

DEVELOPMENT OF ETHNOPANGAN-BASED DIGITAL POCKET BOOKS LOCAL WISDOM TO INCREASE LEARNING MOTIVATION AND AN ATTITUDE OF CARING FOR THE ENVIRONMENT IN MATERIAL BIODIVERSITY

Alya Nur Abdila^{1a*}, Khairiza Lubis^{2b}, Hasruddin^{3c}

Universitas Negeri Medan, Indonesia

alyaabdila01@gmail.com

(*) Corresponding Author

alyaabdila01@gmail.com

ARTICLE HISTORY

Received : 20-06-2026

Revised : 21-07-2026

Accepted : 31-07-2026

KEYWORDS

*Digital pocket book;
Ethnofood;
local wisdom;
biodiversity;
learning motivation;
environmental care
attitude;*

ABSTRACT

Biodiversity learning requires contextual learning resources that can connect scientific concepts with students' local environments and cultural experiences. However, conventional learning materials often provide limited opportunities for students to explore local biological resources and develop environmental responsibility. This study aimed to develop an ethnofood-based digital pocket book integrating the local wisdom of Langkat Regency for biodiversity learning and to evaluate its feasibility and effectiveness in improving students' learning motivation and environmental care attitudes. This research employed a Research and Development (R&D) approach using the ADDIE model, consisting of Analysis, Design, Development, Implementation, and Evaluation stages. The participants involved material experts, media experts, language experts, a biology teacher, and tenth-grade students of SMA Negeri 1 Stabat. Data were collected through validation sheets, teacher and student response questionnaires, learning motivation questionnaires, environmental care attitude questionnaires, observations, and analyzed using descriptive statistics and N-Gain analysis. The results showed that the digital pocket book achieved high feasibility based on expert validation scores for material (90.00%), media (94.16%), language (94.44%), and teacher response (94.29%). The implementation of the media improved students' learning motivation with an N-Gain score of 73.30% and environmental care attitudes with an N-Gain score of 75.03%. These findings indicate that the ethnofood-based digital pocket book is a valid, practical, and effective learning resource that integrates local wisdom, digital technology, and sustainability-oriented biodiversity education.

This is an open access article under the CC-BY-SA license.



INTRODUCTIONS

Biodiversity education plays a strategic role in developing students' scientific literacy, environmental awareness, and sustainable behavior. As one of the fundamental topics in biology education, biodiversity not only introduces the variety of living organisms but also emphasizes the importance of conserving biological resources and maintaining ecosystem sustainability (Nasution & Sari, 2023). Nevertheless, biology learning in many secondary schools continues to rely on textbook-centered instruction and memorization-oriented approaches, limiting students' opportunities to connect scientific concepts with their surrounding environment (Handayani & Widodo, 2024). Such learning practices reduce students' engagement, weaken their learning motivation, and provide limited support for developing pro-

environmental attitudes, despite the increasing urgency of biodiversity conservation and environmental sustainability in the twenty-first century (Hasruddin & Harahap, 2018; Hendrilia et al., 2025)

Learning motivation and environmental care attitude are two essential affective outcomes that influence students' academic achievement and environmental responsibility. Motivated learners tend to demonstrate greater participation, persistence, and curiosity throughout the learning process, while environmental care attitudes encourage students to translate ecological knowledge into responsible behavior (Hasruddin & Harahap, 2018). However, previous studies consistently report that conventional biology instruction often fails to stimulate these affective domains because learning materials are frequently presented in an abstract manner without incorporating students' local experiences or cultural backgrounds (Marlian & Budianingsih, 2023)(Prasetyo & Kurniawati, 2023). Biodiversity is commonly perceived as theoretical knowledge rather than a living reality closely related to students' daily lives. Learning motivation in this study is further interpreted through Keller's ARCS Motivation Theory, which proposes that students are more motivated when learning experiences capture their attention, demonstrate relevance, build confidence, and provide satisfying learning outcomes.

One promising strategy to address this challenge is integrating local wisdom into science learning. Local wisdom provides authentic contexts through which scientific concepts become more meaningful and relevant to learners. Within biodiversity education, ethnobiological knowledge including ethnobotany, ethnomedicine, and ethnofood represents valuable cultural resources that demonstrate how local communities sustainably utilize biological diversity (Ani et al., 2024; Putri et al., 2021). Ethnofood (ethnopangan), in particular, reflects traditional knowledge concerning the utilization, processing, and conservation of local biological resources inherited across generations. Integrating ethnopangan into biology learning allows students to understand biodiversity not merely as scientific content but also as an integral part of cultural identity, sustainable resource management, and environmental stewardship (Kurniawan & Astuti, 2024; Widodo et al., 2022)

The integration of ethnopangan into biodiversity learning is supported by several complementary educational theories. Constructivist Learning Theory posits that students develop meaningful understanding by connecting new knowledge with prior experiences, while Contextual Learning Theory emphasizes that learning becomes more meaningful when scientific concepts are related to learners' everyday lives. Similarly, Situated Learning Theory suggests that knowledge is best acquired through authentic social and cultural contexts, making ethnopangan a relevant medium for understanding biodiversity within local communities. Furthermore, this approach aligns with the principles of Education for Sustainable Development (ESD), which promote the integration of scientific knowledge, cultural values, and environmental responsibility to foster sustainable attitudes and behaviors.

In addition to contextualizing learning through local wisdom, advances in educational technology have encouraged the development of digital learning resources that promote flexible, interactive, and student-centered learning experiences (Lestari et al., 2023). Digital pocket books have emerged as practical learning media because they are portable, easily accessible through smartphones, and capable of integrating multimedia elements such as images, illustrations, hyperlinks, and interactive content (Ani et al., 2024). Previous studies consistently demonstrate that digital learning materials improve students' engagement, motivation, and conceptual understanding. However, these studies largely conceptualize digital media as tools for improving cognitive achievement while giving limited attention to affective outcomes such as environmental care attitudes. In addition, cultural contexts, particularly local wisdom related to biodiversity, remain underrepresented in most existing digital biology learning resources (Ariyanto et al., 2021; Iskandar et al., 2022)

Several studies have explored digital learning media, local wisdom-based education, and biodiversity learning independently. Researchers have developed ethnoscience-based learning materials to improve students' conceptual understanding, while studies on digital pocket books generally report positive effects on learning outcomes and students' responses (Astikasari et al., 2025; Wardani et al., 2023). However, three important gaps remain. First, most digital biodiversity learning media primarily target cognitive achievement, with limited attention to affective outcomes such as learning motivation and environmental care attitudes. Second, studies integrating ethnopangan as a specific form of local wisdom into digital biodiversity learning media are still scarce. Third, few studies have examined the combined influence of ethnopangan-based digital learning resources on both students' motivation and environmental care attitudes within biodiversity education. These limitations indicate the need for a culturally contextualized digital learning resource that integrates local wisdom with educational technology while simultaneously addressing cognitive and affective dimensions of learning.

The context of SMA Negeri 1 Stabat further highlights this need. Preliminary needs analysis revealed that many students experienced difficulties in understanding biodiversity concepts when learning relied solely on printed textbooks. Students also reported that classroom instruction rarely incorporated examples from their surrounding environment, making learning less engaging and reducing the perceived relevance of biological concepts. Although students were accustomed to using smartphones for learning activities, digital instructional materials presenting local biodiversity through ethnopangan were not yet available. Considering that Langkat Regency possesses diverse traditional food products representing the sustainable utilization of local biological resources, this cultural potential remains underutilized as a contextual learning resource for biodiversity education.

Based on these considerations, this study develops an ethnopangan-based digital pocket book integrating the local wisdom of Langkat Regency into biodiversity learning for senior high school students. Unlike previous studies that developed digital biology media or incorporated local wisdom separately, this study integrates three complementary dimensions within a single learning resource: (1) ethnopangan as a representation of local biodiversity knowledge, (2) smartphone-based digital pocket book technology, and (3) affective learning outcomes focusing on students' learning motivation and environmental care attitudes. This integrated approach represents the novelty of the study by combining culturally responsive learning, digital pedagogy, and sustainability-oriented biology education. Therefore, this study aims to develop an ethnopangan-based digital pocket book, evaluate its validity, and examine its effectiveness in improving students' learning motivation and environmental care attitudes in biodiversity learning.

RESEARCH METHODS

This study employed a Research and Development (R&D) approach using the ADDIE model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation. The ADDIE model was selected because it provides a systematic framework for designing, developing, validating, implementing, and evaluating instructional media.

The research was conducted at SMA Negeri 1 Stabat, Langkat Regency, North Sumatra, Indonesia, during the second semester of the 2025/2026 academic year. The developed product was an ethnopangan-based digital pocket book integrating the local wisdom of Langkat Regency into biodiversity learning. The participants consisted of two material experts, two media design experts, two language experts, one biology teacher, and 36 tenth-grade students selected through purposive sampling. The expert validators were selected based on their expertise in biology education, instructional media, and language, while the biology teacher and students were selected because biodiversity is taught at the tenth-grade level. The student participants were involved in the field testing phase to assess the effectiveness of the digital pocket book in enhancing learning motivation and environmental care attitudes using pre-test and post-test measurements.

During the analysis stage, classroom observations, interviews, and needs assessment questionnaires were conducted to identify students' learning needs and instructional challenges. The design stage involved preparing the learning objectives, biodiversity content, interface layout, multimedia elements, and navigation structure of the digital pocket book. The prototype was then developed and validated by material, media, and language experts before being revised according to their recommendations. The revised product was subsequently implemented in biodiversity learning to evaluate its practicality and effectiveness.

Data were collected using observations, interviews, and questionnaires. Observation sheets were used to document the implementation of learning activities, students' engagement, classroom interactions, and challenges encountered during the use of the digital pocket book. Semi-structured interviews with the biology teacher and several students were conducted after the implementation stage to obtain qualitative feedback regarding the strengths, limitations, and potential improvements of the developed media.

Questionnaires were administered to material experts, media experts, language experts, the biology teacher, and students. The expert validation questionnaires assessed the appropriateness of the content, instructional design, media appearance, and language quality of the digital pocket book. Teacher and student response questionnaires were used to evaluate the practicality and usability of the developed media. Students' learning motivation was measured using an ARCS-based questionnaire covering the dimensions of Attention, Relevance, Confidence, and Satisfaction, while environmental care attitude was assessed using a questionnaire measuring environmental awareness, responsibility, and environmentally responsible actions. All questionnaire items employed a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

The collected data were analyzed using descriptive statistics. Expert validation and user response scores were converted into percentages to determine the validity and practicality of the developed media. The effectiveness of the digital pocket book in improving students' learning motivation and environmental care attitudes was analyzed using normalized gain (N-Gain) based on pre-test and post-test scores. Qualitative data obtained from observations and interviews were analyzed descriptively to support and strengthen the quantitative findings.

Table 1. Research Instruments and Measurement Indicators

Instrument	Respondents	Indicators
Material validation sheet	Material experts	Content accuracy; presentation quality; local wisdom integration
Media validation sheet	Media experts	Visual design; interactivity; compatibility
Language validation sheet	Language experts	Clarity; language conventions; contextual suitability
Teacher response questionnaire	Biology teacher	Content suitability; media usefulness; practicality
Student response questionnaire	Grade X students	Attractiveness; accessibility; readability; usability
Learning motivation questionnaire	Grade X students	Attention; Relevance; Confidence; Satisfaction (ARCS)
Environmental care attitude questionnaire	Grade X students	Awareness; responsibility; environmental action
Observation and interview guide	Teacher, students, and researcher	Learning implementation; student engagement; feedback

RESULTS AND DISCUSSION

RESULTS

Needs Analysis

The needs analysis was conducted as the initial stage of the ADDIE development model to identify students' learning conditions, instructional challenges, and the potential integration of local wisdom into biodiversity learning. The analysis consisted of curriculum analysis, teaching material analysis, student needs analysis, and local potential analysis. The findings are presented in Table 2.

Table 2. Results of the Needs Analysis

Aspect	Findings
Curriculum analysis	Biodiversity is included in the Phase E Biology Curriculum of the Merdeka Curriculum, requiring contextual learning resources that connect scientific concepts with students' surrounding environment.
Teaching material analysis	Learning primarily relied on printed textbooks, with limited integration of local wisdom and interactive digital learning resources.
Student needs analysis	Most students preferred digital learning media that were attractive, accessible through smartphones, and provided examples closely related to their daily lives.
Local potential analysis	Langkat Regency possesses diverse ethnopangan resources, particularly Halua and traditional salted fish products, representing local biodiversity utilization and cultural practices.

The findings indicate that existing biodiversity learning resources had not fully supported contextual and culturally relevant learning. The limited integration of local biological resources into classroom materials created a gap between biodiversity concepts and students' everyday experiences. In contrast, students demonstrated a preference for digital learning resources that were interactive, accessible, and connected with their local environment. Therefore, these findings

supported the development of an ethnopangan-based digital pocket book as a learning resource that combines digital technology with local biodiversity knowledge.

Development of the Ethnopangan-Based Digital Pocket Book

Based on the needs analysis, the digital pocket book was developed by integrating biodiversity concepts with ethnopangan resources originating from Langkat Regency. Field observations and interviews with local food producers identified ten plant species and seven fish species utilized in traditional food production. These biological resources were incorporated into the learning materials as authentic examples of biodiversity utilization, species diversity, and sustainable resource management.

The collected information was verified through literature review and expert consultation to ensure scientific accuracy and cultural relevance before being incorporated into the learning content. The final product was designed using Canva and developed into an interactive flipbook using the Heyzine platform, enabling students to access the learning material through smartphones, tablets, and computers. The representative pages of the developed digital pocket book are presented in Figure 1.



Figure 1. Interface and Learning Content Features of the Ethnopangan-Based Digital Pocket Book Integrating Langkat Regency Local Wisdom into Biodiversity Learning

The developed digital pocket book consists of learning objectives, biodiversity concepts, ecosystem diversity, ethnopangan resources of Langkat Regency, environmental conservation materials, illustrations, photographs of local biological resources, and interactive navigation features. Unlike conventional digital textbooks, the developed media provides contextual examples of biodiversity through local food practices, allowing students to understand biological

concepts through familiar cultural experiences. The integration of local biodiversity information also emphasizes the relationship between resource utilization and environmental conservation.

Expert Validation

The feasibility of the ethnopangan-based digital pocket book was evaluated by six expert validators consisting of two material experts, two media experts, and two language experts. The validation process assessed the scientific accuracy, instructional quality, visual design, technical performance, and linguistic appropriateness of the developed media.

Material Expert Validation

Table 3. Results of Material Expert Validation

Assessment Aspect	Score (%)	Category
Content accuracy	92.50	Very Good
Presentation quality	87.50	Very Good
Local wisdom integration	90.00	Very Good
Overall	90.00	Very Good

The overall material validation score of 90.00% indicates that the digital pocket book fulfilled the required standards of biological accuracy, instructional presentation, and contextual relevance. The high score in local wisdom integration demonstrates that ethnopangan content was appropriately connected with biodiversity concepts without reducing scientific validity. These results confirm that the developed media provides meaningful learning content aligned with curriculum requirements.

Media Expert Validation

Table 4. Results of Media Expert Validation

Assessment Aspect	Score (%)	Category
Visual design	92.50	Very Good
Interactivity	95.00	Very Good
Compatibility	95.00	Very Good
Overall	94.16	Very Good

The media validation score of 94.16% demonstrates that the digital pocket book achieved high quality in terms of visual presentation, interactivity, and technical accessibility. The strong evaluation of interactive features and compatibility indicates that the developed media can effectively support digital learning environments and facilitate flexible access across different devices.

Language Expert Validation

Table 5. Results of Language Expert Validation

Assessment Aspect	Score (%)	Category
Clarity	96.66	Very Good
Compliance with Indonesian language conventions	100.00	Very Good
Contextual suitability	86.66	Very Good
Overall	94.44	Very Good

The language validation score of 94.44% indicates that the digital pocket book was presented using clear, appropriate, and understandable language for tenth-grade students. The findings suggest that the developed media successfully minimized linguistic barriers and supported students' comprehension of biodiversity concepts.

Teacher Response

The practicality of the developed digital pocket book was evaluated by the biology teacher responsible for biodiversity instruction.

Table 6. Teacher Response toward the Developed Digital Pocket Book

Assessment Aspect	Score (%)	Category
Content suitability	94.00	Very Good
Media appearance	90.00	Very Good
Language	100.00	Very Good
Media usefulness	96.00	Very Good
Overall	94.29	Very Good

The teacher response score of 94.29% indicates that the developed media was considered practical and appropriate for classroom implementation. The high evaluation of usefulness suggests that the digital pocket book can support teachers in presenting biodiversity concepts through more contextual and engaging learning activities.

Field Testing

Following expert validation and revision, the digital pocket book was implemented with tenth-grade students. Field testing consisted of a small-group trial and a large-group trial to evaluate students' perceptions regarding the usability, attractiveness, and relevance of the developed media.

Table 7. Students' Responses during Field Testing

Trial Stage	Score (%)	Category
Small-group trial	87.72	Very Good
Large-group trial	91.59	Very Good
Overall	89.65	Very Good

The positive student responses indicate that the digital pocket book was perceived as attractive, accessible, and relevant to students' learning needs. The higher score obtained during the large-group trial suggests that the media maintained its practicality and attractiveness when applied in a wider classroom context.

Effectiveness of the Developed Digital Pocket Book

The effectiveness of the digital pocket book was evaluated by comparing students' learning motivation and environmental care attitudes before and after implementation. The evaluation focused on whether integrating ethnopangan-based content into digital learning could support improvements in students' affective learning outcomes.

Table 8. Pre-test and Post-test Results

Variable	Pre-test (Mean)	Post-test (Mean)
Learning motivation	2.41	4.33
Environmental care attitude	2.31	4.34

The results show an increase in both measured variables after students used the ethnopangan-based digital pocket book. Learning motivation increased from 2.41 to 4.33, suggesting that the contextual and interactive characteristics of the media enhanced students' engagement and perceived relevance of biodiversity learning. Meanwhile, the improvement in environmental care attitude from 2.31 to 4.34 indicates that connecting biodiversity concepts with local resource utilization encouraged students to develop stronger environmental awareness and responsibility.

Table 9. N-Gain Analysis of Learning Motivation and Environmental Care Attitude

Variable	-Gain	Category	N-Gain Score (%)	Effectiveness
Learning motivation	00.737	High	73.30	Moderately Effective
Environmental care attitude	00.750	High	75.03	Effective
Average	00.744	High	74.37	Moderately Effective

The N-Gain analysis demonstrates that the ethnopangan-based digital pocket book effectively improved students' affective learning outcomes. The high improvement in learning motivation indicates that the media successfully provided engaging and meaningful learning experiences, consistent with the principles of contextual and motivational learning. Similarly, the improvement in environmental care attitudes suggests that integrating local biodiversity knowledge helped students understand the importance of sustainable resource utilization. Overall, the average N-Gain score of 0.744 indicates that the developed digital pocket book was moderately effective in strengthening students' motivation and environmental responsibility during biodiversity learning.

DISCUSSION

The findings of this study demonstrate that the ethnopangan-based digital pocket book integrating the local wisdom of Langkat Regency represents a valid, practical, and effective instructional medium for biodiversity learning. The developed media successfully combines digital learning technology with culturally relevant biological knowledge, providing a learning resource that goes beyond conventional textbook-based instruction. Previous studies have shown that digital learning media can improve students' engagement, conceptual understanding, and learning experiences through interactive features and flexible accessibility (Ariyanto et al., 2021; Wardani et al., 2023). However, many existing digital biology resources primarily emphasize cognitive achievement, while the present study extends previous research by demonstrating the potential of digital media to strengthen affective outcomes, particularly learning motivation and environmental care attitudes.

The improvement in students' learning motivation can be explained through the interaction between contextual content and digital learning features. According to Keller's ARCS Motivation Theory, effective learning materials should attract students' Attention, demonstrate Relevance, enhance Confidence, and provide Satisfaction. In this study, the integration of ethnopangan increased the relevance of biodiversity concepts by connecting scientific knowledge with students' familiar cultural practices, while interactive digital features supported students' attention and engagement. This finding supports previous studies indicating that digital pocket books and interactive learning media can enhance motivation by providing meaningful and learner-centered experiences (Dewi & Anggraini, 2025; Elisa et al., 2021). Compared with previous studies that mainly focused on the technological aspects of digital media, this study highlights that contextual relevance is an important factor determining the motivational value of digital learning resources.

The role of ethnopangan in supporting meaningful learning is consistent with Constructivist and Contextual Learning perspectives, which emphasize that students construct knowledge more effectively when new concepts are connected with prior experiences and real-life contexts. In this study, biodiversity was not presented merely as abstract scientific information but as knowledge embedded within local food practices and biological resource utilization. This contextual approach helped students recognize the relationship between biodiversity, culture, and environmental sustainability. Similar findings have been reported in local wisdom-based learning studies, which demonstrate that integrating regional knowledge into science education can improve students' engagement and understanding because learning becomes more relevant to their daily experiences (Sya'wanah & Hidayati, 2022; Zhou & Ahmad, 2025). However, unlike previous studies that generally developed local wisdom-based materials without integrating digital platforms, the present study combines cultural context with interactive digital technology.

The improvement in environmental care attitudes further indicates the educational value of ethnopangan-based biodiversity learning. Environmental education research suggests that knowledge acquisition alone is insufficient to develop sustainable attitudes; students require meaningful learning experiences that connect environmental concepts with real-life situations. Through ethnopangan, students learned how biological resources are utilized, processed, and preserved within local communities, allowing them to understand biodiversity conservation from both ecological and cultural perspectives. This finding supports the principles of Education for Sustainable Development (ESD), which emphasize the integration of scientific knowledge, environmental responsibility, and social-cultural values in education. Therefore, the present study extends previous environmental education research by showing that local cultural practices can serve as effective contexts for developing students' environmental awareness and responsibility.

The findings also reveal the importance of integrating local wisdom and digital technology as complementary approaches in science education. Previous studies have generally investigated digital learning media and local wisdom-based education as separate approaches: digital media research has emphasized accessibility and interactivity, whereas local wisdom research has focused on contextual relevance and cultural authenticity. The present study contributes to filling this gap by integrating ethnopangan, digital learning technology, and biodiversity education within a single instructional resource. This integration provides implications for biology education by demonstrating that culturally responsive digital media can support not only students' understanding of scientific concepts but also their motivation and environmental attitudes (Astikasari et al., 2025; Komaria et al., 2023; Yuliani et al., 2022).

Despite these contributions, several limitations should be acknowledged. The study was conducted in a single senior high school using a one-group pretest-posttest design, which limits the generalizability of the findings and prevents direct comparison with a control group. Furthermore, the relatively short implementation period may not fully represent long-term changes in students' motivation and environmental attitudes. Future research should involve larger and more diverse samples, employ experimental or quasi-experimental designs, and examine additional learning outcomes such as scientific literacy, critical thinking, and environmental decision-making skills. Nevertheless, this study provides empirical evidence that ethnopangan-based digital learning media can serve as a promising strategy for developing contextual, culturally responsive, and sustainability-oriented biodiversity education.

CONCLUSION

This study successfully developed an ethnopangan-based digital pocket book integrating the local wisdom of Langkat Regency for biodiversity learning through the ADDIE development model. The developed learning media demonstrated high validity and practicality based on evaluations from material, media, and language experts, as well as positive responses from teachers and students. Furthermore, the implementation results showed that the digital pocket book effectively improved students' learning motivation and environmental care attitudes, as indicated by the high N-Gain values obtained after its use. These findings confirm that integrating digital technology with local wisdom can provide meaningful, engaging, and context-based learning experiences that support affective outcomes in biology education.

The present study contributes to science education by demonstrating that ethnopangan-based digital learning media can bridge scientific knowledge, local wisdom, and environmental sustainability within biodiversity instruction. By transforming local biological resources and traditional food practices into digital learning content, the developed media provides an alternative approach for contextualizing biodiversity concepts while strengthening students' environmental awareness and appreciation of cultural heritage. Therefore, this study extends previous research on digital learning media and local wisdom-based education by presenting an integrated instructional resource that simultaneously addresses technological, cultural, and sustainability dimensions in science learning.

Despite these contributions, this study was limited to a single senior high school and employed a one-group pretest-posttest design with a relatively short implementation period. Therefore, the generalizability of the findings and the long-term effects of the developed media require further investigation. Future studies are recommended to involve larger and more diverse samples, employ experimental or quasi-experimental designs with control groups, extend implementation periods, and examine additional learning outcomes such as scientific literacy, critical thinking, problem-solving skills, and sustainable behavior.

REFERENCES

- Ani, F., Angraini, K., & Halimah. (2024). Profile of Environmental Awareness and Environmental Care Attitude of Students at Junior High School 2 Kaliiori, Rembang Regency. *Unnes Science Education Journal*, 13(3).
- Ariyanto, E., Utami, S., & Ismaya, T. (2021). The development of digital pocketbook media based on inquiry on plant growth materials elementary school students. *Universal Journal of Social Sciences and Humanities (UJSSH)*.
- Astikasari, M., Fajrina, M. D., Utami, R. D., & Fitria, M. (2025). Penguatan Sikap Peduli Lingkungan melalui Kegiatan Preventif bagi Siswa Sekolah Dasar. *Buletin KKN Pendidikan*, 4(2).
- Dewi, A. F., & Angraini, A. (2025). Hubungan antara Pengetahuan Lingkungan dan Sikap Peduli Lingkungan pada Mahasiswa Tadris IPA. *Realita: Jurnal Penelitian Dan Kebudayaan Islam*.
- Elisa, E., Panjaitan, R. G. P., & Wahyuni, E. S. (2021). Pembuatan Buku Saku Sub Materi Pemanfaatan Keanekaragaman Hayati Di Indonesia Kelas X SMA. *Jurnal Pendidikan Informatika Dan Sains*, 10(2), 90–98.

- Hasruddin, & Harahap, F. (2018). Model Inkuiri Kontekstual untuk Meningkatkan Keterampilan Proses Sains Siswa pada Pembelajaran Mikrobiologi. *Jurnal Pendidikan Dan Pembelajaran*, 25(1).
- Hendrilia, Y., Salamah, S., Judijanto, L., Nuryenda, E. Y., & Fauzi, M. S. (2025). Learning Motivation as a Predictor of Academic Success: A Literature Review in Educational Psychology. *TOFEDU: The Future of Education Journal*, 4(6), 1841–1846.
- Iskandar, Nugraha, A., Halimahturrafiah, Amarullah, & Putra, R. (2022). Development Of Android-Based Digital Pocketbook Learning Media In Pancasila And Citizenship Education Subjects For Class VIII SMP. *Jurnal Edu Research and Innovative Teaching (JERIT)*.
- Komaria, S., Mauludin, R., & Putri, R. (2023). Development Of An E-Pocket Book Using The Canva Application To Train Students Scientific Literacy Skills. *Pedagogy Journal: Universitas Pendidikan Mandalika*.
- Kurniawan, R., & Astuti, D. W. (2024). Inovasi Media Pembelajaran Digital untuk Meningkatkan Motivasi Belajar Siswa SMA di Era Teknologi 5.0. *Jurnal Ilmiah Edukasi Dan Pembelajaran*, 8(1), 112–121.
- Lestari, D., Sopian, H., & Mulyani, S. (2023). Digital Pocket Book With Interactive Features To Improve Students Motivation And Independent Learning Skills. *Journal of Digital Learning Media*, 7(1), 23–34.
- Marlian, & Budianingsih, I. (2023). Digital Pocket Book As Learning Medium For Disaster Preparedness In The Technological Era. *International Journal of Community Engagement and Participatory (IJCEP)*.
- Nasution, R., & Sari, D. P. (2023). Pengaruh Media Digital Berbasis Lokal Terhadap Motivasi Belajar Biologi Siswa SMA. *Jurnal Pendidikan Sains Indonesia*, 11(2), 155–166.
- Prasetyo, A., & Kurniawati, L. (2023). Pengembangan Pocket Book Digital Berbasis Potensi Lokal Untuk Meningkatkan Literasi Sains. *Jurnal Pendidikan Biologi*, 15(1), 45–56.
- Putri, F., Ananda, R., & Nurhasanah, S. (2021). Development Of Digital Pocket Book Based On Local Wisdom To Increase Students' Learning Motivation In Science Learning. *Journal of Science Education Innovation*, 4(1), 45–56.
- Sya'wanah, I., & Hidayati, S. (2022). The Development Of Digital Pocket Book-Based Learning Media To Improve Students' Interest In Learning Social Sciences Subject. *Jurnal Pekobis: Jurnal Pendidikan, Ekonomi, Dan Bisnis, Universitas Pamulang*.
- Wardani, S., Naswir, & Afrida, A. (2023). Development of a STEM-Based E-Pocket Book As A Learning Media On Green Chemistry Materials at MAN 2 Jambi City. *Journal of Education and Learning (JONEDU)*.
- Widodo, S., Hartati, R., & Rahayu, D. (2022). Etnopangan Sebagai Sumber Belajar Sains Dan Pelestarian Budaya Lokal. *Jurnal Pendidikan Sains Indonesia*, 11(3), 145–156.
- Yuliani, N., Setiawan, R., & Mulyani, T. (2022). Kandungan Gizi Pangan Tradisional Berbasis Lokal Sebagai Alternatif Ketahanan Pangan Masyarakat. *Jurnal Gizi Dan Pangan*, 17(2), 87–96.
- Zhou, F., & Ahmad, R. A. (2025). The Impact of Learning Motivation on Students' Academic Performance: A Self-Determination Theory Perspective. *Journal of Education, Humanities, and Social Research*, 10(1), 15–27.