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Analysis of Science Activities at the Early Childhood Level: Multi-Case Study of Teachers' Topics and Challenges in Bandung City and Bandung Regency

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Abstract

Science learning in Early Childhood Education (ECE) serves as a crucial foundation for developing children's critical thinking skills and curiosity, aligning with Piaget's Cognitive Development Theory, which emphasizes that children in the pre-operational stage learn through concrete experiences and manipulation of physical objects. However, its implementation often faces challenges related to topic selection, teaching methods, and limited resources. This study aims to analyze the science activities taught, the learning resources used, and the challenges faced by ECE teachers in Bandung City and Bandung Regency. Unlike previous studies that focused on single-case analyses, this research offers holistic insights by employing a multi-case study approach through classroom observations and in-depth interviews at 17 ECE institutions, with data analyzed thematically. Findings indicate that science topics such as colors and water, which dominate due to their concrete nature and alignment with children's cognitive developmental stage, are taught through simple experiments using physical materials. Conversely, complex concepts like human anatomy and engineering are rarely addressed due to teachers' limited understanding and lack of instructional media. Key challenges include low levels of teacher scientific literacy, inadequate facilities, and the characteristics of ECE students that require adaptive approaches. These findings underscore the need for practice-based teacher training, the development of innovative learning media, and multi-stakeholder collaboration to support effective science instruction. This study provides practical contributions for educators,

policymakers, and researchers in designing high-quality and sustainable ECE science learning strategies.

Kata Kunci:
Eksperimen;
Eksplorasi;
PAUD;
IPA.

Abstrak

Pembelajaran sains di Pendidikan Anak Usia Dini (PAUD) merupakan fondasi penting untuk mengembangkan keterampilan berpikir kritis dan rasa ingin tahu anak, sejalan dengan Teori Perkembangan Kognitif Piaget yang menekankan bahwa anak pada tahap pra-operasional belajar melalui pengalaman konkret dan manipulasi benda fisik. Namun, implementasinya sering menghadapi tantangan terkait pemilihan topik, metode pengajaran, dan keterbatasan sumber daya. Penelitian ini bertujuan untuk menganalisis aktivitas sains yang diajarkan, sumber belajar yang digunakan, serta tantangan yang dihadapi guru PAUD di Kota Bandung dan Kabupaten Bandung. Berbeda dari penelitian sebelumnya yang berfokus pada kasus tunggal, penelitian ini menawarkan wawasan holistik dengan menggunakan pendekatan multi-kasus melalui observasi dan wawancara mendalam di 17 sekolah PAUD dan data yang dianalisis secara tematik. Hasil penelitian menunjukkan bahwa topik sains seperti warna dan air, yang mendominasi karena sifatnya yang konkret dan sesuai dengan tahap perkembangan kognitif anak yang diajarkan melalui eksperimen sederhana dengan media fisik. Sebaliknya, konsep kompleks seperti anatomi tubuh dan rekayasa jarang diajarkan akibat keterbatasan pemahaman guru dan kurangnya media pembelajaran. Tantangan utama meliputi rendahnya literasi sains guru, keterbatasan fasilitas, dan karakteristik siswa PAUD yang memerlukan pendekatan adaptif. Temuan ini menegaskan perlunya pelatihan guru berbasis praktik, pengembangan media pembelajaran inovatif, dan kolaborasi multi-pihak untuk mendukung pembelajaran sains yang efektif, memberikan kontribusi praktis bagi pendidik, pengambil kebijakan, dan peneliti dalam merancang strategi pembelajaran sains PAUD yang berkualitas dan berkelanjutan.

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1. Introduction

Science education in Early Childhood Education (ECE) plays vital role in the cognitive development and creativity of children (Churiyah & Fitri, 2024). According to Piaget's Cognitive Developmental Theory, children aged 2-7 years-typical of those in ECE-are in the pre-operational stages, in which they tend to learn through concrete experiences (Aslan, 2025). In the context of science education in ECE, this characteristic can be facilitated through the implementation of science activities.

Science activities are activities that enable children to actively interact with and explore their environment through observation, experimentation, and reflection (Herawati et al., 2023). These activities may include tasks such as planting seeds, experimenting with water, or hands-on activities such as mixing colors. Gavrilas et al. (2024) in their study mention that science education is more effective when it combines practical experiments, digital tools, and interactive activities. This approach makes the learning experience more engaging and helps build a strong foundation for future learning.

In Indonesia, the implementation of science education in ECE is gaining attention with the implementation of the Merdeka Curriculum, which places literacy and STEAM (Science, Technology, Engineering, Arts, and Mathematics) as one of the three core elements of Early Childhood Education Learning Outcomes (Daulay & Fauzidin, 2023). This curriculum reflects the need to align science education with children's developmental characteristics, while considering the local context rich in values and community-based learning approaches. However, the implementation of science in ECE often faces challenges, such as limited teacher competencies, limited resources, and a lack of practical guidelines appropriate to the local context (Sativa & Buahana, 2024). The Indonesian educational context-influenced by socio-cultural diversity, a decentralized educational structure, and varying levels of teacher training-affects how science activities are designed and implemented in ECE settings.

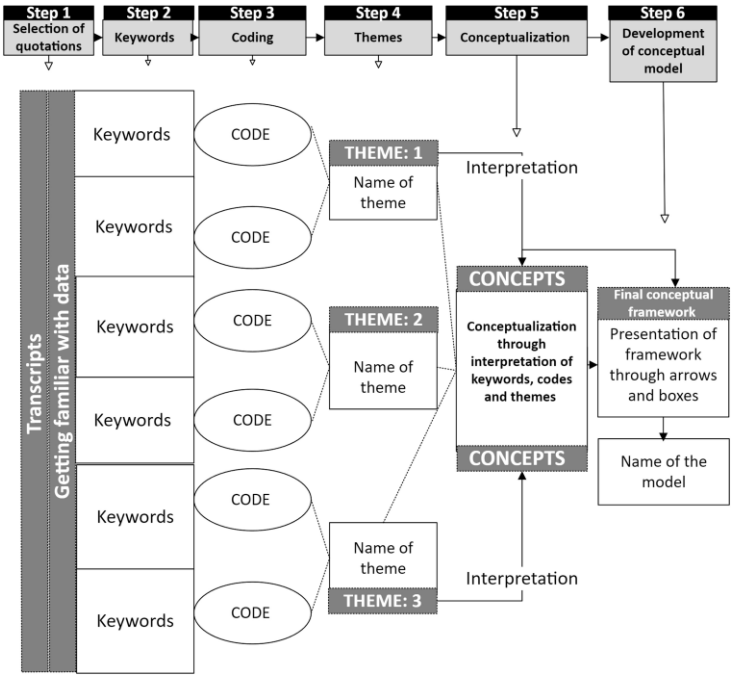
Previous empirical studies have explored science learning in ECE. Ndun et al. (2025) stated in his study that science learning using an experiential learning approach in early childhood education can significantly improve children's observation skills, scientific questioning, and understanding of basic science concepts. Meanwhile, Wiguna et al. (2023) found that simple experiments, such as the "elephant trunk" activity, can foster children's interest in science. Another study by Sativa & Buahana (2024) showed that color mixing experiments improved the cognitive abilities of children from the "Developing as Expected" category in the first cycle to the "Very Good Development" category in the second cycle. However, these studies tend to focus on single case studies and do not consider contextual variations between ECE institutions. Factors such as student characteristics, resource availability, and teacher competencies are often overlooked. Similarly, the challenges faced by teachers in implementing science activities are not adequately addressed. Therefore, more comprehensive research is needed to understand science teaching practices holistically across various ECE contexts.

This study aims to address this gap by answering the following research questions: (1) What are the science topics and types of activities taught in ECE in Bandung City and Bandung Regency?; (2) What learning resources are used to support science learning in ECE?; (3) What science concepts are perceived as difficult to teach by ECE teachers?; (4) What challenges do teachers face in implementing science learning in ECE?; and (5) What competencies are needed by ECE teachers to improve the effectiveness of science teaching?

By integrating data from observations and interviews across 17 ECE institutions in Bandung City and Bandung Regency, this study provides scientific contributions through holistic contextual analysis. The findings of this study have broader implications for ECE policy and practice, including the development of practice-based teacher training, the provision of innovative learning media adapted to the local context, and cross-stakeholder collaboration to support the sustainable science implementation. This research is also expected to provide guidance for policymakers in designing science curricula that are relevant to the needs of young children and the Indonesian educational context, thereby strengthening the foundation of science learning for future generations.

2. Methods

This study employed a qualitative multi-case study design involving 17 ECE institutions in Bandung City and Bandung Regency. The sample was selected using purposive sampling techniques. Data were collected through classroom observations of science learning activities and semi-structured interviews with 24 teachers, focusing on their teaching practices and the challenges they encountered. Thematic analysis was used to identify patterns or themes within the data (Rifa'i, 2023). The data analysis followed several stages, including: (1) transcription, familiarization with the data, and selection of illustrative excerpts; (2) identification of key terms; (3) coding; (4) theme development; and (5) conceptualization (Naeem et al., 2023).



Fg. 1
Thematic Analysis Process
Source: Naeem et al. (2023)

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3. Result and Discussion

The Science Concepts Taught

The first research question explores the science concepts taught at the ECE level (Table 1). Based on observation and interview results, the science topics taught were grouped into 13 categories, including "humans," "animals," "plants," "natural phenomena," "colors," "motion," "hygiene," "light," "water," "density," "acid-base and oxidation," and "changes in states of matter."

Table 1. The Science Concepts Taught

Theme	Category	Code	n
Learning Topics	Humans	Anatomy & Body Systems	1
	Animals	Animal Classification	1
		Animal Life Cycles	1
	Plants	Plant Growth	3
		Ecoprint	1
	Natural Phenomena	Volcanic Eruptions	6
		Earthquakes	1
		Disaster Mitigation	1
	Colors	Rainbow Candy	2
		Rainbow Wipes	3
		Rainbow Rain	2
		Color Mixing with Markers	1
		Magic Bottle	1
		Picture Guessing Wipes	1
		Rainbow Lava	2
	Motion	Paper Plane	3
	Hygiene	Pepper and Soap Experiment	1
		Waste Sorting	1
	Light	Light and Shadows	1
	Water	Flower Bloom	2
		Water Capillarity	3
		Water Filtration	1
		Elephant's Trunk	2
	Density	Floating Stuff Experiment	2
	Acid-Base and Oxidation	Dancing Corn Experiment	1
		Balloon, Vinegar & Baking Soda	1
		Betadine & Orange Juice	1
	Changes in States of Matter	Handmade Ice Cream	1
			49

Source: Author (2025)

According to Table 1, the most frequently taught topic is colors (n=12), with varied subtopics commonly delivered through experimental methods. Teachers explained that this is due to children's preference for bright and vivid colors. Color mixing experiments are widely used in kindergartens in Indonesia to enhance cognitive

development and stimulate curiosity (Sativa & Buahana, 2024). The implementation of science activities has demonstrated positive effects on children's cognitive abilities, with one study reporting an increase from 40.35% to 90.37% after color-mixing experiments (Sativa & Buahana, 2024). These findings underscore the effectiveness of color-based science activities in fostering cognitive development among preschool-aged children in Indonesia.

Meanwhile, the least taught topics were human anatomy & body systems, light, and changes in states of matter (n=1). Previous research indicates that teachers often lack adequate science process skills (Sriwarthini et al., 2023) and face limitations in teaching resources (Fitriyani & Sianturi, 2024). This was also expressed by teachers during interviews. One teacher mentioned that, regarding human anatomy, they found it challenging to explain the concept due to its complexity and the need for appropriate teaching media.

These findings are practical illustrations of Piaget's Cognitive Development Theory. At the preoperational stage, ECE students find it easier to understand concrete and observable science concepts, such as color and water, compared to more abstract concepts like anatomy and body systems. At this stage, children learn through sensory experiences (Pitriani et al., 2023), explaining the popularity of color experiments in teaching.

Learning Resources

The second research question examines the learning resources typically used to support the science learning process in ECE (Table 2). Observations and interviews revealed that these learning resources can be grouped into three categories: "physical materials," "printed media," and "digital media."

Table 2. Learning Resources

Theme	Category	Code	n
Learning Resources	Physical Materials	Loose Parts	4
		Natural Materials	2
	Printed Media	Guidebooks/Reading Materials	6
	Digital Media	Video Platform (YouTube)	4
		Educational Apps/Websites	1
			17

Source: Author (2025)

The data analysis indicates that physical materials and print media are the two most widely used resources in the context of teaching and material delivery. Under the physical materials category, loose parts dominate (n=4), followed by natural materials (n=2). This suggests that manipulable materials remain a primary choice in the learning process, as they enhance interaction and creativity. Consistent with these findings, physical learning media for early childhood education are highly recommended as they can enhance children's critical and creative thinking skills (Haryanto & Twiningsih, 2024).

Meanwhile, printed media, particularly guidebooks or reading materials, had the highest frequency (n=6), indicating that this traditional learning resource remains highly relevant and widely used. Guidebooks are considered easily accessible references that provide systematic information. It is unsurprising that books remain the preferred medium, as they effectively stimulate child development, foster creativity, promote reading interest (Margiani et al., 2024), and enhance language skills (Sukmawati et al., 2023).

Digital media also plays a significant role, though its usage is less frequent compared to physical and printed media. Video platforms such as YouTube (n=4), reflect a growing trend of integrating audiovisual content in modern teaching. Despite potential negative effects, YouTube is considered an effective learning medium for young children when used under parental or teacher supervision (Pratiwi et al., 2024). However, educational apps or websites were only mentioned once, suggesting that interactive technology is still in the developmental stage or not yet fully optimized. However, previous studies have shown that the use of educational applications not only provides information, but also stimulates imagination, improves problem-solving abilities, and develops critical skills from an early age (Lestari et al., 2024).

Science Concepts Perceived as Difficult by ECE Teachers

The next research question explores which science concepts are considered challenging by ECE teachers (Table 3). Observations and interviews revealed that difficult-to-teach science concepts could be categorized into four codes: "anatomy & body systems," "complex natural phenomena," "engineering," and "no difficult concepts." For this research question, data were presented directly in codes due to the highly diverse responses obtained.

Table 3. Science Concepts Difficult to Teach

Theme	Code	n
Science Concepts Difficult to Teach	Anatomy & Body Systems	1
	Complex Natural Phenomena	1
	Engineering	1
	No Difficult Concepts	11
		14

Source: Author (2025)

According to the data in Table 3, the majority of respondents (n=11) stated that no difficult science concepts to teach. This suggests that most educators and learners perceive science concepts as comprehensible and effectively deliverable, possibly due to adapted teaching methods or relatively digestible material.

However, a few respondents identified specific challenging science concepts: anatomy & body systems, complex natural phenomena, and engineering, each mentioned by one respondent. Anatomy & body systems were deemed difficult due to the complexity of biological structures and organ functions, which require in-depth understanding and clear visualization.

Complex natural phenomena present significant educational challenges as they involve dynamic processes and intricate interactions among various natural factors that are difficult to model simply. Meanwhile, engineering concepts require technical knowledge and practical application that may exceed the current capabilities of both teachers and students.

These findings further reinforce Piaget's Cognitive Development Theory that children in the praoperational stage learn more effectively through simple and concrete activities than through abstract or complex (Pitriani et al., 2023). Teachers' ability to introduce concepts is influenced by several factors, including motivation, educational background, work culture, and teaching experience (Haratua et al., 2024). Addressing this issue requires improving teacher competencies through methods, such as workshops (Mutaqin et al., 2024), training programs (Sofyan et al., 2023), and continuous professional development focused on technology-integrated instruction.

Challenge Faced by Teachers

The next research question focuses on common challenges faced by ECE teachers when conducting science learning activities (Table 4). Based on observation and interview data, the challenges faced by teachers can be categorized into four sub-themes: "teacher-related challenges," "student-related challenges," "environmental and facility-related challenges," and "classroom management challenges."

Table 4. Teacher Challenges

Theme	Sub-theme	Category	Code	n
Teacher Challenges	Teacher-related Challenges	Time Management & Preparation	Lack of Time Management	2
		Competency & Confidence	Low Science Literacy	2
			Nervous & Lacking Confidence	1
			Difficult to Simplify Material	1
	Student-related Challenges	Behaviour & Characteristics	Characteristic Differences	2
			Short Concentration	2
			High Curiosity, Difficult to Control	2
		Collaboration & The Role of Parents	The Role of Parents is Lacking	1
	Environmental & Facility-	Tools Materials	Limited Tools Materials	3

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related Challenges	Reference & Inspiration	Limited Reference & Inspiration	2
	Security & Space	Limited Safety & Space	1
Classroom Management Challenges	Monitoring & Management	Activity Monitoring is Difficult	1
	Steps & Media Management	Media & Less Nature Measures	1
			21

Source: Author (2025)

In student-related challenges, diverse learning characteristics (n=2), short attention spans (n=2), and high curiosity (n=2) emerged as primary concerns. This highlights the need for adaptive teaching strategies to accommodate student diversity and maintain their focus. Additionally, lack of parental involvement (n=1) was identified as a barrier, emphasizing the importance of collaboration between teachers and parents in shaping children's character development at home.

Teacher-related, such as lack of time management (n=2) indicates the need for better preparation regarding tools, materials, and lesson planning. Low science literacy (n=2), nervousness and lack of confidence (n=1), and difficulty simplifying complex concepts (n=1) suggest the importance of enhancing teacher science literacy and content delivery skills.

Environmental and facility-related challenges include limited tools and materials (n=3), limited references and inspiration (n=2), and safety & space constraints (n=1). These limitations can hinder creativity and learning effectiveness, necessitating efforts to find easily implementable references and create safe, conducive learning environments.

The data analysis reveals that science instruction in ECE faces multidimensional and interconnected challenges. Addressing these issues requires a comprehensive approach, including: (1) enhancing teacher competencies through professional development in science literacy and pedagogical strategies; (2) developing adaptive teaching methods to accommodate diverse learners and sustain engagement; and (3) improving facilities and resources to support inquiry-based and hands-on learning. Strengthening collaboration among teachers, students, and parents to foster a supportive learning ecosystem and student learning outcomes (Irhamah et al., 2024). By implementing these measures, the teaching and learning process can become more effective and optimal, ultimately nurturing competent and well-rounded learners.

Required Competencies

The final research question examines the advanced competencies required by teachers (Table 5). Observations and interviews revealed

that the necessary competencies can be grouped into three sub-themes: "science teaching," "instructional components," and "additional skills."

Table 5. Required Competencies

Theme	Sub-theme	Category	Code	n
Required Competencies	Science Teaching	Comprehensive Science Understanding	Science Fundamentals	5
			Learning Stages	3
			Theory-Practice Integration	5
		Learning Activities	Safety Criteria for Activities	2
			Science Activity References	6
	Instructional Components	Teaching Media	Teaching Media	2
			Safe Media Selection	1
		Learning Resources	Learning Resources References	2
		Learning Objectives	Character Development	1
			Literacy Integration	1
	Additional Skills	Pedagogical Skills	Explanation Skills	2
			Assessment Skills	1
				31

Source: Author (2025)

The most frequently cited need was competence in science teaching (n=23), particularly in identifying relevant and engaging science activities for students. Teachers expressed frequent uncertainty when planning science activities during instructional design. The least mentioned competencies were pedagogical skills (n=3), especially in explanation techniques and assessment methods. These findings are consistent with previous studies suggesting that professional competence among ECE teachers is generally lower compared to other areas, such as pedagogical, social, and professional skills. One contributing factor is the lack of educational backgrounds aligned with the required standards (Sukirman & Ekantiningsih, 2023). Thus, improving competencies is necessary, whether through formal education or through workshops and training programs (Sriwarthini et al., 2023).

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4. Conclusion

This study reveals that science learning in ECE institutions in Bandung City and Bandung Regency is dominated by simple topics, such as colors and water, which are taught through experimental methods using physical materials. However, more complex concepts, such as human anatomy and engineering, remain challenging for teachers due to limited understanding, a lack of teaching media, and insufficient training. These findings align with Piaget's Cognitive Development Theory, which posits that children in the preoperational stage learn more effectively through concrete experiences and sensory-based activities.

The main challenges identified include low levels of science literacy among teachers, inadequate facilities, and the unique characteristics of early childhood learners that demand creative pedagogical approaches. These findings highlight the importance of strengthening teacher competencies through practical training, developing innovative learning media, and enhancing collaboration with parents and local governments to provide adequate learning resources. Implementing these recommendations is expected not only to enhance the quality of science education in ECE settings but also to lay a strong scientific foundation for early childhood children, aligning with curriculum goals and the demands of 21st-century learning.

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References

Agustin, M., Suryana, S. I., & Pratama, Y. A. (2022). Penguatan Pembelajaran Sains di PAUD Saat dan Pasca Belajar dari Rumah (BDR). *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, *6*(6), 7264–7272. https://doi.org/10.31004/obsesi.v6i6.3734

Churiyah, & Fitri, R. (2024). Pentingnya Pendidikan Sains Bagi Perkembangan Kognitif dan Kreatifitas Anak Usia Dini. *Harmoni Pendidikan: Jurnal Ilmu Pendidikan*, *1*(3), 37–43. https://doi.org/https://doi.org/10.62383/hardik.v1i3.406

Daulay, M. I., & Fauzidin, M. (2023). Implementasi Kurikulum Merdeka Pada Jenjang PAUD. *Jurnal Bunga Rampai Usia Emas (BRUE)*, *9*(2), 101–116.

Fitriyani, A. S. K., & Sianturi, R. (2024). Problematika Guru PAUD dalam Pengembangan Profesi Dilihat dari Penerapan Kurikulum Merdeka. *PERNIK: Jurnal Pendidikan Anak Usia Dini*, *7*(1), 62–2. https://doi.org/https://doi.org/10.31851/pernik.v7i1.15142

Gavrilas, L., Papanikolaou, M. – S., & Kotsis, K. T. (2024). Exploring Electricity in Early Childhood Education: A 5E-Based Learning Approach. *Science Activities,* 62(1), 53–94. https://doi.org/10.1080/00368121.2024.2406208

Haratua, C. S., Hanief, M., Nurdin Toha, A., Muhamad, L., Mauludin, N., & Ikhsan, M. (2024). Faktor Intrinsik dan Ekstrinsik yang Mempengaruhi Kinerja Guru. *Attractive: Innovative Education Journal*, *5*(3), 195–205. https://doi.org/10.51278/aj.v6i3.1478

Haryanto, F. T., & Twiningsih, A. (2024). Implementasi Media Loose Parts pada Pendidikan Anak Usia Dini. *Edudikara: Jurnal Pendidikan Dan Pembelajaran*, *9*(2), 54–64. https://doi.org/10.32585/edudikara.v9i2.362

Herawati, Dewi, Y., & Yanti, D. (2023). Pengaruh Aktivitas Sains Terhadap Perkembangan Kognitif Anak Usia Dini Di RA Muslimat Darurrahman Tritunggal Kecamatan Waway Karya Kabupaten Lampung Timur. *Tadris: Jurnal Keguruan Dan Ilmu Tarbiyah*, *1*(2). http://journal.an-nur.ac.id/index.php/tarbiyahjurnal

Irhamah, I., Asdar, & Madjid, S. (2024). Kolaborasi Guru Dan Orang Tua Terhadap Motivasi Dan Hasil Belajar Membaca Siswa SD Di Kompleks Bayang Kota Makassar. *Bosowa Journal of Education*, *5*(1), 97–102. https://doi.org/10.35965/bje.v5i1.5413

Lestari, N. A. P., Kurniawati, K. L., Dewi, M. S. A., Hita, I. P. A. D., Or, M., Astuti, N. M. I. P., & Fatmawan, A. R. (2023). *Model-Model Pembelajaran Untuk Kurikulum Merdeka Di Era Society 5.0.* Nilacakra.

Margiani, K., Seran, T. N., Betty, C. G., & Dongowea, J. A. S. (2024). Meningkatkan Kreativitas Guru PAUD Melalui Pelatihan Pembuatan Buku Cerita Bergambar untuk Anak Usia Dini. *KALIMUTU: Journal of Community Service (KJCS)*, *4*, 39–46.

Mutaqin, M. F. T., Rosmilawati, I., Risna, I., Aprilanata, E. R., & Mulyani, W. (2024). Kompetensi Parenting: Penerapan Pendekatan Reflektif untuk Guru Pendidikan Anak Usia Dini di Kecamatan Kasemen. *Jurnal Pengabdian Pada Masyarakat*, *9*(4), 923–930. https://doi.org/10.30653/jppm.v9i4.1072

Naeem, M., Ozuem, W., Howell, K., & Ranfagni, S. (2023). A Step-by-Step Process of Thematic Analysis to Develop a Conceptual Model in Qualitative Research. *International Journal of Qualitative Methods*, *22*. https://doi.org/10.1177/16094069231205789

Ndun, M. S., Rostiani, Y. S., & Imamah. (2025). Pengaruh Aktivitas Eksperimen Sederhana Terhadap Perkembangan Literasi Sains Pada Anak Usia Dini. *Inspirasi Edukatif: Jurnal Pembelajaran Aktif*, *6*(2), 22–32. https://ejurnals.com/ojs/index.php/

Pitriani, H., Faslah, D., & Masitoh, I. (2023). Implementasi Teori Perkembangan Kognitif Jean Piaget Pada Anak Usia Dini. *Jurnal Ilmiah Al-Muttaqin*, *9*(1), 33–38. https://doi.org/10.37567/al-muttaqin.v9i1.2218

Rifa'i, Y. (2023). Analisis Metodologi Penelitian Kulitatif dalam Pengumpulan Data di Penelitian Ilmiah pada Penyusunan Mini Riset. *Jurnal Ilmu Sosial Dan Humaniora*, *1*(1), 31–37. https://doi.org/https://doi.org/10.59996/cendib.v1i1.155

Sativa, F. E., & Buahana, B. N. (2024). Penarapan Pembelajaran Sains Melalui Eksperimen Pencampuran Warna Terhadap Perkembangan Kognitif Anak Usia Dini Usia 5-6 Tahun di PAUD Nurul Iman. *Jurnal*

Ilmiah Profesi Pendidikan, *9*(2), 1322–1326. https://doi.org/10.29303/jipp.v9i2.2310

Sofyan, H., Hasni, U., Amanda, R. S., Ismiatun, A. N., & Siregar, M. (2023). Kompetensi Profesional Guru PAUD Melalui Pelatihan Pengembangan Gamifikasi Dalam Pembelajaran AUD. *Jurnal Pengabdian Multidisiplin*, *3*(2), 1–6. https://doi.org/https://doi.org/10.51214/japamul.v3i2.668

Sriwarthini, N. L. P. N., Nurhasanah, Astawa, I. M. S., & Rachmayani, I. (2023). Pelatihan Pengembangan LKPD Berbasis Keterampilan Proses Sains Untuk Calon Guru PAUD. *Warta Pengabdian Pendidikan*, *3*(2), 105–110. https://doi.org/https://doi.org/10.29303/interaktif.v3i2.105

Pratiwi, A.I., Cahyo, E.D., Azizah, B.N., Wahyuningsih, H., & Fitria, L. (2024). Efektifitas Penggunaan Aplikasi Youtube Sebagai Media Pembelajaran Bagi Pendidikan Anak Usia Dini. *Jurnal Pendidikan Islam Anak Usia Dini Al-Amin.*

Sukirman, D., & Ekantiningsih, P. D. (2023). Pemetaan Kompetensi Dasar Guru Pendidikan Anak Usia Dini Non-Formal. *Jurnal Penelitian Dan Pengembangan Pendidikan*, *7*(1), 37–48. https://doi.org/10.23887/jppp.v7i1.56363

Sukmawati, S., Romdhoningsih, D., & Mahpudoh, M. (2023). Peningkatan Budaya Belajar Anak Usia Dini Melalui Diseminasi Buku Calistung (Membaca, Menulis, dan Berhitung). *Jurnal Anugerah*, *5*(1), 109–118. https://doi.org/10.31629/anugerah.v5i1.5578

Wiguna, I. B. A. A., Ekaningtyas, N. L. D., Saridewi, D. P., Wiasti, N. K., Amni, S. S., Yasa, I. M. A., Andari, I. A. M. Y., Atika, N. M. F., & Widari, N. M. S. P. (2023). Integrasi Pembumian Pembelajaran Sains Anak Usia dini dengan Pendekatan STEAM di PAUD Mutiara Hati Rinjani. *Dharma Sevanam: Jurnal Pengabdian Masyarakat*, *02*(1), 114. https://doi.org/10.53977/sjpkm.v2i1.963