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Development of DACAR as a new learning model to train critical and creative thinking skills: A study on early childhood education

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Abstract: This research seeks to evaluate the validity and reliability of the DACAR learning model, an instructional framework incorporating Demonstration, Association, Collaboration, Action, and Reward as an innovative method for fostering critical and creative thinking in early childhood education. The DACAR approach is tailored to support engaging, activity-based learning experiences that align with young children's developmental traits, such as their curiosity, imagination, and social nature. The model was developed using a research and development (R&D) methodology, which involved model conceptualization, expert validation, reliability testing, and subsequent revisions. Validation of the DACAR model and its associated instruments was conducted by three field-specific experts, while learning tools were assessed by four validators, and reliability testing involved three evaluators. Assessments used a 5-point Likert scale, with additional space for qualitative feedback. The results revealed that the validity coefficients for the DACAR model (rα = 0.997, 0.993, and 0.990) exceeded the critical value of rtable. Similarly, high validity scores were observed for learning plans (RPPH) (rα = 0.983, 0.984, 0.991, 0.989), instructional materials (rα = 0.961, 0.978, 0.997), and implementation evaluations (rα = 0.961, 0.978, 0.997). Instruments measuring children's activity (rα = 0.90, 0.81, 0.75) and learning observations (rα = 0.857, 0.570, 0.857) also demonstrated acceptable validity, and a learner response score of 3.67 was recorded. Regarding reliability, the DACAR model scored 0.992, while RPPH tools scored 0.990, teaching materials 0.950, implementation tools 0.662, children's observation sheets 0.761, and response questionnaires 0.907. Based on these findings, the DACAR model is deemed suitable for use as a viable educational strategy to enhance critical and creative thinking in early childhood education.

Keywords: *Critical and creative skills, DACAR, Early childhood education, New learning model.*

1. Introduction

The ability to think critically and creatively is a fundamental skill that should be nurtured starting in early childhood [1]. These skills are integral to 21st-century competencies, equipping children to navigate and adapt to the demands of the future [2]. Within early childhood education, critical thinking involves a child's capacity to notice details, ask questions, and explain their thoughts or reactions to what they observe or experience [3, 4]. On the other hand, creative thinking is reflected in a child's ability to come up with original ideas, express themselves imaginatively, and discover inventive ways to play or tackle everyday challenges [5].

Despite its importance, fostering critical and creative thinking in young children continues to encounter a range of challenges in practice [6, 7]. A key factor behind this issue is the type of learning approach commonly used in early childhood education settings. Many of these models remain heavily teacher-directed, with limited interaction and minimal opportunities for children to explore

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independently or take initiative in their learning [8]. Children often take on a passive role in the classroom, with few chances to ask questions, engage in discussions, experiment, or create things on their own [9].

In reality, young children possess strong curiosity, vivid imagination, and a remarkable capacity to learn through handson experiences [10]. Unfortunately, many current teaching methods fall short in fully nurturing this potential. Approaches that focus heavily on rote memorization and repetitive tasks may, in fact, limit the growth of children's higher-order thinking abilities [11, 12].

Given these circumstances, there is a clear need to innovate learning approaches that align more closely with the developmental characteristics of young children. Approaches that are engaging, dynamic, exploratory, and incorporate elements such as demonstration, connection, teamwork, hands-on activity, and positive reinforcement are seen as promising ways to cultivate critical and creative thinking from an early age. As such, exploring and developing alternative learning models becomes essential to address these educational challenges.

Earlier research has shown that integrating STEAM (Science, Technology, Engineering, Arts, and Mathematics) with traditional games is a practical and effective approach for enhancing creativity, critical thinking, early scientific understanding, and foundational math skills in young children [8]. STEAM-based learning has been found to positively influence the development of critical and creative thinking skills in children aged 5 to 6 years [9]. The use of teacher questioning strategies can help cultivate critical thinking skills in young children during early education [13]. The project learning method has a positive and significant influence on the critical and creative thinking skills of children aged 5-6 years [14]. Development of a deep learning model to improve critical thinking in children aged 5-6 years [15].

While a variety of learning models such as learning through play, learning centers, and the Montessori method are implemented in early childhood education, many do not explicitly and systematically target the integrated development of critical and creative thinking skills. These approaches often prioritize foundational cognitive development and behavioral shaping, offering limited opportunities for children to explore ideas, engage in problem-solving, or collaborate in real-life scenarios. Furthermore, research on instructional models that intentionally incorporate elements like demonstration, association, collaboration, action, and reward to strengthen higher-order thinking in young children remains scarce, both in national and international studies. This highlights the need for a new approach. The DACAR learning model an acronym for Demonstration, Association, Collaboration, Action, and Reward is a purposeful and innovative framework designed specifically to foster critical and creative thinking in early learners. It integrates five interrelated stages that align with the developmental needs and characteristics of children in early childhood education settings.

The *Demonstration* stage involves presenting clear, visual examples to help children grasp new concepts. *Association* connects new information with children's existing knowledge or experiences. *Collaboration* encourages social interaction and teamwork from an early age. *Action* gives children the freedom to actively explore and apply their ideas. *Reward* offers positive reinforcement to build motivation and self-confidence. Together, these five components form a learning model that integrates active, constructivist, and social-emotional learning principles into a cohesive framework. It is specifically designed to meet the developmental needs of young learners, who are naturally curious, imaginative, and eager to explore. Few educational models place equal emphasis on combining all five elements within the early childhood education context. This makes the DACAR model both timely and relevant as a response to the demands of 21st-century education for young children. Building on this foundation, the present study aims to develop the DACAR model as an effective tool for nurturing critical and creative thinking skills in early learners.

2. Research Method

This study adopts a research and development (R&D) approach with the goal of creating a valid and reliable learning model known as DACAR an acronym for Demonstration, Association,

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Collaboration, Action, and Reward designed to enhance critical and creative thinking in early childhood. The development process follows a simplified version of the Borg and Gall model, consisting of several key stages: preliminary research (including needs analysis and literature review), DACAR model design, expert validation, and model refinement through revision. Validation of the model and instruments involved three experts selected based on their specific fields of expertise: the first in early childhood learning model development, the second in cognitive development in children, and the third in instructional model design. Learning tools were validated by four individuals, including two experts in early childhood education and cognitive development, along with two Early Childhood Education practitioners. Reliability testing also involved three validators with the same areas of specialization. Assessments were conducted using a 5-point Likert scale, supplemented by space for comments and feedback. Data were analyzed using SPSS version 25. The validation process included descriptive quantitative analysis (mean scores), followed by Pearson correlation tests, while reliability was evaluated using Cronbach's Alpha. The results were interpreted using a set of criteria to categorize validity and reliability as very high, high, moderate, low, or invalid/unreliable.

3. Results

3.1. Validity Test Results

3.1.1. Validity of Learning Model

The finalized DACAR learning model, documented in the model book, was submitted to expert validators for evaluation using a dedicated assessment sheet to measure both content and construct validity. The validation process involved three experts: the first specializing in early childhood learning model development, the second in children's cognitive development, and the third in instructional model design. A summary of the validation results from these experts, including the average scores for each aspect of the model's validity, is presented in Table 1.

Table 1.
The results of the validator's assessment of the learning model.

No	Assessed Aspect	V1	V2	V3	Mean
1	DACAR model development needs	2.57	2.71	2.57	2.61
2	State of the art	3.5	3.5	3.5	3.5
3	DACAR Model Theory Support	3	3	3	3
4	Objectives of the DACAR Model	3	3	3	3
5	Model rationale and syntax sequence of the DACAR model	3.20	3.20	3.40	3.26
6	Learning environment and classroom management of the DACAR model	3.67	3.67	3.67	3.67
	Validity Value				3.17

Referring to Table 1, the average score given by the validators for the DACAR learning model was 3.17. To further assess its validity, the model underwent statistical testing using Pearson Correlation. The resulting validity coefficients from each validator were 0.997, 0.993, and 0.990, all exceeding the critical r value ($r\alpha > r$table), indicating that the data are valid. These findings demonstrate both a statistically and practically significant correlation among the assessed variables. Overall, the DACAR learning model has met the criteria for validity and is considered highly appropriate for use in early childhood education.

3.1.2. Learning Device Validity

The DACAR learning model device underwent evaluation by four independent experts. The first reviewer specialized in early childhood learning model development, while the second had expertise in child cognitive development. The third and fourth reviewers were practitioners actively involved in early childhood education. The assessment covered lesson plans, instructional materials, and observations of how the learning model was implemented. The validation outcomes are summarized in Tables 2, 3, and 4.

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Table 2.
Results of validator assessment of RPPH.

No	Assessed Aspect	V1	V2	V3	V4	Mean
1	Learning Identification	3.6	3.40	3.60	3.60	3.55
2	Learning Objectives	2.25	2.25	2.5	2.5	3.50
3	Learning Materials	2.80	3.6	3.8	3,8	3.50
4	Approach, Model and Method	3.50	3.25	3.5	3,5	3.43
5	Learning Activities	2.67	3.67	3	3	3.08
6	Assessment	3	3.33	3.3	3.33	3.24
7	Learning Resources	3	3	3	3	3
8	Format	2.5	2.5	3.5	2.5	2.75
9	Word Usage and Reading	3.67	3.67	3.67	4	3.75
	Validity Value					3.31

As shown in Table 2, the average score from the validators for the DACAR learning model's lesson plan (RPPH) was 3.31. To assess its validity, a Pearson Correlation test was conducted, yielding validity values of 0.983, 0.984, 0.991, and 0.989 from each validator. Since all $r\alpha$ values exceeded the $r$table threshold, the data are considered valid. These results demonstrate a statistically and practically significant relationship among the assessed components. Therefore, the DACAR model's lesson plan is deemed to meet validity standards and is considered highly appropriate for implementation in the learning process.

Table 3.
Validator assessment results on teaching materials

No	Assessed Aspect	V1	V2	V3	Mean
1	Content appropriateness aspect	3	2.8	3.2	3
2	Bringing up aspects of critical thinking skills	2,2	3.2	3	2.9
3	Bring out aspects of creative thinking skills	3	2.33	1.67	2.3
4	Linkage with other materials	2	1.5	3	2.1
5	Presentation method	4	4	4	4
6	Use of sentences and language	4	3,5	4	3,83
	Validity Value				3.86

As presented in Table 3, the average validator score for the DACAR learning model's teaching materials was 3.86. Validity testing using Pearson Correlation produced values of 0.961, 0.978, and 0.997 from each validator. Since all $r\alpha$ values are greater than the $r$table threshold, the data are considered valid. These findings confirm a statistically and practically significant relationship among the variables. Therefore, the teaching materials developed for the DACAR model meet the established validity criteria and are considered highly appropriate for use in the educational process.

Table 4.
Results of validator assessment of learning implementation.

No	Assessed Aspect	V1	V2	V3	Mean
1	The observation sheet is arranged in an attractive manner	3	4	4	3.6
2	Consistency and logical connection between the statements on the observation sheet and the aspects to be revealed.	4	4	3	3.6
3	Clarity of instructions and directions.	2	3	2	2.3
4	Using grammar that refers to the rules of the general guidelines for Indonesian spelling (PUEBI)	3	3	3	3
5	The type and size of the font is appropriate so that it is easy to read.	4	3	4	3.6
6	Content writing format is interrelated	3	4	3	3.3
	Validity Value				3.23

According to Table 4, the average score from validators for the implementation of learning was 3.23, indicating that the implementation component is considered highly valid. The Pearson

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Correlation test for validity produced scores of 0.857, 0.570, and 0.857 from the three validators. Since all $r\alpha$ values exceeded the $r$table threshold, the data are deemed valid. These results suggest a statistically and practically significant relationship among the assessed variables. Overall, the implementation component of the DACAR learning module meets the established standards of validity and is considered well-suited for use in instructional settings.

3.1.3. Instrument Validity

Table 5.
Results of validator assessment of children's activity sheets.

No	Assessed Aspect	V1	V2	V3	Mean
1.	The observation sheet is arranged in an attractive manner	3	4	3	3.3
2.	Consistency and logical connection between the statements on the observation sheet and the aspects to be revealed.	4	4	4	4
3.	Clarity of instructions and directions.	2	2	3	2.3
4.	Using grammar that refers to the rules of the general guidelines for Indonesian spelling (PUEBI)	3	3	4	3.3
5.	The type and size of the font is appropriate so that it is easy to read.	4	3	4	3.6
6	Content writing format is interrelated	3	4	4	3.6
	Validity Value				3.35

Table 5 shows that the average score given by validators for the children's activity sheet was 3.35. Validity testing using Pearson Correlation resulted in values of 0.90, 0.81, and 0.75 from each validator. Since all $r\alpha$ values exceeded the critical $r$table value, the data are considered valid. These findings indicate a reasonably strong statistical and practical correlation among the assessed components. Therefore, the children's activity sheet developed as part of the DACAR learning model meets the validity requirements and is well-suited for use in the learning process.

Table 6.
The results of the validator's assessment of learning implementation observation.

No	Assessed Aspect	V1	V2	V3	Mean
1	The observation sheet is arranged in an attractive manner	3	4	4	3.6
2	Consistency and logical connection between the statements on the observation sheet and the aspects to be revealed.	4	4	3	3.6
3	Clarity of instructions and directions.	2	3	2	2.3
4	Using grammar that refers to the rules of the general guidelines for Indonesian spelling (PUEBI)	3	3	3	3
5	The type and size of the font is appropriate so that it is easy to read.	4	3	4	3.6
6	Content writing format is interrelated	3	4	3	3.3
	Validity Value				3.23

As shown in Table 6, the average score given by validators for the observation of learning implementation was 3.23. The Pearson Correlation test produced values of 0.857, 0.570, and 0.857, all of which exceeded the $r$table value, indicating that the data are valid. Additionally, Table 7 presents the validation results for the children's response questionnaire, which received an average score of 3.16 from expert validators. Based on the established validity criteria, these results confirm that the questionnaire is considered highly valid and appropriate for use in assessing children's responses.

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Table 7.
The results of the validator's assessment of the response questionnaire.

No	Assessed Aspect	V1	V2	V3	Mean
1	Observation sheets are arranged in an interesting way	3	3	3	3.00
2	Consistency and logical relationship between statements on the observation sheet and aspects to be revealed.	4	4	4	4.00
3	Clarity of instructions and directions.	2	2	2	2.00
4	Using grammar that refers to the general guidelines for Indonesian spelling (PUEBI)	3	3	3	3.00
5	The type and size of letters are appropriate so that they are easy to read.	4	4	3	3.67
6	The format for writing interrelated content	3	3	4	3.33
	Validity Value				3.16

3.2. Reliability Test Results

Reliability refers to the degree to which an instrument or learning model produces consistent and stable results across different evaluators or under varying conditions. It involves multiple factors, including agreement among raters, consistency within the collected data, and stability of results over time.

3.2.1. Reliability of the DACAR Model

Table 8.
Reliability test results of DACAR Learning Model.

Reliability Statistics	
Cronbach's Alpha	**N of Items**
0.992	3

The data in the Table 8 indicates that the reliability test results fall within the range of 0.6 to 1.0, suggesting a high level of consistency when the measurements are repeated. Specifically, the DACAR learning model book achieved a reliability score of 0.992, which places it in the "excellent" category.

3.2.2. Reliability of Learning Devices

Table 9.
RPPH reliability results.

Reliability Statistics	
Cronbach's Alpha	**N of Items**
0.990	4

Table 9 shows that the lesson plan achieved a reliability score of 0.990. Since this value exceeds the 75% threshold (R ≥ 75%), it can be concluded that the lesson plan meets the criteria for being considered reliable.

Table 10.
Reliability results of teaching materials.

Reliability Statistics	
Cronbach's Alpha	**N of Items**
0.905	3

As shown in Table 10, the teaching materials received a reliability score of 0.95, which surpasses the minimum acceptable threshold of 0.75, indicating strong reliability. Likewise, Table 11 presents a reliability score of 0.662 for the learning implementation sheet. While this score is somewhat lower, it still falls within an acceptable range, suggesting that the sheet is consistent enough to be considered

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appropriate.

Table 11.
Reliability results of learning implementation sheet.

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.662	0.645	3

3.2.3. Instrument Reliability

Table 12.
Reliability results of child observation sheets.

Reliability Statistics	
Cronbach's Alpha Based on Standardized Items	N of Items
0.761	3

Referring to Table 12, the child observation sheet achieved a reliability score of 0.761. Since this exceeds the 75% threshold (R ≥ 75%) outlined in Chapter III, the instrument can be considered reliable. Similarly, Table 13 shows that the child response questionnaire scored 0.907 in the reliability test, which also surpasses the required benchmark. Therefore, in line with the predetermined criteria, the questionnaire is also confirmed to be a reliable tool.

Table 13.
Reliability results of child response questionnaire.

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.907	0.907	3

4. Discussion

The study's findings suggest that the DACAR learning model comprising Demonstration, Association, Collaboration, Action, and Reward has been evaluated by experts as highly valid and reliable. This supports its potential use as an effective alternative for fostering critical and creative thinking in early childhood education. Several factors reinforce this conclusion. First, both the model itself and its associated tools and instruments have met the criteria for validity and reliability. Second, the structure of the DACAR model aligns well with the natural learning tendencies of young children, which center around play, imitation, interaction, and direct experience. These components effectively encourage the development of cause-and-effect reasoning, exploration, and problem-solving key elements of critical and creative thought. Designed to be active, engaging, and relevant to children's real-life experiences, the DACAR model provides opportunities for learners to express ideas, collaborate with peers, connect new knowledge with prior understanding, and receive positive feedback through rewards. Each phase of the model contributes to a learning environment that promotes higher-order thinking while also attending to children's social and emotional growth. The Demonstration component allows children to understand concepts through concrete examples that are easy to follow [16]. The Association stage encourages children to relate new experiences to those they already have, thus forming logical connections in thinking [17]. Collaboration strengthens children's social skills and ability to solve problems together [18-20]. Through Action, children are given the opportunity to try out and evaluate their own ideas [21], while Rewards serve to strengthen motivation and foster self-confidence [11, 12].

Third, the DACAR model overcomes the limitations of traditional teacher-centered approaches by offering a more participatory learning environment that encourages children to actively construct their own understanding. This shift is particularly well-suited to early childhood education (PAUD), where learning is most effective when grounded in direct, hands-on experiences, aligning closely with the

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principles of experiential learning [22]. Moreover, the DACAR model offers a valuable alternative to traditional teaching methods that are often dominated by teacher control and limit opportunities for independent thinking and creative expression.

Fourth, the DACAR model promotes holistic development by addressing not only cognitive growth but also incorporating social, emotional, and motor skills. This integrated approach helps create learning experiences that are both meaningful and enduring [23]. Based on expert evaluations, alignment with early childhood developmental needs, and its relevance to 21st-century learning goals, the DACAR model shows strong potential for implementation in early childhood education. It offers an integrated and engaging approach to nurturing critical and creative thinking skills in young learners.

In conclusion, the DACAR model presents a viable alternative for fostering critical and creative thinking in young children from an early age. Its implementation is anticipated to contribute to innovative early childhood education practices that are responsive to the evolving demands of 21st-century learning.

5. Conclusions

The development and validation process involving three experts specialists in early childhood learning model design, cognitive development, and instructional strategies indicated that the DACAR model (Demonstration, Association, Collaboration, Action, and Reward) is highly valid. This validation covered aspects such as content relevance, structural coherence, and alignment with early childhood developmental characteristics. From a theoretical standpoint, the DACAR model addresses the need for learning approaches that promote critical and creative thinking through active participation, collaboration, and enjoyable activities. Each component of the model contributes to meaningful learning experiences tailored to the developmental stages of young children. As such, the DACAR model presents itself as a promising alternative for use in early childhood education settings to nurture these essential cognitive skills from an early age. However, this research is limited to the design and expert validation phase, without extending into classroom implementation or field testing. Consequently, the model's practical effectiveness in enhancing critical and creative thinking in real-world early childhood education environments remains unverified. Future studies should include pilot implementations and evaluations across various early childhood education institutions to assess its impact directly on students' cognitive development.

2

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

References

[1] N. Leggett, *Creative and critical thinking in early childhood. In N. Rezaei (Ed.), Integrated education and learning*. Springer. https://doi.org/10.1007/978-3-031-15963-3_7, 2023.

[2] E. Tohani and I. Aulia, "Effects of 21st century learning on the development of critical thinking, creativity, communication, and collaboration skills," *Journal of Nonformal Education*, vol. 8, no. 1, pp. 46-53, 2022.

[3] C. O'Reilly, A. Devitt, and N. Hayes, "Critical thinking in the preschool classroom-A systematic literature review," *Thinking Skills and Creativity*, vol. 46, p. 101110, 2022. https://doi.org/10.1016/j.tsc.2022.101110

[4] A. Fauziah and N. Mariana, "Implementation of the realistic mathematics education (RME) approach to fourth grade elementary school students to measure critical thinking," *Jurnal Pendidikan dan Pembelajaran Matematika*, vol. 11, no. 1, pp. 163-174, 2025.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 9, No. 6: 742-750, 2025
DOI: 10.55214/25768484.v9i6.7872

[5] V. Yalçin and Ş. Erden, "The effect of STEM activities prepared according to the design thinking model on preschool children's creativity and problem-solving skills," *Thinking Skills and Creativity*, p. 100864, 2021. https://doi.org/10.1016/j.tsc.2021.100864
[6] S. A. L. Abdelaty, O. Abdul, D. Muttalib, Z. A. A. Ismail, and N. A. H. Nounou, "Obstacles of developing critical thinking skills for early-stage children from the female teachers' point of view in Saudi Arabia," *Psychology and Education*, vol. 58, no. 1, pp. 667-681, 2021. https://doi.org/10.17762/pae.v58i1.816
[7] N. Leggett, "Early childhood creativity: Challenging educators in their role to intentionally develop creative thinking in children," *Early Childhood Education Journal*, vol. 45, no. 6, pp. 845-853, 2017. https://doi.org/10.1007/s10643-016-0836-4
[8] M. Sit and F. Rakhmawati, "Development of science, technology, engineering, arts, and mathematics learning models for early childhood," *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, vol. 6, no. 6, pp. 6813-6826, 2022. https://doi.org/10.31004/obsesi.v6i6.3496
[9] R. A. Permata, T. Rafida, and A. S. Sitorus, "The influence of steam learning on critical thinking skills and creativity of children aged 5-6 years at RA Fathimaturridha Medan," *Jurnal Ilmiah Potensia*, vol. 8, no. 1, pp. 170-182, 2023. https://doi.org/10.33369/jip.8.1.170-182
[10] N. Afifah, "Stimulating early childhood creativity through experimental methods," *Journal of Early Childhood Education* vol. 7, no. 2, pp. 45–55, 2023.
[11] A. z. A. Usman and L. Rohmah, "Giving rewards in learning to increase early childhood learning activity: A descriptive qualitative study," *DUNIA ANAK: Jurnal Pendidikan Anak Usia Dini*, vol. 7, no. 2, pp. 60-73, 2024.
[12] T. Astari, S. N. Aisyah, and D. A. Sari, "Early childhood education teachers' responses to giving rewards and their influence on learning motivation and social emotional development of early childhood children," *Journal of Early Childhood Islamic Education Study*, vol. 1, no. 2, pp. 141-155, 2020.
[13] D. Suryana and R. Yulia, "Model of questioning skill teacher for developing critical thinking skill in early childhood education in West Sumatra, Indonesia," *Educational Sciences: Theory & Practice*, vol. 21, no. 2, pp. 101–114, 2021.
[14] S. Cahyaningsih and H. Harun, "The influence of project learning methods on children's critical thinking and creativity skills," *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, vol. 7, no. 5, pp. 5481-5494, 2023.
[15] P. Widyaningrum and H. Hendiyani, "Development of a deep learning model to improve critical thinking in children aged 5–6 years: A descriptive study," *Jurnal Anak Bangsa*, vol. 4, no. 1, pp. 160-178, 2025.
[16] S. Sumirah, S. Binari, M. Musli, and M. Miftahuddin, "Demonstration learning method in forming the character of early childhood," *Al-Miskawaih: Journal of Science Education*, vol. 1, no. 2, pp. 397-412, 2022. https://doi.org/10.56436/mijose.v1i2.165
[17] A. Saarinen, J. Lipsanen, M. Huotilainen, M. Hintsanen, and L. Keltikangas-Järvinen, "The association of early childhood education and care with cognitive learning outcomes at 15 years of age in finland," *Psychology*, vol. 10, no. 4, pp. 500-520, 2019. https://doi.org/10.4236/psych.2019.104033
[18] M. Liu, H. Hedges, and M. Cooper, "Effective collaborative learning for early childhood teachers: structural, motivational and sustainable features," *Professional Development in Education*, vol. 50, no. 2, pp. 420-438, 2024. https://doi.org/10.1080/19415257.2023.2235578
[19] L. Connors-Tadros, "Why collaboration is important now and opportunities for future research," *Early Education and Development*, vol. 30, no. 8, pp. 1094-1099, 2019. https://doi.org/10.1080/10409289.2019.1662689
[20] F. Dovigo, "Argumentation in preschool: A common ground for collaborative learning in early childhood," *European Early Childhood Education Research Journal*, vol. 24, no. 6, pp. 818-840, 2016. https://doi.org/10.1080/1350293X.2016.1239327
[21] F. Wahidah, "Efforts to improve fine motor skills of early childhood (Classroom Action Research at RA Mutiara Hati)," *Childhood Education: Jurnal Pendidikan Anak Usia Dini*, vol. 2, no. 2, pp. 138-150, 2021. https://doi.org/10.53515/CJI.2021.2.2.138-150
[22] L. D. Prabawati and D. P. Ambara, "Project-based learning video media on the theme of plants sub-theme how to farm for early childhood," *Jurnal Pendidikan Anak Usia Dini Undiksha*, vol. 10, no. 2, pp. 197-206, 2022. https://doi.org/10.23887/paud.v10i2.49950
[23] R. M. r. Rohmah, A. i. Yusuf, and R. Azizah, "The role of holistic education in early childhood character development," *Jurnal Dimensi Pendidikan Dan Pembelajaran*, vol. 11, no. 1, pp. 154-165, 2023. https://doi.org/10.24269/dpp.v11i1.8268

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