



NEEDS ANALYSIS OF ETHNOSCIENCE-BASED DIGITAL TEACHING MATERIALS FOR SCIENCE AND SOCIAL STUDIES (IPAS) ON ECOSYSTEM TOPICS FOR GRADE V ELEMENTARY SCHOOL

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ABSTRAK

Kecenderungan penggunaan bahan ajar cetak pada pembelajaran IPAS materi ekosistem di sekolah dasar masih menyisakan kesenjangan antara penyajian konsep ilmiah dengan pengalaman belajar yang dekat dengan kehidupan peserta didik. Kondisi tersebut semakin terasa ketika materi belum mengakomodasi keberagaman kemampuan belajar siswa maupun potensi kearifan lokal sebagai sumber belajar yang kontekstual. Penelitian ini bertujuan mengidentifikasi kebutuhan pengembangan bahan ajar digital berbasis etnosains bagi siswa kelas V sekolah dasar sebagai dasar penyusunan desain pembelajaran yang lebih adaptif. Penelitian menggunakan pendekatan deskriptif kualitatif melalui *needs analysis* dengan tahapan observasi pembelajaran, wawancara mendalam bersama guru, serta analisis dokumen perangkat pembelajaran yang dilaksanakan di SD Negeri 3 Penglatan dan SD Negeri 1 Penglatan. Hasil penelitian menunjukkan bahwa dominasi media cetak statis menyebabkan pembelajaran kurang menarik dan belum mampu mengakomodasi heterogenitas kemampuan akademik siswa. Analisis juga mengungkap kebutuhan terhadap bahan ajar digital yang mendukung pembelajaran berdiferensiasi melalui penyajian konten yang interaktif, fleksibel, dan kontekstual dengan mengintegrasikan sistem Subak sebagai representasi etnosains lokal. Temuan tersebut menegaskan bahwa pengembangan bahan ajar digital berbasis etnosains memiliki landasan kebutuhan yang kuat sebagai acuan konseptual dalam merancang pembelajaran IPAS yang lebih adaptif, bermakna, dan relevan dengan karakteristik peserta didik serta lingkungan budayanya.

Kata Kunci: *Analisis Kebutuhan, Bahan Ajar Digital, Etnosains, Pembelajaran IPAS, Ekosistem*

ABSTRACT

The continued reliance on printed teaching materials in elementary science (*IPAS*) ecosystem learning has created a gap between the presentation of scientific concepts and students' authentic learning experiences. This challenge becomes more evident when instructional materials fail to accommodate students' diverse learning needs while overlooking the potential of local wisdom as a meaningful contextual learning resource. This study aimed to identify the instructional needs for developing ethnoscience-based digital teaching materials for fifth-grade elementary students as a foundation for designing more adaptive learning resources. A qualitative descriptive approach was employed using a *needs analysis* framework through classroom observations, in-depth interviews with teachers, and document analysis of instructional planning conducted at SD Negeri 3 Penglatan and SD Negeri 1 Penglatan. The findings revealed that the predominance of static printed materials contributed to less engaging



learning experiences and was insufficient to address the heterogeneity of students' academic abilities. The analysis further identified the need for interactive, flexible, and contextual digital teaching materials that support differentiated learning by integrating the Subak irrigation system as a representation of local ethnoscience. These findings provide a strong empirical basis for developing ethnoscience-based digital teaching materials and offer a conceptual foundation for designing elementary *IPAS* learning that is more adaptive, meaningful, and responsive to students' characteristics and local cultural contexts.

Keywords: *Needs Analysis, Digital Learning Materials, Ethnoscience, IPAS Learning, Ecosystem.*

INTRODUCTION

Learning Science and Social Studies (*IPAS*) in elementary schools is expected to cultivate students' ability to interpret scientific concepts within authentic environmental contexts rather than merely recalling factual knowledge. This expectation becomes particularly relevant in ecosystem learning, where understanding emerges from recognizing dynamic interactions among living organisms and their surroundings. Yet, such concepts frequently remain abstract when instructional activities rely primarily on verbal explanations and printed materials that provide limited visualization. The integration of digital teaching materials therefore represents not only technological innovation but also an instructional approach capable of strengthening students' initial conceptual understanding, fostering independent learning, supporting mastery of basic competencies, and promoting 21st-century thinking skills (Utami & Atmojo, 2021; Sari & Atmojo, 2021).

Despite the growing emphasis on digital transformation in education, classroom practices observed at SD Negeri 3 Penglatan and SD Negeri 1 Penglatan reveal a different reality. Interviews with fifth-grade teachers showed that ecosystem instruction continues to depend largely on conventional textbooks and printed LKS, while interactive digital resources remain absent from daily learning activities. Similar conditions have also been reported nationally, where the utilization of digital teaching materials in elementary *IPAS* learning reached only 53.53% (Puspitasari et al., 2024). Such limitations reduce opportunities for scientific exploration, encourage teacher-centered instruction, and contribute to the relatively low level of science literacy among Indonesian elementary students because learning resources capable of stimulating inquiry remain limited (Wahyuningsih et al., 2024). As a result, students often experience difficulty connecting ecosystem concepts with environmental phenomena encountered in their daily lives.

The complexity of this issue extends beyond instructional media because elementary classrooms are characterized by diverse academic readiness that cannot be effectively addressed through uniform learning experiences. Findings from interviews at both partner schools indicate that some students complete learning activities rapidly, whereas others require continuous guidance before achieving comparable understanding. Responding to this diversity requires differentiated learning, which enables teachers to adapt learning content, processes, products, and environments according to students' readiness, interests, and learning profiles (Gusman et al., 2025). Within this framework, interactive digital media provide opportunities to organize learning activities with varying levels of difficulty, offer independent enrichment for advanced learners, and facilitate structured scaffolding for students requiring additional support, allowing diverse learning needs to be accommodated simultaneously without disrupting classroom instruction.



Designing adaptive digital instruction, however, requires more than technological flexibility because meaningful learning also depends on students' ability to relate scientific knowledge to the cultural environment in which they live. This perspective places ethnoscience as an important pedagogical foundation through the reconstruction of indigenous knowledge, local traditions, cultural practices, and community experiences into scientifically explainable concepts (Amalia et al., 2025). In the Balinese context, the traditional Subak irrigation system, village agricultural management, and theological–ecological interaction patterns provide authentic ecosystem examples that are highly relevant for elementary IPAS learning. Integrating these local resources with differentiated learning through interactive digital media enables scientific concepts to be explored in ways that are contextual, culturally meaningful, and responsive to students' diverse learning readiness (Wahyuningsih et al., 2024). Recent evidence further demonstrates that ethnoscience-based teaching materials continue to show considerable potential for strengthening contextual science learning while encouraging culturally responsive instructional innovation in elementary education (Ratnasari et al., 2024).

Although studies on interactive media, differentiated learning, and ethnoscience have expanded considerably, these themes have generally developed independently rather than as an integrated instructional framework. Karima et al. (2025) developed ethnoscience-based E-LKPD for fifth-grade ecosystem learning, yet the study paid limited attention to differences in students' academic readiness and did not comprehensively examine teachers' preparedness or school infrastructure. Likewise, Sari et al. (2025) introduced local wisdom-based IPAS teaching materials supported by Augmented Reality, but the instructional design remained relatively uniform for students with different learning characteristics. A recent systematic literature review also concluded that studies on differentiated learning media in elementary IPAS have increased, although comprehensive needs analyses integrating learner diversity, local wisdom, and digital instructional design remain scarce (Kurniawan et al., 2025). These findings indicate that empirical evidence is still limited regarding how teachers' readiness, school technological capacity, students' heterogeneous learning profiles, and local cultural resources should be systematically mapped before adaptive digital teaching materials are developed.

The present study responds to this gap by positioning needs analysis as the principal contribution rather than treating it merely as a preliminary stage of product development. Its novelty lies in the simultaneous integration of three complementary dimensions: the analysis of interactive digital teaching material needs, the mapping of differentiated learning readiness in heterogeneous classrooms, and the scientific reconstruction of Balinese Subak ethnoscience for ecosystem learning. Unlike previous studies that primarily emphasized product innovation, this research establishes an upstream empirical foundation by examining teachers' professional competencies and readiness, school technological infrastructure, students' diverse learning characteristics, and the socio-cultural potential of the Subak agricultural system in Buleleng Regency. Such an approach is expected to produce future digital teaching materials that are pedagogically adaptive, culturally contextual, and closely aligned with authentic classroom conditions rather than functioning solely as digital substitutes for printed resources.

Building upon these considerations, this study aims to comprehensively analyze the needs for developing Subak ethnoscience-based interactive digital IPAS teaching materials from the perspective of differentiated learning implementation in fifth-grade elementary schools in Buleleng Regency. The investigation focuses on three interconnected aspects: identifying the actual conditions and expectations of teachers and students regarding interactive digital teaching materials for ecosystem learning, examining teachers' readiness to implement



differentiated learning in academically heterogeneous classrooms, and exploring the scientific reconstruction of Balinese Subak local wisdom for integration into elementary IPAS teaching materials. Collectively, these three aspects are expected to generate a comprehensive empirical foundation for designing digital teaching materials that effectively integrate technological innovation, local wisdom, and learner diversity within elementary science education.

RESEARCH METHODS

The empirical foundation of this study was established through a qualitative descriptive approach employing a needs analysis framework to identify discrepancies between existing classroom practices and the characteristics of digital teaching materials required for elementary IPAS learning. Field activities were conducted from March to April 2026 in two partner schools, namely SD Negeri 3 Penglatan and SD Negeri 1 Penglatan, Buleleng Regency, Bali Province, where ecosystem learning is implemented within the Kurikulum Merdeka. Information was generated from two fifth-grade homeroom teachers selected through purposive sampling because they fulfilled three predetermined criteria: actively teaching Grade V under the Kurikulum Merdeka, experiencing constraints in developing interactive digital media, and managing classrooms characterized by heterogeneous academic abilities within a socio-cultural environment closely associated with Subak ethnosience. These characteristics enabled both informants to provide in-depth information regarding instructional needs relevant to the objectives of this study.

Evidence was assembled by combining three complementary sources so that classroom conditions could be examined from different perspectives rather than relying on a single form of data. Classroom observations documented the availability of digital infrastructure, students' use of learning devices, and their engagement during ecosystem instruction, while in-depth interviews explored pedagogical challenges, variations in students' learning characteristics, and teachers' experiences in integrating Subak local wisdom into instructional activities. Documentary analysis was subsequently undertaken to examine the structure and content of textbooks and printed worksheets used in daily learning, particularly their representation of local cultural contexts. To strengthen data credibility, the consistency of information was verified through source triangulation by comparing responses across informants and through technique triangulation by relating interview findings to classroom observations and documentary evidence.

Rather than treating analysis as a separate stage performed after data collection, interpretation developed continuously throughout the fieldwork using the interactive model of Miles and Huberman. Field notes, interview transcripts, and documentary records were first condensed into four analytical categories comprising digital teaching material needs, teachers' technological competence, student learning heterogeneity, and the potential integration of Subak ethnosience. The organized information was then presented in narrative descriptions and comparative matrices to facilitate pattern identification before drawing conclusions regarding the specifications of adaptive ethnosience-based digital teaching materials required for subsequent development. This iterative analytical process ensured that every conclusion emerged from the convergence of multiple sources of evidence rather than from a single observation or individual perception.



RESULTS AND DISCUSSION

Results

The empirical findings are presented through four analytical indicators describing the current conditions of ecosystem learning in the two participating schools. These indicators encompass the instructional media used during classroom learning, teacher-related constraints, student learning characteristics, and the availability of local *ethnoscience* content within existing teaching materials. The presentation of the findings follows the sequence of evidence obtained from document analysis, classroom observations, and interviews to maintain consistency with the field data. Each indicator is described separately to provide a clear overview of the conditions identified during the study.

The first indicator concerns the instructional media employed in ecosystem learning. Examination of the four teaching documents revealed that all instructional resources (100%) consisted of government-issued textbooks and commercial worksheets presented in static two-dimensional printed formats. Classroom observations conducted throughout the research period likewise did not record the implementation of interactive digital media or technology-based electronic worksheets during learning activities. A detailed description of the instructional resources identified in the participating schools is presented in Table 1.

Table 1. Matrix of IPAS Grade V Teaching Material Needs Analysis

Resource / Media Type	Physical Characteristics	Field Finding Description
MoECRT Textbook	Printed, text-dominant, static images	Serves as the sole primary reading source in the classroom.
Commercial Worksheet (<i>LKS</i>)	Printed, newsprint paper, two-dimensional	Contains a collection of text-based exercise questions without experiments.
Digital-Based Media	Interactive software / animation	Projector facilities are available at the school but have not been optimized.

The information summarized in Table 1 demonstrates that the instructional resources used in both schools were characterized by similar formats and functions throughout ecosystem learning. Government-issued textbooks and commercial worksheets remained the primary learning materials available to teachers and students during classroom instruction. Although projector facilities had already been provided by the schools, no observations documented their utilization to support *IPAS* learning through interactive digital media. These empirical conditions were consistently identified across the observation period at both research sites.

The second and third analytical indicators describe the classroom conditions from the perspectives of teachers and students. Interview records consistently documented the experiences of the participating teachers in developing instructional media, while classroom observations captured students' responses during ecosystem learning activities. These two sources of evidence were considered complementary because they describe instructional implementation from both instructional and learner perspectives. A summary of the empirical findings related to teacher constraints and student characteristics is presented in Table 2.

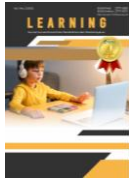


Table 2. Student Characteristics and Teacher Constraints

Observed Variable	Field Symptom Indicators	Finding Quantification	Actual Obstacle / Behavior Notes
Teacher Constraints	Limited Time & IT Competence	2 out of 2 Teachers (100%)	Burdened by administrative paperwork and have not mastered interactive media creation.
Student Characteristics	Learning Boredom in Heterogeneous Groups	Average of 75% of students lose focus	As many as 5 advanced students finished tasks early, while 6 low-tier students experienced delays.

The empirical information presented in Table 2 indicates that both participating teachers reported comparable constraints associated with limited preparation time and information technology competence when developing interactive digital learning media. Classroom observations also documented that approximately 75% of the 38 observed students, equivalent to around 28–29 learners, exhibited reduced attention after the first twenty minutes of text-based learning activities, including behaviors such as engaging in unrelated conversations or resting their heads on their hands. Observation records dated March 18, 2026 further identified academic heterogeneity within the classroom, consisting of five advanced students and six low-performing students learning in the same instructional setting. These patterns were recorded consistently throughout the observation period across the two participating schools.

The fourth analytical indicator examines the representation of local *ethnoscience* within the ecosystem teaching materials used in the participating schools. Documentary analysis was undertaken to identify the contextual examples presented in textbooks and printed worksheets, while field observations were used to examine the environmental characteristics surrounding the schools. The two sources of evidence were subsequently combined to describe the relationship between existing instructional content and the local learning environment. A synthesis of the empirical findings generated from all analytical indicators is presented in Table 3.

Table 3. Synthesis Matrix of Teaching Material Development Needs

Analysis Aspect	Actual Field Empirical Condition	Identified Development Needs
Learning Media	Dominated by printed textbooks and static 2D worksheets.	Dynamic and moving visualization of ecosystem circulations.
Teacher Constraints	High administrative burden; limited media design skills.	Ready-to-use packages that are practical and do not overload the teacher's workload.
Student Characteristics	High boredom (75%); unaccommodated academic ability heterogeneity.	Flexible activity structures to support differentiated learning.
Ethnoscience Integration	Balinese local content is absent; examples are too macro/generic.	Scientific reconstruction of <i>Subak</i> local wisdom as concrete, contextual objects.



The synthesis presented in Table 3 integrates the empirical evidence obtained through observations, interviews, and document analysis into four interconnected analytical aspects. The documented classroom conditions comprise the instructional media currently used, teacher-related constraints, student learning characteristics, and the representation of local *ethnoscience* within existing teaching materials. Alongside these empirical conditions, the table records the development needs identified through the *needs analysis* conducted during the study. This integrated presentation provides a comprehensive overview of the field findings without introducing information beyond the collected evidence.

Taken together, the three tables consistently describe the learning conditions identified across the two participating schools. The findings collectively portray the characteristics of instructional media currently implemented, classroom conditions experienced by teachers and students, and the availability of local *ethnoscience* within ecosystem teaching materials. Each analytical indicator contributes complementary empirical evidence, allowing the findings to be presented as a unified description of the observed learning context. These results constitute the complete empirical basis generated during the field investigation and serve as the reference point for the discussion presented in the subsequent section.

Discussion

The findings indicate that the need for ethnoscience-based digital teaching materials extends beyond the provision of technological resources and reflects a broader demand for instructional approaches that are responsive to students' learning characteristics and curriculum expectations. Teachers recognized that existing instructional materials have not fully supported conceptual understanding of ecosystem topics or accommodated diverse learning needs in elementary classrooms. This condition suggests that the design of digital teaching materials should integrate meaningful learning experiences with contextual content rather than merely converting printed materials into digital formats. Such an interpretation is consistent with Ayudia and Prasetya (2023), who emphasized the importance of aligning instructional materials with students' cognitive development, and with Purnamawati et al. (2025), who highlighted the role of digital teaching materials in creating more active and concept-oriented learning environments.

The limited effectiveness of current instructional resources also reflects the importance of managing students' cognitive processes during science learning. Although digital media have become increasingly available in elementary schools, they often present information without sufficient instructional guidance, reducing their potential to facilitate conceptual understanding. From the perspective of Cognitive Load Theory, instructional materials should minimize unnecessary cognitive demands while directing students' attention toward essential scientific concepts through structured learning activities. This interpretation supports the findings of Purnamawati et al. (2025), who demonstrated the benefits of interactive digital resources in improving conceptual learning, and Anarli et al. (2023), who argued that well-designed digital learning environments encourage greater engagement and deeper conceptual processing rather than passive information consumption.

Another important finding concerns the diversity of students' learning readiness, which requires instructional materials capable of accommodating different levels of understanding within the same classroom. Rather than providing identical learning experiences for all students, differentiated instruction encourages adaptive learning pathways that respond to students' individual needs and learning progress. This perspective is closely related to the concept of the



Zone of Proximal Development, where appropriate instructional support enables learners to progress beyond their current level of competence. Zahara (2024) emphasized that differentiated learning promotes equitable participation by recognizing learners' diverse characteristics, while Hardiansyah et al. (2024) and Rafli et al. (2024) highlighted the importance of adaptive digital teaching materials in facilitating flexible learning experiences. Consequently, the proposed E-LKPD framework is intended to provide structured learning support that accommodates heterogeneous learning needs within elementary science classrooms.

The successful implementation of digital teaching materials also depends on teachers' readiness to integrate instructional innovation into everyday classroom practice. The challenges identified in this study indicate that limited time, administrative responsibilities, and varying levels of digital competence may restrict teachers' ability to develop or adapt digital learning resources independently. Therefore, digital teaching materials should be designed not only to support students' learning but also to reduce instructional complexity by providing practical, accessible, and adaptable learning resources. This interpretation aligns with Nurnaifah (2024), who identified instructional planning as a continuing challenge in implementing the Independent Curriculum, and with Rafli et al. (2024), who emphasized that effective differentiated instruction requires teaching materials that are both pedagogically meaningful and practically feasible for classroom implementation.

The findings further indicate that contextualizing ecosystem learning through local knowledge provides opportunities to connect scientific concepts with students' everyday experiences. The absence of local cultural contexts in existing teaching materials suggests that science learning remains largely decontextualized, limiting students' ability to construct meaningful understanding from authentic environmental phenomena. Within the ethnoscience perspective, indigenous knowledge serves not merely as supplementary content but as a valuable epistemological resource that bridges scientific concepts and local practices. This interpretation is supported by Delimanugari (2023), who emphasized the importance of conducting needs analysis before developing local wisdom-based teaching materials, and by Solihin et al. (2024), who demonstrated that integrating cultural phenomena into science instruction enhances contextual learning. Similarly, Wardani and Suniasih (2022) argued that culturally responsive digital media increase both learning relevance and student engagement. Therefore, integrating the Subak irrigation system into the proposed E-LKPD represents an effort to transform local ecological knowledge into meaningful scientific learning experiences.

The primary contribution of this study lies not in introducing another digital learning product but in establishing an empirical framework for designing ethnoscience-based digital teaching materials grounded in classroom needs. The findings suggest that effective instructional innovation should emerge from the integration of students' learning characteristics, teachers' instructional readiness, and local cultural resources rather than from technological considerations alone. This perspective extends previous studies by positioning needs analysis as the conceptual foundation of digital instructional design. In line with the systematic literature review conducted by Rofita and Arfa (2026), meaningful integration of ethnoscience, digital technology, and differentiated instruction requires instructional planning that reflects authentic educational contexts. Consequently, the novelty of this study lies in proposing a needs-based conceptual framework that integrates pedagogical, technological, and cultural dimensions for developing adaptive IPAS teaching materials in elementary schools.



Overall, these findings demonstrate that the development of digital teaching materials should be viewed as part of a broader transformation of elementary science learning rather than simply as the digitization of conventional resources. Meaningful instructional innovation depends on the alignment of differentiated instruction, contextual learning, and ethnoscience within a coherent pedagogical framework that addresses students' diverse learning needs while remaining responsive to local socio-cultural contexts. From a theoretical perspective, this study reinforces the importance of needs analysis as a critical stage in instructional design because it provides an empirical basis for aligning technological innovation with authentic classroom conditions. Accordingly, the proposed Subak-based ethnoscience E-LKPD offers not only a potential instructional resource for ecosystem learning but also a conceptual reference for developing adaptive, culturally responsive, and digitally supported teaching materials across broader elementary IPAS contexts.

CONCLUSION

This study achieved its objective of identifying the instructional needs for developing an ethnoscience-based digital E-LKPD on ecosystem topics for fifth-grade elementary students. The findings demonstrate that the demand for digital teaching materials extends beyond technological innovation, reflecting the need for instructional resources that simultaneously accommodate students' diverse learning readiness, support teachers' classroom practices, and contextualize scientific concepts through local cultural knowledge. These findings indicate that effective instructional design should originate from a comprehensive needs analysis, ensuring that pedagogical, technological, and socio-cultural dimensions are integrated into a coherent learning framework. Consequently, this study provides an empirical foundation for designing adaptive digital teaching materials that are more responsive to the implementation of the Independent Curriculum and the characteristics of elementary science learning.

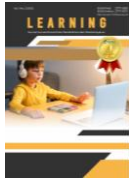
The principal contribution of this research lies in proposing a conceptual framework that integrates differentiated instruction, *ethnoscience*, and digital learning into a unified needs-based instructional design model. This integration offers broader implications for strengthening contextual science learning while promoting more inclusive and culturally responsive learning experiences in elementary education. Building upon these findings, future studies are encouraged to conduct *Research and Development (R&D)* to develop and validate the proposed E-LKPD, evaluate its practicality and usability in authentic classroom settings, and examine its effectiveness in improving students' scientific literacy and conceptual understanding. Furthermore, the framework introduced in this study may be adapted to other IPAS topics and diverse local cultural contexts, thereby expanding its contribution to the development of contextual digital teaching materials in elementary education.

REFERENCES

- Amalia, R. (2024). Analisis kebutuhan pengembangan LKPD berbasis etnosains terkait makanan khas Kawalu Ketupat Air Tanjung untuk SD. *Jurnal Pasundan*, 10(1), 12–21. <https://journal.unpas.ac.id/index.php/pendas/article/view/23077>
- Anarli, A., Hermita, N., & Putra, Z. H. (2023). Pengembangan media interaktif *Articulate Storyline* berbasis kontekstual pada materi ekosistem kelas V sekolah dasar. *Tunjuk Ajar: Jurnal Penelitian Ilmu Pendidikan*, 6(1), 15–29. <https://jta.ejournal.unri.ac.id/index.php/JTA/article/view/154>



- Ayudia, I., & Prasetya, C. (2023). Analisis kebutuhan media digital pada pembelajaran IPA di sekolah dasar. *Jurnal Pengajaran Sekolah Dasar*, 2(1), 48–59. <https://doi.org/10.56855/jpsd.v2i1.314>
- Delimanugari, D. (2023). Analysis of local wisdom-based science teaching material needs for elementary school teachers in Gunungkidul Regency. *Pedagogik: Journal of Islamic Elementary School*, 8(2), 669–678. <https://doi.org/10.24256/pijies.v8i2.7661>
- Gusman, F., Apriliya, S., & Mulyadiprana, A. (2025). Analisis kebutuhan pengembangan bahan ajar digital menulis puisi di sekolah dasar. *Pedadidaktika: Jurnal Ilmiah Pendidikan Guru Sekolah Dasar*, 12(2), 89–102. <https://ejournal.upi.edu/index.php/pedadidaktika/article/view/90108>
- Hardiansyah, F., Sukitman, T., Wahdian, A., & Hodairiyah, H. (2024). The use of differentiated digital learning models to enhance science problem-solving in elementary schools. *AL-ISHLAH: Jurnal Pendidikan*, 16(2), 1462–1474. <http://journal.staihubbulwathan.id/index.php/alishlah/article/view/5087>
- Karima, M. K. (2025). Pengembangan E-LKPD berbasis etnosains pada materi ekosistem untuk meningkatkan hasil belajar siswa kelas V SD. *Mudabbir: Journal Research and Education Studies*, 5(1), 45–56. <https://doi.org/10.56832/mudabbir.v5i1.1120>
- Kurniawan, R., Sriwahyuni, E., Mahananingtyas, E., & Lamsir, S. (2026). Media pembelajaran berdiferensiasi pada pembelajaran IPAS di sekolah dasar: *Systematic literature review*. *Pendas: Jurnal Ilmiah Pendidikan Dasar*, 11(1), 83–106. <https://journal.unpas.ac.id/index.php/pendas/article/view/44063>
- Nurnaifah, I. I. (2024). Analisis kesulitan guru dalam menyusun perangkat kurikulum merdeka. *Jurnal Edukasi Saintifik*, 4(2), 65–73. <https://garuda.kemdiktisaintek.go.id/documents/detail/4823154>
- Purnamawati, E., Hamdu, G., & Nur, L. (2025). Analisis kebutuhan pengembangan media interaktif berbasis *game-based learning* pada materi keseimbangan ekosistem. *Jurnal Penelitian Pendidikan*, 25(3), 305–315. <https://ejournal.upi.edu/index.php/JER/article/view/83466>
- Puspitasari, O. (2024). Analisis kebutuhan bahan ajar digital pada mata pelajaran IPAS di SD Negeri 141 Palembang. *Jurnal Pasundan*, 9(3), 143–155. <https://journal.unpas.ac.id/index.php/pendas/article/view/16644>
- Rafli, M. F., Mahlianurrahman, M., Sari, C. K., & Syarah, M. (2024). Pelatihan penyusunan modul ajar berdiferensiasi berbasis digital dalam upaya implementasi Kurikulum Merdeka dalam komunitas belajar sekolah dasar. *Journal of Human and Education (JAHE)*, 4(5), 650–657. <http://www.jahe.or.id/index.php/jahe/article/view/1528>
- Ratnasari, E. A., Rusilowati, A., Diana, D., Subali, B., & Widiarti, N. (2024). Literature review of research trend of ethnoscience-infused teaching materials in elementary IPAS learning in 2020–2025. *Journal of Primary Education*, 13(2), 114–125. <https://doi.org/10.15294/jpe.v13i2.24699>
- Rofita, D., & Arfa, A. N. (2026). Toward *ethno-digital science learning*: A systematic literature review of ethnoscience, digital literacy, and appropriate technology in elementary science education. *International Journal of Economics Management and Social Science*, 9(3), 30–40. <https://journal.salewangang.net/ijemss/article/view/155>
- Sari, F. F. K., & Atmojo, I. R. W. (2021). Analisis kebutuhan bahan ajar digital berbasis *flipbook* untuk memberdayakan keterampilan abad 21 peserta didik pada pembelajaran



- IPA sekolah dasar. *Jurnal Basicedu*, 5(6), 2341–2350. <https://doi.org/10.31004/basicedu.v5i6.1715>
- Sari, N. R. (2025). Analisis kebutuhan pengembangan bahan ajar digital IPAS berbasis kearifan lokal dilengkapi dengan *augmented reality* untuk pembelajaran di sekolah dasar. *Social, Humanities, and Educational Studies (SHES): Conference Series*, 8(3), 76–88. <https://jurnal.uns.ac.id/SHES/article/view/107401>
- Solihin, A., Choirunnisa, N. L., & Mintohari, M. (2024). Eksplorasi etnosains Monumen Kapal Selam Surabaya sebagai sumber belajar IPAS sekolah dasar. *Jurnal Review Pendidikan Dasar: Jurnal Kajian Pendidikan dan Hasil Penelitian*, 10(2), 137–148. <https://doi.org/10.26740/jrpd.v10n2.p137-148>
- Utami, N., & Atmojo, I. R. W. (2021). Analisis kebutuhan bahan ajar digital dalam pembelajaran IPA di sekolah dasar. *Jurnal Basicedu*, 5(6), 154–163. <https://doi.org/10.31004/basicedu.v5i6.1716>
- Wahyuningsih, S., Ananda, T., Utami, N. C., & Hidayat, O. S. (2024). Analisis kebutuhan pengembangan modul IPAS yang berbasis etnosains kelas V di sekolah dasar. *Jurnal Basicedu*, 8(2), 34–45. <https://doi.org/10.31004/basicedu.v8i2.7349>
- Wardani, W. P., & Suniasih, N. W. (2022). E-LKPD interaktif berbasis kearifan lokal pada materi Aksara Bali kelas V sekolah dasar. *Mimbar Ilmu*, 27(1), 173–182. <https://doi.org/10.23887/mi.v27i1.44586>
- Zahara, R. (2024). Implementasi pembelajaran berdiferensiasi dengan memanfaatkan media digital di Sekolah Dasar Negeri Keumuneng Hulu. *Edelweiss: Journal of Current Innovation in Educational Research*, 3(2), 7–14. <https://doi.org/10.62462/edelweiss.v2i3.41>