JPPIPA 12(8) (2026)

Jurnal Penelitian Pendidikan IPA

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

Early Childhood Science Learning Decision Making Based on Environmental Contextual Analysis: A Study of Pre-Early Childhood Education Teacher Students

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Received: May 17, 2026
Revised: August 17, 2026
Accepted: August 25, 2026
Published: August 31, 2026

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DOI: 10.29303/jppipa.v12i8.15322

Abstract: This study aims to describe and analyze environmental knowledge, environmentally based learning behavior, and decision-making ability in science learning among pre-service early childhood education (ECE) teachers. A quantitative descriptive design involved 21 students in the ECE Teacher Education Study Program at Universitas Muhammadiyah Buton. Data were collected using a 10 item environmental knowledge test, a 12 item environmentally based learning behavior questionnaire, and five case-based analytical tasks assessing contextual decision making. Descriptive statistics were used to calculate average scores and achievement categories. The results showed high levels of environmental knowledge (7.81), environmentally based learning behavior (7.48), and decision-making ability (7.80). Students demonstrated particular strength in understanding environmental analysis, adapting learning to available facilities, integrating environmental contexts with science concepts, and selecting developmentally appropriate activities. However, contextual analysis, environmental utilization, learning reflection, and consideration of community sociocultural characteristics remained moderate. The novelty of this study lies in providing an integrated descriptive profile of these three competencies through environmental contextual analysis rather than examining them separately. The findings highlight the need to strengthen case-based learning, field experience, and reflective practice in ECE teacher education to support more adaptive, authentic, and locally responsive science learning.

Keywords: Decision making; Early childhood education; Environmental analysis; Pre-service teacher; Science learning

Introduction

The environment is an essential context for early childhood science learning because it provides real objects, observable phenomena, and everyday experiences through which children develop curiosity, scientific understanding, critical thinking, and environmental awareness. Children construct scientific knowledge more meaningfully when they can observe, question, explore, and discuss phenomena directly connected to their lives. Authentic and integrative learning environments support children's scientific reasoning through dialogue, exploration, and engagement with familiar phenomena (Bradbury et al., 2026; Franco-Mariscal et al., 2026; Sáez-Bondía et al., 2024). Integrating natural, physical, and social environments into early science education therefore connects scientific learning with sustainability and children's everyday experiences (Ismail & Shahpo, 2025; Rodrigues-Silva & Alsina, 2023).

Science learning in early childhood focuses not on mastering abstract scientific theories but on developing children's ability to observe, compare, classify, predict, explain simple cause-and-effect relationships, and solve everyday problems (Kusmara et al., 2025). These abilities can develop when children interact with plants, soil,

How to Cite:
Kurniati, A., Marwah, Viola, V., & Nurussyaman, S. M. (2026). Early Childhood Science Learning Decision Making Based on Environmental Contextual Analysis: A Study of Pre-Early Childhood Education Teacher Students. *Jurnal Penelitian Pendidikan IPA*, *12*(8), 228–235. https://doi.org/10.29303/jppipa.v12i8.15322

water, weather, animals, human activities, cultural practices, and other resources available in their surroundings (Sumarni & Kurniati, 2026). Local cultural resources also connect learning with children's identities and lived experiences, making the curriculum more contextual and meaningful (Kurniati & Wahira, 2024). This orientation is consistent with place-based education, which positions local environments, cultures, and communities as meaningful sources and contexts of learning. Through this approach, children learn not only about a place but also in, from, and with the places that shape their experiences, identities, sense of belonging, and relationships with their communities (Chan & Ritchie, 2025; Furu et al., 2023; Kess & Puroila, 2023).

Environmental potential, however, cannot automatically become meaningful science learning without systematic contextual analysis and appropriate pedagogical decision-making. Environmental contextual analysis enables teachers to identify natural, physical, social, and cultural resources; recognize limitations in facilities and infrastructure; and understand children and their surrounding communities. The results of this analysis provide a foundation for translating curriculum expectations into contextual learning objectives, relevant scientific content, exploratory activities, appropriate learning media, and meaningful assessment. Context-sensitive planning matters because curriculum implementation must accommodate the actual conditions and diversity of learners and educational settings (Scanlon et al., 2018). In ECE, pedagogical planning also cannot be separated from the social, cultural, and environmental contexts in which learning occurs (Kess & Puroila, 2023). Research on holistic-integrative ECE programs similarly shows that educational services must respond to the concrete conditions and needs of children, families, educational institutions, and surrounding communities (U. R. Putri et al., 2026). Teachers' pedagogical decisions should therefore be based on an evaluation of learning alternatives that are developmentally appropriate, scientifically relevant, feasible within the available facilities, and responsive to local environmental and community characteristics.

A central problem in ECE teacher education is preparing pre-service teachers to translate their environmental and scientific knowledge into contextual pedagogical decisions. Pre-service ECE teachers are expected to identify environmental potential, evaluate the relevance of local resources, adapt activities to the facilities available in ECE units, and connect scientific phenomena with children's experiences and community life (Bravo et al., 2022; Kewalramani et al., 2025; Sinta et al., 2026). Preliminary classroom observations during analysis and discussion activities in the ECE Curriculum course at the Early Childhood Education Teacher Education Study Program of Universitas Muhammadiyah Buton indicated that students were generally able to identify visible physical resources, such as plants, schoolyards, soil, and water, as potential sources of science learning. However, their analyses remained largely descriptive. Some students did not consistently consider limitations in educational facilities, the socio-cultural characteristics of surrounding communities, or alternative learning activities that could be implemented under different environmental conditions. The pedagogical reasons underlying their selection of learning activities were also not always clearly articulated. These observations suggest that conceptual knowledge does not automatically ensure the ability to use contextual analysis as a basis for pedagogical decision-making. Without this ability, science learning may remain generic, classroom-centered, and insufficiently connected to children's identities, sense of belonging, and socio-cultural experiences (Chan & Ritchie, 2025).

Existing studies on environmental and science learning in ECE reveal three broad research tendencies. First, studies on environment-based learning have predominantly examined its implementation and effects on children's cognitive development, environmental awareness, and environmentally responsible behavior (Cinantya, 2022; Halida et al., 2023; Putri et al., 2023; Suryani & Seto, 2020; Yaswinda et al., 2023). Second, research on authentic and integrative science learning environments has emphasized children's scientific understanding, critical thinking, exploration, and engagement with environmental phenomena (Bradbury et al., 2026; Franco-Mariscal et al., 2026; Sáez-Bondía et al., 2024). Third, studies involving pre-service ECE teachers have generally focused on science and STEM integration or on designing nature-based learning experiences and field trips (Bravo et al., 2022; Kewalramani et al., 2025). Despite these contributions, limited attention has been given to the extent to which pre-service ECE teachers demonstrate environmental knowledge, environmentally based learning behavior, and contextual decision-making ability within a single analytical framework. The novelty of the present study lies in providing an integrated descriptive profile of these three competencies through environmental contextual analysis in early childhood science learning. Accordingly, this study aims to describe and analyze the levels of environmental knowledge, environmentally based learning behavior, and decision-making ability of pre-service ECE teachers in selecting science learning alternatives that correspond to environmental conditions, institutional facilities, community characteristics, and children's developmental needs. The findings are expected to provide an empirical basis for strengthening ECE teacher education through case-

based learning, field experience, contextual analysis, and reflective pedagogical practices so that future teachers can design science learning that is adaptive, authentic, developmentally appropriate, and responsive to local environmental and socio-cultural potential.

Method

This study uses a quantitative, descriptive design to comprehensively analyze the relationships among environmental knowledge, environmental behavior, and the contextual analysis skills of PG-ECE students in decision-making regarding environmental-based science learning. The research subjects were 21 PG-PAUD students at Universitas Muhammadiyah Buton who were taking the ECE Curriculum course, and were exploring the topic of developing operational curriculum for ECE units, had a conceptual understanding of learning planning, and a basic understanding of early childhood science learning.

The research instrument was designed to assess the relationships among conceptual understanding, behavioral practice, and analytical skills in the context of environmentally based science learning. The instrument, based on higher-order thinking skills (HOTS), consists of three main components. First, a 10-question environmental knowledge test measures students' ability to understand environmental concepts and relate them to science learning. The knowledge test instrument was developed based on the levels of thinking in Anderson's taxonomy, as shown in the table below.

Table 1. Indicators of the Thinking Ability of Prospective ECE Teachers Regarding Environmental Knowledge for Science Learning

Indicators	Question Number
Remember (C1)	-
Understand (C2)	2, 4
Apply (C3)	1, 5, 7
Analyze (C4)	3, 6, 8, 9
Evaluate (C5)	10

Second, a context- and scenario-based environmental behavior questionnaire measures prospective early childhood education teachers' tendencies to engage in behaviors related to science learning. The questionnaire consists of 12 items, with response options ranging from strongly disagree to agree strongly. Third, a science learning decision-making ability instrument based on environmental contextual analysis consists of five analytical tasks. Respondents were asked to identify environmental potential (natural, social, and cultural), analyze its relevance as a source of science learning, and formulate learning plans that are appropriate to the conditions of educational unit facilities and community characteristics as a decision-making tool for environment-based science learning.

The average score across all instruments is presented in the following table in the following categories: very high, high, medium, low, and very low.

Table 2. Average Score Categories Based on Score Intervals

Category	Score Interval
Very high	9-10
Tall	7-8
Currently	5-6
Low	3-4
Very Low	0-2

Data collection was conducted through the offline distribution of an instrument, and respondents were asked to complete an Informed Consent Form. The data obtained were then analyzed using descriptive statistics, including the calculation of averages and the distribution of achievement score categories (very high, high, medium, low, very low). Instrument validity was tested through expert judgment involving ECE curriculum experts and cognitive science experts to ensure the suitability of the indicators with the constructs being measured. Meanwhile, instrument reliability was assessed using Cronbach's alpha to ensure internal consistency for each instrument.

Result and Discussion

Environmental Knowledge in the Context of Early Childhood Education Science Learning

The results of research related to environmental knowledge and thinking skills for science learning for prospective ECE teachers can be seen in Table 3 and Table 4.

The results of the study in Table 3 indicate that environmental knowledge for science learning among prospective ECE teachers is in the high category with an average score of 7.81. Aspects that received very high scores include the function of environmental analysis, the environment as a learning resource, the impact of a lack of environmental analysis, and decision-making based on environmental analysis. These findings indicate that prospective ECE teachers have understood the importance of the environment as a foundation for early childhood science learning. Furthermore, the integration of environment and science concepts, as well as contextual science learning aspects, is also in the high category, indicating that prospective ECE teachers have been able to connect the environment with children's learning experiences.

Table 3. Environmental Knowledge Scores of Prospective Early Childhood Education Teachers for Science Learning

Item	Score (scale 1-10)	Category
Utilization of the environment in science learning	7.14	Tall
Environment as a learning resource	9.05	Very high
Integration of environmental and science concepts	8.57	Tall
Contextual science learning	8.57	Tall
The impact of the lack of environmental analysis	9.05	Very high
Environmental facility considerations	5.71	Currently
Environmental analysis function	10.00	Very high
Context-based learning decisions	5.71	Currently
Environmentally based learning factors	5.24	Currently
Environmental analysis-based decision making	9.05	Very high
Average	7.81	Tall

Table 4. Thinking Skills of Prospective ECE Teachers Related to Environmental Knowledge for Science Learning

Indicators	Score	Category
Remember (C1)	-	-
Understand (C2)	8.81	Very high
Apply (C3)	8.73	Very high
Analyze (C4)	6.31	Currently
Evaluate (C5)	9.05	Very high

Furthermore, the findings in Table 4 regarding the thinking skills of prospective ECE teachers show very high scores in the understand (C2), apply (C3), and evaluate (C5) aspects. This indicates that prospective ECE teachers have understood environmental concepts, applied them in learning, and recognized the importance of environmental analysis in science learning. This condition is relevant to Table 3, which presents high scores for the aspects of the environment as a learning resource, the function of environmental analysis, and decision-making based on environmental analysis. Thus, the environmental knowledge possessed by prospective ECE teachers is not only at the level of conceptual understanding, but is also beginning to develop into the ability to apply and evaluate in the context of early childhood science learning.

However, the analytical ability (C4) in Table 4 is still in the moderate category, with a score of 6.31. This finding is consistent with the results in Table 3, which show that aspects of environmental facility considerations, context-based learning decisions, and environmental-based learning factors remain in the moderate category. These results indicate that prospective ECE teachers still experience difficulties conducting in-depth contextual analysis, particularly in connecting real-world environmental conditions, facility availability, and decision-making in science learning. Therefore, it is necessary to strengthen practice-based learning, case studies, and field experience so that prospective ECE teachers' environmental analysis skills can develop in a more applicable, context-specific manner.

This aligns with the opinion of McKee et al. (2023) that developing prospective ECE teachers' environmental analysis skills requires strengthening through an authentic, contextual, and experience-based learning approach. Environmental analysis skills are not only related to mastery of concepts but also include the ability to interpret environmental conditions, identify the potential and limitations of learning resources (ElSayary & Mohebi, 2025), and make learning decisions relevant to the context of early childhood (Sriwarthini et al., 2023). Therefore, the implementation of practice-based learning, case studies, and field experiences is important in the educational process of prospective ECE teachers (Eckhoff, 2017). Through this approach, students, as prospective ECE teachers, have the opportunity to conduct direct observations, analyze learning problems in context, and reflect on the relationship between environmental conditions and the planning of science learning. These authentic experiences strengthen analytical and problem-solving skills and support more adaptive pedagogical decision-making. Furthermore, field experiences enable prospective teachers to understand the environment as an integral part of planning contextual science learning, ensuring that the resulting learning decisions are not only theoretical but also appropriate to the environment, facilities, and learning needs of early childhood (Cheng & Liu, 2026).

Behavior of Prospective Early Childhood Education Teachers in the Context of Environmentally Based Science Learning

The results of research related to the behavior of prospective ECE teachers in the context of environmental-based science learning can be seen in Table 5. The results of the study indicate that the behavior of prospective ECE teachers in the context of environment-based science learning is in the high category, with an average score of 7.48. The highest-scoring aspect is facility adaptation, with a score of 9.40, placing it in the very high category. These results indicate that prospective ECE teachers have been able to adapt science learning activities to the conditions of the facilities available in the ECE unit environment.

Furthermore, environmental observation, environmental analysis, learning evaluation, environmental collaboration, resource efficiency, and environmental-science integration were also high. These findings indicate that prospective early childhood education teachers have demonstrated positive behavioral tendencies in using the environment as a learning resource, conducting learning evaluations, and connecting environmental conditions to science concepts in early childhood learning.

Table 5. Behavioral Values of Prospective ECE Teachers in the Context of Environmentally Based Science Learning

Item	Score (scale 1-10)	Category
Environmental observation	8.69	Tall
Environmental adjustment	5.00	Currently
Environmental analysis	8.45	Tall
Environmental utilization	6.07	Currently
Facility adaptation	9.40	Very high
Facility considerations	6.55	Currently
Learning evaluation	8.21	Tall
Environmental collaboration	7.86	Tall
Environmental characteristics	6.55	Currently
Resource efficiency	8.10	Tall
Environmental-science integration	8.93	Tall
Learning reflection	5.95	Currently
Average	7.48	Tall

However, several aspects remain in the moderate category: environmental adjustment, environmental utilization, facility considerations, environmental characteristics, and learning reflection. These findings indicate that some prospective ECE teachers remain inconsistent in adapting their learning to different environmental conditions and are not yet optimal at reflecting on the learning decisions they make. In addition, behavior that considers environmental characteristics and uses the surrounding environment as a basis for learning still needs to be strengthened. These results indicate that the environment-based learning behavior of prospective ECE teachers still requires strengthening through practical experience, contextual learning, and reflective activities so that science learning decision-making abilities can develop in a more adaptive and applicable manner.

This aligns with the opinion Chan et al. (2025) that the development of effective teacher behavior in environmental-based science learning should be fostered through contextual, reflective, and authentic practice-based learning experiences. Through experiential learning, environmental observation, field practice, and case-based learning, teachers can develop pedagogical habits of using the environment as a learning resource, adapting learning to facility conditions, and connecting environmental phenomena with scientific concepts in more applicable ways (Beers Dewhirst & Goldman, 2020). These experiences also shape adaptive behavior, critical thinking skills, and accurate decision-making in learning across diverse environmental conditions.

In addition, the development of effective teacher behavior is influenced by strengthening reflective practice and ongoing professional collaboration. Reflection activities help teachers evaluate the effectiveness of their learning decisions and develop pedagogical awareness of the practices they implement, while learning communities and professional discussions support the formation of a culture of sharing experiences and innovation in environment-based learning.

Decision Making of Early Childhood Education (ECE) Teacher Candidates for Environmentally Based Science Learning

The results of the research related to the decision-making of prospective ECE teachers for environmental-based science learning can be seen in Table 6.

Table 6. Decision -Making Ability of Early Childhood Education Teacher Candidates for Environmentally Based Science Learning

Indicators	Score	Category
Environmental suitability	8.45	Tall
Compliance with facilities	7.98	Tall
Conformity to community characteristics	6.55	Currently
Suitability for science learning	8.61	Tall
Suitability for early childhood	8.45	Tall
Ability to choose learning alternatives	7.50	Tall
Ability to provide reasons for decisions	7.08	Tall
Average	7.8	Tall

The results in Table 6 indicate that the decision-making ability of prospective ECE teachers in environmental-based science learning is in the high category, with an average score of 7.80. This score was obtained from an analysis of prospective ECE teachers' answers to case studies that included the real conditions of ECE units with environmental potential, limited facilities, and characteristics of the surrounding community. The aspect that received the highest score was suitability for science learning, with a score of 8.61, followed by suitability for the environment and suitability for early childhood, each with a score of 8.45. In addition, the aspects of suitability for facilities, the ability to choose learning alternatives, and the ability to provide reasons for decisions were also in the high category. These findings indicate that most prospective ECE teachers have been able to use environmental analysis as a basis for learning decision-making, such as

identifying the potential of the environment as a learning resource, connecting the environment with simple scientific concepts, and designing learning activities that allow children to directly observe and explore according to environmental conditions and available facilities.

However, the suitability aspect with respect to community characteristics remains in the moderate category, with a score of 6.55. Based on the case study responses, some prospective early childhood education teachers still do not integrate social conditions and the characteristics of the surrounding community effectively into their learning decisions. Respondents' answers tended to make greater use of the physical environment, such as plants and school yards, but did not often link learning to the lives of the surrounding community. These findings indicate that the decision-making abilities of prospective ECE teachers still need to be strengthened, especially in integrating the socio-cultural context of the community into environmental-based science learning in a more in-depth and contextual manner.

This is in line with the opinion Geist (2025) that making decisions about environmentally based science learning requires not only the ability to utilize the physical environment as a learning resource, but also the ability to integrate the social and cultural context of the community into the learning experiences of early childhood (Gusni et al., 2026). Prospective teachers tend to associate science learning more readily with concrete environmental objects, such as plants, water, or schoolyards, rather than with social practices, community activities, and local wisdom related to children. In fact, science learning grounded in a socio-cultural context plays an important role in creating learning experiences that are more meaningful, relevant, and close to children's daily lives (Chan & Ritchie, 2025; Kurniati et al., 2020).

The ability to integrate community characteristics into learning decision-making develops through field experiences (McKee et al., 2023), interactions with local communities, and real-world context-based learning that enable prospective teachers to understand the relationship between the environment, culture, and children's learning processes. Furthermore, place-based education and contextual science learning approaches are considered effective in helping teachers develop more adaptive pedagogical skills (Yasar, 2019), particularly in designing science learning that utilizes local potential and children's social experiences as learning resources. Therefore, the results of this study demonstrate the importance of strengthening the education of prospective early childhood education teachers through learning experiences that involve socio-cultural analysis of the community, so that the ability to make decisions about environmentally based science learning can develop in a more contextual and integrative manner.

Conclusion

This study shows that prospective early childhood education teachers have high levels of environmental knowledge, environmentally based learning behaviors, and decision-making skills in science learning. Prospective early childhood education teachers can understand the role of environmental analysis, use the environment as a learning resource, and determine science learning appropriate to the environmental conditions, facilities, and characteristics of early childhood. The results of the case study also indicate that most prospective early childhood education teachers can use environmental analysis as a basis for decision-making about environmentally based science learning. However, the ability to analyze contextually and reflect on learning is still not optimal, especially in integrating community characteristics and real environmental conditions into learning decisions in more depth. The implications of this research emphasize the importance of strengthening learning in PG-PAUD study programs, focusing not only on conceptual mastery but also on developing HOTS (Hot and State Skills), contextual analysis, and environmentally-based decision-making skills. The use of case studies, field practice, and contextual learning needs to be strengthened to help prospective ECE teachers connect environmental knowledge and behavior with more adaptive, contextual, and meaningful science learning practices that are tailored to the real-world conditions of ECE units and the surrounding community.

Acknowledgments
Thank you for Universitas Muhammadiyah Buton to support this research in 2026.

Author Contributions
A.K., Designing the research and method; R.S., Making instruments; M., collect data and write article.

Funding
No external funding.

Conflicts of Interest
No Conflicts of Interest.

References

Beers-Dewhirst, C., & Goldman, J. (2020). Launching motivation for mindfulness: Introducing mindfulness to early childhood preservice teachers. *Early Child Development and Care*, *190*(8),

1299–1312. https://doi.org/10.1080/03004430.2018.1531853

Bradbury, O., Mallett, D., Pfeiffer, L., Busch, G., & Hughes, L. (2026). STEM in the Park: Eliciting Young Children's Understandings Through Dialogue and Image. *International Journal of Science and Mathematics Education*, *24*(4), 40. https://doi.org/10.1007/s10763-026-10655-1

Bravo, E., Costillo, E., Bravo, J. L., Mellado, V., & Conde, M. D. C. (2022). Analysis of prospective early childhood education teachers' proposals of nature field trips: An educational experience to bring nature close during this stage. *Science Education*, *106*(1), 172–198. https://doi.org/10.1002/sce.21689

Chan, A., & Ritchie, J. (2025). Exploring Perspectives on Identity, Belonging, Inclusion and Social Cohesion: Implications for Placed-Based Early Childhood Education. *New Zealand Journal of Educational Studies*, *60*(2), 451–468. https://doi.org/10.1007/s40841-025-00403-4

Cheng, E. C. K., & Liu, R. H. Y. (2026). *Academic Learning vs Everyday Learning?: How do 21st Century Learning Trends Break Down the Dichotomy?*. Routledge. https://doi.org/10.4324/9781003733638

Cinantya, C. (2022). Pembelajaran Sains Berbasis Kegiatan Bermain Kreatif di Lingkungan Lahan Basah untuk Mengembangkan Kecerdasan Naturalistik Anak Usia Dini. *Jurnal Pendidikan Anak Usia Dini Undiksha, 10*(3), 449-456. https://doi.org/10.23887/paud.v10i3.52560

Eckhoff, A. (2017). Partners in Inquiry: A Collaborative Life Science Investigation with Preservice Teachers and Kindergarten Students. *Early Childhood Education Journal*, *45*(2), 219–227. https://doi.org/10.1007/s10643-015-0769-3

ElSayary, A., & Mohebi, L. (2025). Fostering preservice teachers socio-emotional, technological, and metacognitive knowledge (STM-K) using e-portfolios. *Education and Information Technologies*, *30*(2), 2095–2122. https://doi.org/10.1007/s10639-024-12894-7

Franco-Mariscal, A. J., Rodríguez-Melero, A. M., López-Fernández, M.-M., & Cano-Iglesias, M. J. (2026). Doctor's Learning Environment: Fostering Critical Thinking in 4-Year-Old Children. *Education Sciences*, *16*(3), 491. https://doi.org/10.3390/educsci16030491

Furu, A.-C., Chan, A., Larsson, J., Engdahl, I., Klaus, S., Navarrete, A. M., & Turk Niskač, B. (2023). Promoting Resilience in Early Childhood Education and Care to Prepare Children for a World of Change: A Critical Analysis of National and International Policy Documents. *Children*, *10*(4), 716. https://doi.org/10.3390/children10040716

Geist, E. (2025). *Reinventing STEM in Early Childhood Education: A Constructivist Approach* (1st edn). Routledge. https://doi.org/10.4324/9781003488873

Gusni, K., Mayar, F., Rakimahwati, & Eliza, D. (2026). Development of Local Culture-Based Interactive Media to Improve Children's Mathematics Skills in Kindergarten. *Jurnal Penelitian Pendidikan IPA*, *12*(4), 525–532. https://doi.org/10.29303/jppipa.v12i4.14481

Halida, H., Yuniarni, D., Astuti, I., Putri, A. A. P., Sanulita, H., & Windaniati, W. (2023). Permainan My City Cleaning Waste Recycle untuk Meningkatkan Karakter Peduli Lingkungan pada Anak Usia Dini. *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, *7*(2), 1961–1972. https://doi.org/10.31004/obsesi.v7i2.4325

Ismail, A. F., & Shahpo, S. M. (2025). The integrative learning approach in early childhood: A proposed framework based on STEM – a field study. *European Journal of STEM Education*, *10*(1), 30. https://doi.org/10.20897/ejsteme/17477

Kess, R., & Puroila, A.-M. (2023). Narratives from the North: Early Childhood Teachers' Narrative Identities in Place. *Scandinavian Journal of Educational Research*, *67*(1), 126–139. https://doi.org/10.1080/00313831.2021.1983867

Kewalramani, S., Devi, A., & Ng, A. (2025). Supporting Early Childhood Preservice Teachers to Effectively Integrate STEM in Their Future Teaching Practice. *Education Sciences*, *15*(2), 189. https://doi.org/10.3390/educsci15020189

Kurniati, A., Kudus, I., Marwah, M., & Hartati, H. (2020). Pembelajaran Kearifan Lokal Pakaian Adat Suku Buton bagi Anak Usia Dini. *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, *5*(2), 1101–1112. https://doi.org/10.31004/obsesi.v5i2.737

Kurniati, A. & Wahira. (2024). Kebutuhan Manajemen Kurikulum Pendidikan Anak Usia Dini Berbasis Kearifan Lokal Budaya Buton. *Murhum: Jurnal Pendidikan Anak Usia Dini*. https://doi.org/10.37985/murhum.v5i2.1013

Kusmara, E. F., Syaodih, E., & Agustin, M. (2025). Bermain Bermakna Melalui Pendekatan Qur'anic Sains Pada Fase Fondasi. *AWLADY: Jurnal Pendidikan Anak, 11*(1), 10-26.https://doi.org/10.24235/awlady.v11i1.18430

McKee, A., Myck-Wayne, J., & Lee, S. H. (2023). Inclusive mindedness: Evolving knowledge and beliefs of preservice educators in California. *Frontiers in Education*, *8*, 1142670. https://doi.org/10.3389/feduc.2023.1142670

Putri, A. A. P. P., Rahardjo, B., & Olby, N. A. (2023). Project-Based Learning Model Improves Ability to Understand Environmental Cleanliness in Early Childhood. *Jurnal Pendidikan Anak Usia Dini Undiksha*, *11*(1), 43–51. https://doi.org/10.23887/paud.v11i1.54589

Putri, U. R., Diana, D., & Formen, A. (2026). Implementation of the Holistic Integrative Early Childhood Education Program in Preventing Stunting in Aceh Tamiang Regency. *Jurnal Penelitian Pendidikan IPA*, *12*(3), 100–112. https://doi.org/10.29303/jppipa.v12i3.14024

Rodrigues-Silva, J., & Alsina, Á. (2023). STEM/STEAM in Early Childhood Education for Sustainability (ECEfS): A Systematic Review. *Sustainability*, *15*(4), 3721. https://doi.org/10.3390/su15043721

Sáez-Bondía, M. J., Mateo, E., & Martín-García, J. (2024). Science learning in 3- and 5-year-old children in the same free-choice learning environment on plant diversity. *Learning Environments Research*, *27*(1), 199–215. https://doi.org/10.1007/s10984-023-09475-9

Scanlon, E., Schreffler, J., James, W., Vasquez, E., & Chini, J. J. (2018). Postsecondary physics curricula and Universal Design for Learning: Planning for diverse learners. *Physical Review Physics Education Research*, *14*(2), 020101. https://doi.org/10.1103/PhysRevPhysEducRes.14.020101

Sinta, S., Kurniati, A., Susanti, S. M., & Said, R. (2026). Principal Leadership as a Driver of Early Childhood Teacher Competency: A Systematic Literature Review. *JED (Jurnal Etika Demokrasi)*, *11*(2), 233–254. https://doi.org/10.26618/zbmjpp49

Sriwarthini, N. L. P. N., Astini, B. N., & Gunawan, G. (2023). Analysis of Early Childhood Pre-Service Teacher's Science Concepts Comprehension Based On Their Science Process Skill. *Jurnal Penelitian Pendidikan IPA*, *9*(2), 906–910. https://doi.org/10.29303/jppipa.v9i2.3241

Sumarni, S., & Kurniati, A. (2026). Utilization of School Resources for Science Learning in Early Childhood Education: A Systematic Literature Review. *Ceria: Jurnal Program Studi Pendidikan Anak Usia Dini*, *15*(2), 848-863. https://doi.org/10.31000/ceria.v15i2.16030

Suryani, L., & Seto, S. B. (2020). Penerapan Media Audio Visual untuk Meningkatan Perilaku Cinta Lingkungan pada Golden Age. *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, *5*(1), 900–908. https://doi.org/10.31004/obsesi.v5i1.601

Yasar, M. (2019). 'It Is Not Our Fault; It Is Our Professors' Fault!' Preservice Teachers' Perspectives on Their Own Experiences in Teacher Education Classrooms. *European Journal of Educational Research*, *8*(1), 141–156. https://doi.org/10.12973/eu-jer.8.1.141

Yaswinda, Y., Putri, D. M. E., & Irsakinah, I. (2023). Pembelajaran Sains Berbasis Pemanfaatan Lingkungan untuk Peningkatan Kognitif Anak Usia Dini. *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, *7*(1), 94–103. https://doi.org/10.31004/obsesi.v7i1.2842