based on the literature review conducted in the previous stage, as well as the results of the earlier survey. The main concepts outlined in the concept map are as follows:

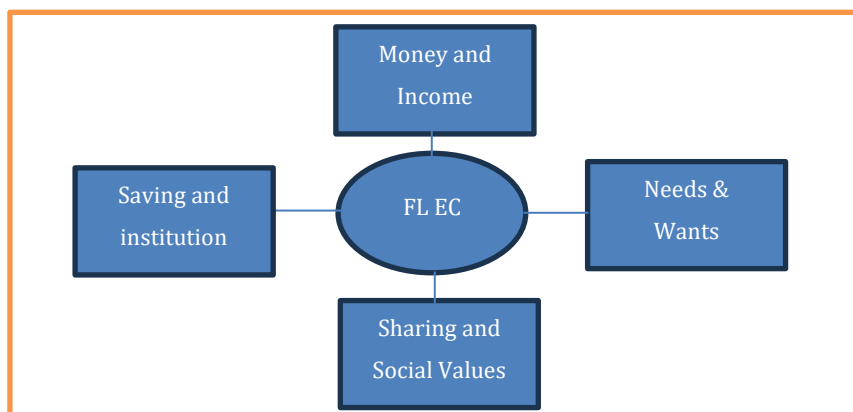


Figure 8: Concept map of children's financial literacy (Holden et al., 2017; Otoritas Jasa Keuangan, 2020).

5) Specifying Instructional Objectives

At the concept analysis stage, a concept map was developed to connect relevant and important financial literacy topics that should be introduced to young children. The creation of this concept map was based on the literature review conducted in the previous stage, as well as the results of the earlier survey. The main concepts outlined in the concept map are as follows:

- a) After being introduced to the concepts of money and income, children are able to recognize and correctly identify various types of money (coins and paper money) and income.
- b) After being introduced to the concepts of saving and saving methods, children can explain the concept of saving and correctly identify ways and places to save.
- c) After being introduced to the concept of the uses of money, children are able to understand the uses of money and correctly distinguish between needs and wants.

- d) After being introduced to the concept of sharing, children are able to recognize and demonstrate sharing behavior correctly.

Through comprehensive needs assessment, this research provides valuable insights into the existing state of financial literacy education for young children, as well as the potential role of AR in enhancing financial learning experiences. The findings from the surveys and game-based assessments revealed that, while a majority of both parents and educators perceive children's financial understanding to be at a sufficient level, there are still considerable gaps in knowledge, particularly regarding the concept of sharing. The data from Figures 4.1 and 4.2 indicate that although concepts such as money, income, and spending were well recognized, the concept of sharing received significantly lower emphasis. This finding aligns with the overall results, where none of the children achieved a high level of financial understanding, highlighting the need for targeted educational interventions.

The results also suggest that both parents and educators see financial literacy as a critical skill but remain focused primarily on basic concepts such as money and spending. Teaching only basic financial literacy concepts, such as money and spending, at the preschool level can limit children's understanding of broader financial principles, hindering their ability to make informed decisions and develop healthy financial habits necessary for future economic well-being (Birbili & Kontopoulou, 2015; Sajid, 2024). This supports the notion that early financial education should include broader topics like saving, decision-making, and the social implications of money. The concept of sharing, despite its importance in fostering social and moral values, was largely underemphasized in the educational material and practices currently available.

The integration of AR in financial literacy education could provide significant benefits. By making abstract financial concepts more tangible and engaging, AR has the potential to enhance children's understanding and retention of financial knowledge. The interactive nature of AR could make learning about financial concepts more dynamic, fostering better engagement among young learners (Wu et al., 2024). Moreover, AR-based content could help bring real-world financial scenarios into the classroom in a way that is accessible and enjoyable for children (Cahyaningtyas, 2020; Egunjobi & Adeyeye, 2024; Sathyapriya et al., 2024). Although the current material covers essential financial concepts, such as money and income, the addition of AR could further enhance the learning experience by allowing children to visualize and interact with these concepts in a meaningful way. For example, AR could bring to life the concept of saving by simulating scenarios where children "save" virtual money in an engaging environment, teaching them the value of delayed gratification and future planning.

The task analysis results, which were based on teacher feedback, highlighted the need for financial literacy content that is both developmentally appropriate and comprehensive. The concept map (Figure 4.8) developed during the concept analysis stage effectively connected various financial literacy topics such as money, spending, saving, and sharing. This visual representation of the content provides a clear roadmap for developing financial literacy materials for young children, which can be further enhanced by AR technology (Fitriah, 2023; Holden et al., 2017; Otoritas Jasa Keuangan, 2020). The results from both the task analysis and concept analysis also emphasized the importance of teaching children to differentiate between needs and wants, as well as understanding the value of money and the role it plays in everyday life. These foundational concepts are crucial for building financial competence and helping children make informed financial decisions as they grow older.

By capturing the actual needs, interests, and cognitive abilities of children, as well as the pedagogical requirements of teachers, learning content, forms of interaction, and visual representations can be precisely tailored. This not only enables age-appropriate teaching of fundamental financial skills but also promotes the acceptance and effectiveness of AR applications in educational contexts. In the long term, such an analysis contributes to the development of evidence-based design guidelines and practical models that sustainably support the use of AR as an innovative medium for early childhood financial education.

D. CONCLUSION

The need for better financial literacy instruction is crucial for children. Understanding the scope of the material, explored through various related references and survey results, provides valuable information to align it with the characteristics of early childhood. While there is a gap between theories and the facts in society regarding the scope of the material, a thorough needs analysis can be used to address these gaps. A needs analysis using the 4D model approach yielded basic financial concepts needed by early childhood, including: 1) money and income, 2) saving and where to save, 3) needs and wants, and 4) sharing.

This approach not only explored the scope of the financial literacy material but also explored the need for the use of augmented reality as an initiative to introduce financial literacy to early childhood. Theoretical research and survey results revealed that the use of augmented reality is an innovative option. AR technology can present real-life situations, providing opportunities for children to learn more interactively.

The task analysis and concept analysis conducted in this study revealed that a comprehensive approach to financial literacy is crucial for children. The development of materials that produce basic literacy concept maps for early childhood serves as a tool for creating financial literacy materials, which can be further enhanced through AR technology to support the development of critical financial skills.

REFERENCES

- Birbili, M., & Kontopoulou, M. (2015). Financial Education for Preschoolers: Preparing Young Children for the 21st Century. *Childhood Education*, 91(1), 46–53. <https://doi.org/10.1080/00094056.2015.1001670>
- Cahyaningtyas, A. S. (2020). Pembelajaran Menggunakan Augment Reality Untuk Anak Usia Dini Di Indonesia. *Jurnal Teknologi Pendidikan: Jurnal Penelitian dan Pengembangan Pembelajaran*, 5(1), 20–37. <https://doi.org/10.33394/jtp.v5i1.2850>
- Egunjobi, D., & Adeyeye. (2024). (PDF) Revolutionizing Learning: The Impact of Augmented Reality (AR) And Artificial Intelligence (AI) on Education. *ResearchGate*. <https://doi.org/10.55248/gengpi.5.1024.2734>
- Fitriah, N. (2023). *Pengembangan media pembelajaran menggunakan self-organized learning environment model berbasis gamifikasi untuk meningkatkan literasi finansial anak usia dini / Nurlaeli Fitriah* [Doctoral, Universitas Negeri Malang]. <https://repository.um.ac.id/349860/>
- Holden, K., Kalish, C., Scheinholz, L., Dietrich, D., & Novak, B. (2017). *Financial Literacy Programs Targeted on Pre-School Children*: 52.
- Holkova, B., Malichova, E., Falat, L., & Pancikova, L. (2023). Determinants of Tax Ethics in Society: Statistical and Logistic Regression Approach. *Mathematics*, 11(10), Article 10. <https://doi.org/10.3390/math11102341>
- Klapper, L., & Lusardi, A. (2020). Financial literacy and financial resilience: Evidence from around the world. *Financial Management*, 49(3), 589–614. <https://doi.org/10.1111/fima.12283>
- Lucaci, A., & Năstase, C. (2023). Financial literacy and employment: An overview and bibliometric analysis. *Journal of Financial Studies*, 14-Special-June(8), 129–150.
- Murdy, K., & Wilyanita, N. (2023). Media Interaktif Augmented Reality untuk Peningkatan Kemampuan Financial Literacy Anak Usia Dini. *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, 7(1), 211–224. <https://doi.org/10.31004/obsesi.v7i1.3795>
- Otoritas Jasa Keuangan. (2020). *Menumbuhkan Kecakapan Literasi Keuangan pada Anak Usia Dini*. Otoritas Jasa Keuangan.
- Pyanova, N. V., Stolyarova, E. A., Pyanov, R. R., & Kryzhanovskaya, O. A. (2025). Financial literacy as a key component of an educational strategy: Analysis and recommendations. *Proceedings of the Southwest State University. Series: Economics. Sociology. Management*, 14(6), 159–169. <https://doi.org/10.21869/2223-1552-2024-14-6-159-169>

- Sajid, M. A. (2024). Fostering financial literacy in children: A cornerstone for economic well-being. *Journal of Childhood Literacy and Societal Issues*, 3(1), Article 1. <https://doi.org/10.71085/joclsi.03.01.39>
- Sari, R. C., Aisyah, M. N., Ilyana, S., & Hermawan, H. D. (2022). Developing a Financial Literacy Storybook for Early Childhood in an Augmented Reality Context. *Contemporary Educational Technology*, 14(2), ep363. <https://doi.org/10.30935/cedtech/11734>
- Sathyapriya, J., Vedavalli, K., & Sree, S. (2024). Enhancing Engagement and Understanding in Education using Augmented Reality. *Journal of Information Technology and Digital World*, 6(3), 264–273. <https://doi.org/10.36548/jitdw.2024.3.005>
- Suzanti, L., Fitriyanti, N. S., Widjayatri, R. D., Soflianti, S. D., Utari, G. C., Bulan, D. V. C., Burairoh, S. A., & Fajriah, A. (2023). Development of a Financial Literacy Book, 'Good and Bad Character Augmented Reality,' for Early Childhood. *EduBasic Journal: Jurnal Pendidikan Dasar*, 5(1), Article 1. <https://doi.org/10.17509/ebj.v5i1.51996>
- Thiagarajan, S., Semmel, D. S., & Semmel, M. I. (1974). *Instructional Development for training teachers of exceptional children*. Indiana University.
- Wu, J., Jiang, H., Long, L., & Zhang, X. (2024). Effects of AR mathematical picture books on primary school students' geometric thinking, cognitive load and flow experience. *Education and Information Technologies*, 29(18), 24627–24652. <https://doi.org/10.1007/s10639-024-12768-y>