JPPIPA 12(4) (2026)

Jurnal Penelitian Pendidikan IPA

http://jppipa.unram.ac.id/index.php/jppipa/index

Development of Interactive Wordwall Games Based on Inquiry into Children's Mathematical Abilities in Kindergarten

Mellie Guspita Yanty[1], Rakimahwati[2*], Farida Mayar[2], Yaswinda[2]

[1] Master of Early Childhood Education Study Program, Faculty of Education, Universitas Negeri Padang, Padang, Indonesia.
[2] Early Childhood Education Study Program, Faculty of Education, Universitas Negeri Padang, Padang, Indonesia.

Received: January 31, 2026
Revised: March 10, 2026
Accepted: April 25, 2026
Published: April 30, 2026

Corresponding Author:
Rakimahwati
rakimahwati@fip.unp.ac.id

DOI: 10.29303/jppipa.v12i4.14470

Abstract: This study was conducted in response to the limited development of early childhood mathematical abilities, which is closely associated with the insufficient use of interactive and explorative learning media. The present research focuses on designing and evaluating an inquiry-oriented interactive wordwall game intended to enhance young children's mathematical competencies. The study employed a Research and Development framework using the ADDIE model, encompassing analysis, design, development, implementation, and evaluation phases. The participants involved 15 kindergarten children aged 5–6 years, while data were collected through expert validation, observation, questionnaires, and pre-test and post-test assessments. The findings reveal that the developed media achieved a very high level of feasibility, indicated by media and material validation scores of 96% and 92%, respectively. Practicality testing also demonstrated a very positive response from teachers and strong engagement from children. In terms of effectiveness, there was a substantial improvement in mathematical ability, reflected by an increase in average scores from 60.1% to 97%, with an N-Gain score of 0.91 categorized as high. These results suggest that combining interactive digital media with an inquiry-based approach can meaningfully support children's conceptual understanding and engagement. Therefore, the developed Wordwall-based learning media can be considered an effective and innovative tool for improving early childhood mathematics learning.

Keywords: Early childhood education; Interactive digital media; Inquiry-based learning; Mathematical skills; Wordwall

Introduction

Early Childhood Education (PAUD) is a strategic foundation in building the quality of human resources because at this stage there is rapid development in the cognitive, social, and emotional aspects of children. Theoretically, the early age period is known as the golden age which greatly determines the success of subsequent development, so appropriate, planned, and meaningful stimulation is needed (Amiliya et al., 2021; Aryani et al., 2020; Uce, 2017).

In the context of education policy in Indonesia, the implementation of the Independent Curriculum emphasizes child-centered, contextual, and oriented learning to strengthen literacy and numeracy from an early age (Arum et al., 2023; Supriyanto, 2025; Syafriana et al., 2025; Winarji et al., 2024).

Constructivistically, Piaget asserts that children build knowledge through active interaction with the environment, while Vygotsky emphasizes the importance of social interaction and scaffolding in the zone of proximal development to optimize learning (Aminah et al., 2025; Kurniati, 2025; Wahyuningsih et al., 2024; Wathon, 2024). Thus, learning in PAUD needs to be designed actively, exploratory, and based on direct experience in order to be able to develop children's thinking skills optimally.

One of the essential cognitive aspects of early childhood education is early math skills that include the introduction of the concepts of numbers, patterns,

How to Cite:
Yanty, M. G., Rakimahwati, Mayar, F., & Yaswinda. (2026). Development of Interactive Wordwall Games Based on Inquiry into Children's Mathematical Abilities in Kindergarten. *Jurnal Penelitian Pendidikan IPA*, *12*(4), 424–431. https://doi.org/10.29303/jppipa.v12i4.14470

geometry, measurement, and simple problem-solving. This ability plays an important role in forming a logical, systematic, and critical mindset from an early age (Delfia et al., 2019; Hayati et al., 2023; Nopiana et al., 2025; Papadakis et al., 2018; Sufa, 2022). However, various studies show that mathematics learning in early childhood still tends to be conventional, teacher-centered, and has minimal use of interactive media, so it is less able to stimulate children's active involvement (Puspita, 2024; Wahyuningsih et al., 2024; Yuliantina, 2020; Zulminiati et al., 2023).

This condition has an impact on low learning motivation and limited conceptual understanding of children's mathematical material (Alotaibi, 2024; Brezovszky et al., 2019; Chen et al., 2020). Therefore, learning innovations are needed that are able to integrate approaches that are in accordance with the characteristics of children's development and make optimal use of technology.

The use of interactive digital media based on games (digital game-based learning) is one of the effective alternatives in improving the quality of mathematics learning in early childhood. Empirically, game-based learning media is able to increase children's motivation, participation, and learning outcomes because it provides a fun and meaningful learning experience (Elhefni et al., 2023; Pan et al., 2022; Zunidar et al., 2025). Wordwall as one of the digital learning platforms offers various interactive features such as quizzes, matching, grouping, and challenge-based games that suit the child's learning characteristics (Al-Hassan et al., 2025; Dan et al., 2024; Hussein et al., 2022).

In addition, the integration of inquiry approaches in learning allows children to actively observe, question, explore, and discover concepts independently, thus improving conceptual understanding and critical thinking skills (Chen et al., 2023; Karademir et al., 2020; Putri et al., 2025; Susilawati et al., 2023). This approach is in line with constructivist theory which emphasizes that learning will be more effective if children are directly involved in the process of knowledge discovery.

Although various studies have shown the effectiveness of digital media and inquiry approaches separately, studies that integrate the two in the context of early childhood mathematics learning, particularly through the Wordwall platform, are still relatively limited, especially in the context of education in Indonesia. The results of initial observations at Nurul Ilmi Kindergarten, West Pasaman Regency, show that the mathematical ability of children aged 5–6 years is still in the low category, characterized by difficulties in recognizing the concepts of numbers, patterns, and simple geometry.

This is due to the use of monotonous learning methods and the limitations of interesting and interactive learning media (Az-Zahra et al., 2025; Kemala, 2023; Muliyadi et al., 2023; Munandar et al., 2024; Susanti et al., 2024). The gap between curriculum demands and learning practices in the field is a strong reason for the need to develop innovative learning media that can significantly improve the quality of mathematics learning.

Based on this description, this research was conducted with the aim of developing an inquiry-based interactive Wordwall game that is valid, practical, and effective in improving early childhood mathematics skills. This research is important because it makes a theoretical contribution to strengthening the integration between constructivism approaches and digital learning technology, as well as practical contributions in the form of alternative innovative learning media that can be used by PAUD educators.

In addition, this research also answers the actual needs in the field related to children's low mathematical ability and the limitations of learning media that support active learning, so that it is expected to be able to improve the quality of learning that is more meaningful, interactive, and child-centered.

Method

Research Time and Location

This research was carried out at Nurul Ilmi Kindergarten, West Pasaman Regency, West Sumatra. The research activities take place in odd semesters of the 2025/2026 school year, namely from July to August 2025. The selection of the research location was based on the results of initial observations which showed that the mathematical ability of children aged 5-6 years is still relatively low and the limited use of interactive learning media in the learning process. This condition makes the research location relevant as a context for the development of innovative technology-based learning media.

Research Methods

This research uses a Research and Development (R&D) approach which aims to produce products in the form of learning media and test the level of feasibility and effectiveness. The development model used is ADDIE (Analysis, Design, Development, Implementation, Evaluation) because it has a systematic and flexible structure in the development of technology-based learning products. The ADDIE model also allows evaluations to be carried out continuously at each stage of development so that the resulting products are more empirically tested.

The study subjects consisted of 15 children of group B aged 5–6 years who were determined using the total sampling technique, considering that the population

was relatively small and the entire subject met the characteristics of the study. In addition, this research also involves expert validators consisting of material experts, media experts, and linguists to assess the quality of the products developed.

This procedure refers to the steps in the ADDIE model research and development procedure as shown in figure 1.

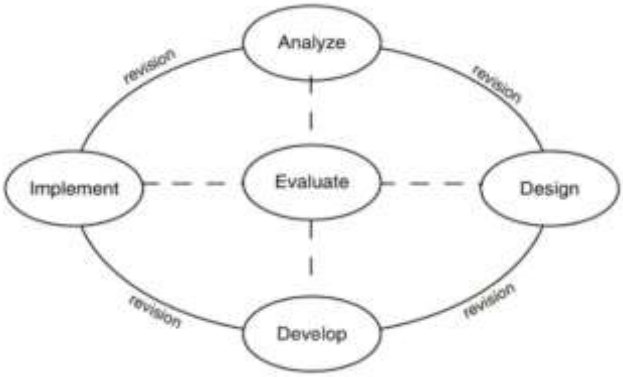

Figure 1. Research procedure

Research Stages

The research procedure refers to the stages of the ADDIE model which are described as follows:

Stages of Analysis

At this stage, an analysis of learning needs, characteristics of students, and mathematics learning conditions in the field was carried out. Data was obtained through observation and interviews with teachers to identify problems faced in early childhood mathematics learning.

Planning Stage

This stage focuses on designing learning media in the form of an interactive Wordwall game based on inquiry. The activities carried out include the preparation of indicators of children's mathematical ability, the design of the game flow, and the determination of material content that is in accordance with the developmental characteristics of children aged 5-6 years.

Development Stage

At this stage, learning media products are made and validated by experts. Validation includes aspects of material feasibility, media display, and language use. The validation results are used as a basis for revising and improving the product before testing.

Implementation Stage

The products that have been developed are then tested on a limited basis for children aged 5–6 years. At this stage, data collection related to the practicality of media use is carried out through teacher response questionnaires and observation of children's activities during the learning process.

Evaluation Stage

The evaluation stage was carried out to assess the effectiveness of media in improving children's mathematical skills. The evaluation was carried out through a comparison of pre-test and post-test results as well as an analysis of the achievement of children's math ability indicators.

Data Analysis

The data in this study were analyzed descriptively, quantitatively, and qualitatively. The data from expert validation and practicality were analyzed using percentage techniques and categorized based on product feasibility criteria. Effectiveness data were analyzed using the N-Gain test to determine the level of improvement in children's mathematical skills before and after the use of learning media.

In addition, a paired sample t-test analysis was carried out to test the significance of the difference between pre-test and post-test scores. The entire data analysis process is carried out with the help of Microsoft Excel software to ensure the accuracy of calculations and systematic data presentation. The results of this analysis are used as a basis for drawing conclusions regarding the level of validity, practicality, and effectiveness of the developed learning media.

Result and Discussion

This research produced a product in the form of an inquiry-based interactive Wordwall game developed through the stages of the ADDIE model and tested from the aspects of validity, practicality, and effectiveness in improving early childhood mathematics skills. The validation results showed that the developed media obtained a very high score, namely 96% for the media aspect and 92% for the material aspect, so it was included in the very valid category.

Table 1. Develop Assessment Instrument

Validity	Percentage (%)	Feasibility Criteria
Media	96	very valid
Material	92	very valid

This high level of validity shows that media design, content suitability, and language use have met the principles of early childhood learning that are child-centered and in accordance with their cognitive development stages. This result is in line with previous research which states that digital-based learning media

designed according to children's characteristics can improve the quality of material delivery and learning effectiveness (Dan et al., 2024; Hussein et al., 2022; Papadakis et al., 2018).

Table 2. Practicality Test of Wordwall Interactive Games

No	Total Score	Max Score	Percentage
1	27	28	96.42
2	27	28	96.42
Total	54	56	
Average			96.42%
Categories			Very Practical

From the practical aspect, the results of the study showed that the media obtained a score of 96.42% with a very practical category based on the teacher's response and the results of observation of children's activities during learning. Teachers consider that media is easy to use, interesting, and able to increase children's active involvement in the learning process. These findings reinforce the results of the study (Savira et al., 2022) and (Elhefni et al., 2023) which shows that the use of Wordwall as an interactive learning medium can increase student motivation and participation.

In addition, international studies also reveal that digital game-based learning is able to create a more engaging learning experience and increase students' cognitive engagement (Alotaibi, 2024; Chen et al., 2020; Pan et al., 2022). Thus, the practicality of this media is not only seen from the ease of use, but also from its ability to create an active and fun learning atmosphere.

Figure 2. Large scale test pre-test post-test comparison

$$N - gain = \frac{Mean\ posttest - mean\ pretest}{Max\ Skor - mean\ pretest} \quad (1)$$

Table 3. N-gain Score

Descriptive Statistics					
	N	Min	Max	Mean	Hours of deviation
Ngain Score	15	.67	1.00	.9152	.11759
Ngain Presses	15	66.67	100.00	91.5238	11.75856
Valid (listwise)	15				

The results of the effectiveness test showed a significant improvement in children's math skills after the use of media, shown by an increase in the average score from 60.1% in the pre-test to 97% in the post-test, with an N-Gain value of 0.91 which was included in the high category. This improvement shows that the learning media developed is effective in improving the understanding of basic mathematical concepts such as numbers, patterns, geometry, grouping, and measurement.

These results are consistent with research Brezovszky et al. (2019) and Fadhila et al. (2025) which states that game-based learning media is able to significantly improve children's numeracy skills. In addition, recent research also shows that the integration of digital technology in mathematics learning has a positive impact on improving children's learning outcomes and thinking skills (Al-Hassan et al., 2025; Dan et al., 2024; Hussein et al., 2022).

The results of the development of the interactive game product "wordwall" which is based on the investigation of early childhood mathematics skills are shown in Figure 3. Theoretically, the effectiveness of this media can be explained through a constructivist approach that emphasizes that knowledge is actively constructed by learners through hands-on experience. The inquiry approach integrated in the Wordwall media encourages children to observe, question, explore, and discover concepts independently, thereby improving conceptual understanding and thinking skills (Chen et al., 2023; Karademir et al., 2020). This is in line with the views of Piaget and Vygotsky who emphasize the importance of active interaction and environmental support in the child's learning process (Pan et al., 2022; Rosidah et al., 2024).

Thus, the success of this media is not only influenced by technological aspects, but also by the suitability of the learning approach used. Furthermore, the use of inquiry-based interactive Wordwall media also has a positive impact on children's affective aspects, such as increased motivation, interest in learning, and confidence in understanding mathematics. Children no longer view math as a difficult activity, but rather as a fun and challenging activity.

These findings are supported by research (Haloho et al. (2023) and Savira et al. (2022) which states that interactive media can increase children's interest in learning. In addition, international studies have also shown that digital game-based learning can reduce learning anxiety and increase positive attitudes towards mathematics (Alotaibi, 2024; Behnamnia et al., 2023; Chen et al., 2020).

1. Classification

2. Match

3. Sorting

4. Compare

5. Counting

Figure 3. Interactive game media content *wordwall* math kids

This shows that the media developed not only has an impact on the cognitive aspect, but also on the emotional and motivational aspects of children. Overall, the results of this study confirm that the integration of interactive digital media with an inquiry approach is an effective and relevant strategy in early childhood mathematics learning. These findings reinforce the results of previous research that emphasized the importance of technology-based learning innovations to improve the quality of education (Al-Hassan et al., 2025; Al Banna et al., 2025; Pan et al., 2022).

In addition, this research also makes an empirical contribution to the development of Wordwall-based learning media which is still limited in the context of PAUD in Indonesia. Thus, the media developed can be an alternative solution for educators in creating more interactive, meaningful, and child-centered mathematics learning.

Conclusion

The findings of this study indicate that the inquiry-based interactive Wordwall game developed through the ADDIE model demonstrates a high level of feasibility in terms of validity, practicality, and effectiveness. The media not only meets expert validation standards but also proves to be easy to implement and capable of fostering active participation among children. Empirical results show a substantial improvement in early childhood mathematical abilities,

as reflected in the significant increase between pre-test and post-test scores and supported by a high N-Gain value. These outcomes confirm that the integration of inquiry-based learning with interactive digital media contributes positively to children's conceptual understanding and learning engagement. Consequently, this media can serve as an effective alternative for supporting meaningful, engaging, and child-centered mathematics learning in early childhood education.

Acknowledgments
I would like to thank all those who have supported the completion of this article. Thank you to the supervisor who has provided meaningful direction and guidance. I also appreciate all colleagues and parties who have contributed to the development of this *wordwall* interactive games, as well as those who have provided opportunities and support during the research process.

Author Contributions
MGY: Research concept, media design, data collection, analysis, article writing. RKM: Theory development, methodology, data analysis, article revision. FM: Initial media design, product trial, data collection, analysis. YW: Field testing, data processing, media evaluation, writing trial results.

Funding
This research was independently funded by the researcher

Conflicts of Interest
The authors declare no conflict of interest.

References

Al-Hassan, O. M., Alhasan, L. M., AlAli, R. M., Al-Barakat, A. A., Al-Saud, K. M., & Ibrahim, N. A. (2025). Enhancing Early Childhood Mathematics Skills Learning through Digital Game-Based Learning. *International Journal of Learning, Teaching and Educational Research*, *24*(2), 186–205. https://doi.org/10.26803/ijlter.24.2.10

Al Banna, H., Kurniasih, Faisal, R., Musyadad, M. A., & Yudha, H. S. (2025). Inovasi Pembelajaran Anak Usia Dini Berbasis Teknologi Untuk Meningkatkan Keterampilan Literasi Dan Numerasi Anak. *Jurnal Pengabdian Masyarakat Dan Riset Pendidikan*, *4*(1), 1385–1393. https://doi.org/10.31004/jerkin.v4i1.1739

Alotaibi, M. S. (2024). Game-based learning in early childhood education: a systematic review and meta-analysis. *Frontiers in Psychology*, *15*(April). https://doi.org/10.3389/fpsyg.2024.1307881

Amiliya, R., Susanti, U. V, & Basori. (2021). Urgensi Masa Golden Age bagi Perkembangan Anak Usia Dini. *Al-Abyadh*, *7*(2), 105–113. Retrieved from https://ojs.diniyah.ac.id/index.php/Al-Abyadh/article/view/1372

Aminah, S., & Mauliyah, A. (2025). Stimulasi Kemampuan Metakognitif pada Anak Usia Dini melalui Aktivitas Reflektif Berbasis Bermain. *Journal of Early Childhood Education Studies*, *5*(1), 84–102. https://doi.org/10.54180/joeces.v5i1.477

Arum, R. P., Putro, K. Z., & Jatmiko, A. (2023). Implementation of The Independent Learning Curriculum in Kindergarten. *JOYCED: Journal of Early Childhood Education*, *3*(2), 88–97. https://doi.org/10.14421/joyced.2023.32-01

Aryani, N., Mudjiran, Rakimahwati, Sapendi, & Prianda. (2020). *Manajemen Pembelajaran PAUD: Berbasis Perkembangan Anak*. Edu Publisher.

Az-Zahra, R. T., Suryana, D., Yaswinda, & Eliza, D. (2025). Development of Smart Box Media Based on QR Code Technology to Improve Early Childhood Numerical Literacy Skills. *Jurnal Penelitian Pendidikan IPA*, *11*(3), 80–86. https://doi.org/10.29303/jppipa.v11i3.10538

Behnamnia, N., Kamsin, A., Ismail, M. A. B., & Hayati, S. A. (2023). A review of using digital game-based learning for preschoolers. *Journal of Computers in Education*, *10*(4), 603–636. https://doi.org/10.1007/s40692-022-00240-0

Brezovszky, B., McMullen, J., Veermans, K., Hannula-Sormunen, M. M., Rodríguez-Aflecht, G., Pongsakdi, N., Laakkonen, E., & Lehtinen, E. (2019). Effects of a mathematics game-based learning environment on primary school students' adaptive number knowledge. *Computers and Education*, *128*, 63–74. https://doi.org/10.1016/j.compedu.2018.09.011

Chen, C.-H., Law, V., & Huang, K. (2023). Adaptive scaffolding and engagement in digital game-based learning. *Educational Technology Research and Development*, *71*(4), 1785–1798. https://doi.org/10.1007/s11423-023-10244-x

Chen, C.-H., Shih, C.-C., & Law, V. (2020). The effects of competition in digital game-based learning (DGBL): a meta-analysis. *Educational Technology Research and Development*, *68*(4), 1855–1873. https://doi.org/10.1007/s11423-020-09794-1

Dan, N. N., Trung, L. T. B. T., Nga, N. T., & Dung, T. M. (2024). Digital game-based learning in mathematics education at primary school level: A systematic literature review. *Eurasia Journal of Mathematics, Science and Technology Education*, *20*(4). https://doi.org/10.29333/ejmste/14377

Delfia, E., & Mayar, F. (2019). Penanaman Konsep Berhitung Anak melalui Permainan Pencocokkan Kepingan Buah. *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, *4*(1), 350. https://doi.org/10.31004/obsesi.v4i1.350

Elhefni, E., Ihwanah, A., Adib, H., Ariani, R., & Safitri, R. (2023). Use of Word Wall Learning Media to

Improve Learning Outcomes Indonesian Learning in Elementary Schools. *AL-ISHLAH: Jurnal Pendidikan*, *15*, 1556–1562. https://doi.org/10.35445/alishlah.v15i2.1447

Fadhila, R. A. N., Kurniawati, A. B., & Nopiana, N. (2025). the Influence of Educational Game Media on the Mathematical Ability of Children. *Journal of Early Childhood Education (JECE)*, *7*(1), 49–57. https://doi.org/10.15408/jece.v7i1.46422

Haloho, Y. mesilina, Suartama, I. K., & Sudarma, I. K. (2023). Educational Game-Based Thematic Learning Media to Improve Student Learning Competence. *Mimbar Ilmu*, *28*(1), 106–115. https://doi.org/10.23887/mi.v28i1.58764

Hayati, Z., Jarmita, N., Rahmi, P., & A, M. (2023). Pengembangan Media Busy Book Numbering dari Bahan Bekas untuk Pengenalan Matematika pada Anak Usia Dini. *AWLADY : Jurnal Pendidikan Anak*, *9*(2), 71. https://doi.org/10.24235/awlady.v9i2.14812

Hussein, M. H., Ow, S. H., Elaish, M. M., & Jensen, E. O. (2022). Digital game-based learning in K-12 mathematics education: a systematic literature review. *Education and Information Technologies*, *27*(2), 2859–2891. https://doi.org/10.1007/s10639-021-10721-x

Karademir, A., Kartal, A., & Türk, C. (2020). Science Education Activities in Turkey: A Qualitative Comparison Study in Preschool Classrooms. *Early Childhood Education Journal*, *48*(3), 285–304. https://doi.org/10.1007/s10643-019-00981-1

Kemala, R. (2023). Pengaruh Penggunaan Media Pembelajaran Interaktif terhadap Kemampuan Berhitung Anak Usia Dini di PAUD. *Thufuli: Jurnal Pendidikan Islam Anak Usia Dini*, *1*(1), 8–13. https://doi.org/10.62070/thufuli.v1i1.17

Kurniati, E. (2025). Teori Sosiokultural Vygotsky untuk Anak Usia Dini. *JSPAUD: Jurnal Studi Pendidikan Anak Usia Dini*, *1*(1), 19–24. Retrieved from https://www.putrapublisher.org/index.php/jspaud/article/view/703

Muliyadi, L., Doyan, A., Susilawati, Hamidi, Hakim, S., & Munandar, H. (2023). Training on Using PhET Virtual Media on Newton's Law of Gravity for Class X Students at Islamic Senior High School of Syaikh Abdurrahman Kotaraja, East Lombok. *Unram Journal of Community Service*, *1*(1), 15–18. Retrieved from https://journals.balaipublikasi.id/index.php/jcss/article/view/68

Munandar, H., Doyan, A., Susilawati, S., Hakim, S., Muliyadi, L., & Hamidi, H. (2024). Increasing Motivation to Study Physics Using PhET Media on Mechanical Energy Material. *MANDALIKA : Journal of Social Science*, *2*(1), 1–5. https://doi.org/10.56566/mandalika.v2i1.70

Nopiana, & Misgiyati. (2025). Menstimulasi Perkembangan Matematika Anak Usia Dini melalui Pembelajaran Berbasis Bermain. *Journal Of Humanities, Social Sciences, And Education*, *1*(10), 131–143. https://doi.org/10.64690/jhuse.v1i10.570

Pan, Y., Ke, F., & Xu, X. (2022). A systematic review of the role of learning games in fostering mathematics education in K-12 settings. *Educational Research Review*, *36*(March), 1–13. https://doi.org/10.1016/j.edurev.2022.100448

Papadakis, S., Kalogiannakis, M., & Zaranis, N. (2018). The effectiveness of computer and tablet assisted intervention in early childhood students' understanding of numbers. An empirical study conducted in Greece. *Education and Information Technologies*, *23*(5), 1849–1871. https://doi.org/10.1007/s10639-018-9693-7

Puspita, S. M. (2024). Implementasi Pengembangan Early Math Skills Di Pendidikan Anak Usia Dini. *Jurnal UPI Research in Early Childhood Education and Parenting*, 55–64. https://doi.org/10.17509/recep.v6i2.93399

Putri, S., Edison, D., & Eliza, D. (2025). Interactive E-Modules in Life Science to Foster Scientific Literacy and Process Skills in Early Childhood. *Jurnal Pendidikan Anak Usia Dini Undiksha*, *13*, 491–501. Retrieved from https://ejournal.undiksha.ac.id/index.php/JJPAUD/article/view/96648

Rosidah, S., Zulaeha, I., & Formen, A. (2024). Cultivating Critical Thinking Skills in Early Childhood through Inquiry-Based Learning Models Grounded in Teachers' Experiences. *Golden Age: Jurnal Ilmiah Tumbuh Kembang Anak Usia Dini*, *9*(1`), 159–169. https://doi.org/10.14421/jga.2024.91-14

Savira, A., & Gunawan, R. (2022). Pengaruh Media Aplikasi Wordwall dalam Meningkatkan Hasil Belajar Mata Pelajaran IPA di Sekolah Dasar. *Edukatif : Jurnal Ilmu Pendidikan*, *4*, 5453–5460. https://doi.org/10.31004/edukatif.v4i4.3332

Sufa, F. F. (2022). *Konsep Matematika untuk Anak Usia Dini*. Unisri Press.

Supriyanto. (2025). Urgensi Pengenalan Literasi Numerasi pada Anak Usia Dini: Dampak terhadap Kemampuan Matematika di SD dan Kesiapan Sekolah. *Alzam: Jurnal Pendidikan Islam Anak Usia Din*, *5*(1), 85–93. https://doi.org/10.51675/alzam.v5i1.1093

Susanti, S., Aminah, F., Mumtazah Assa'idah, I., Aulia, M. W., & Angelika, T. (2024). Dampak Negatif Metode Pengajaran Monoton Terhadap Motivasi Belajar Siswa. *PEDAGOGIK: Jurnal Pendidikan Dan Riset*, *2*(2), 86–93.

https://doi.org/10.65311/pedagogik.v2i2.529

Susilawati, Doyan, A., Rokhmat, J., & Muliyadi, L. (2023). Analysis Validation of Modern Physics Learning Media Based on Smartphone Integrated Project Based Learning to Improve Students' Creativity and Scientific Literacy. *Jurnal Penelitian Pendidikan IPA*, *9*(10), 7888–7892. https://doi.org/10.29303/jppipa.v9i10.5404

Syafriana, D., Dawolo, B. D. P., Butar, L. ndriani B., Batubara, N., & Silitonga, S. (2025). Implementasi Kurikulum Merdeka Dalam Pendidikan Indonesia: Kajian Literatur. *ADIDAYA : Aplikasi Pendidikan Dan Sosial Budaya*, *2*(3), 134–141. https://doi.org/10.58466/adidaya.v2i3.1965

Uce, L. (2017). The Golden Age : Masa Efektif Merancang Kualitas Anak. *Bunayya : Jurnal Pendidikan Anak*, *1*(2), 77. https://doi.org/10.22373/bunayya.v1i2.1322

Wahyuningsih, Najihudin, A., Riyandi, I. I., Laffanilah, F., & Ramadhan, R. (2024). Peran Guru dalam Meningkatkan Motivasi Belajar Siswa. *Student Scientific Creativity Journal*, *2*(5), 327–335. https://doi.org/10.55606/sscj-amik.v2i5.4153

Wathon, A. (2024). Strategi Peningkatan Kemampuan Berpikir Kritis Pada Anak Usia Dini Melalui Bermain. *AUD: Jurnal Anak Usia Dini*, *1*(1), 1–19. Retrieved from https://oj.mjukn.org/index.php/aud

Winarji, B., Rasmani, U. E. E., Wahyuningsih, S., Nurjanah, N. E., Jumiatmoko, J., Zuhro, N. S., & Fitrianingtyas, A. (2024). Qualitative Study: Comparison of Implementation of Independent Curriculum in Early Childhood Institutions in Sukoharjo District. *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, *8*(5), 1235–1244. https://doi.org/10.31004/obsesi.v8i5.6158

Yuliantina, I. (2020). Kendala Guru Dalam Menstimulasi Kemampuan Matematika Awalpada Anak Usia 4-5 Tahun Di Provinsi Banten. *Pedagogika*, *9*(2), 207–220. https://doi.org/10.37411/pedagogika.v9i2.39

Zulminiati, Z., Salamah, U., & Roza, D. (2023). Preliminary Research Media Pembelajaran Matematika Anak Usia Dini. *Murhum : Jurnal Pendidikan Anak Usia Dini*, *4*(2), 666–676. https://doi.org/10.37985/murhum.v4i2.318

Zunidar, Z., & Suwandi, S. (2025). The Influence of Wordwall Learning Media and Learning Interest on Learning Outcomes. *Journal of Innovation in Educational and Cultural Research*, *6*(1), 145–155. https://doi.org/10.46843/jiecr.v6i1.1972