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Mobile Learning Mahilung as an Ethno-Edugames Media Dayak Cultural Literacy in Game-Based Learning

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Abstract: This study aims to evaluate the level of feasibility and user response to the Mahilung Mobile Learning (M-Learning) application as an ethno-edugames media based on Dayak cultural values in Game-Based Learning (GBL) in elementary schools. The research method was evaluative with a quantitative descriptive design supported by qualitative analysis of open-ended comments. The evaluation was conducted in two stages: expert validation and limited trials. Validation involved material and media experts. The implementation trial involved six teachers and 31 fifth-grade students from two elementary schools selected purposively. The research instruments included an expert validation sheet, teacher and student response questionnaires, and an observation sheet. The results showed that Mahilung was categorized as "very suitable," with validation scores from material experts of 96% and media experts of 90%. Teacher responses reached 88% and student responses 92%, both of which fall into the "very good" category. Qualitative feedback confirmed that Mahilung is engaging, easy to use, and relevant to the local cultural context. It was also found that using the application can help increase student engagement and understanding in game-based thematic learning. Mahilung contributes as an effective digital learning media to support the implementation of GBL, increase student engagement, and support teachers in strengthening local cultural literacy in elementary schools. This research, which integrates ethno-edugames based on Dayak cultural values into GBL at the elementary school level, is novel and contributes empirical evidence regarding the feasibility, user acceptance, and cultural relevance of local digital media, thus enriching the study of culture-based learning in Indonesian education.

Keywords: Cultural Literacy, Ethno-Edugames, Games Based Learning

A. Introduction

Digital transformation in education has become an unavoidable necessity, especially after the pandemic disrupted face-to-face learning processes on a large scale. Schools in marginalized areas, such as the Central Kalimantan River Basin Area (DAS), face a

dual challenge: limited infrastructure and internet access and a lack of learning media that contextually integrate local wisdom. This has the potential to hinder efforts to strengthen students' character and cultural identity. Conversely, cultural literacy is increasingly recognized as a crucial 21st-century competency not only for cultural inheritance but also for strengthening tolerance, citizenship, and pride in local identity (Prihatiningsih et al., 2025).

Game-Based Learning (GBL) has been shown to increase student motivation, engagement, and competence in various academic domains. For example, systematic studies have shown that implementing game-based learning significantly supports student engagement and motivation (Zakaria et al., 2025). Research indicates that GBL provides an interactive and active learning environment, which is crucial for elementary school children (Sun, 2021). Bibliometric studies also indicate that GBL research trends increasingly emphasize the development of digital games, motivation, and 21st-century skills (Nursetyo et al., 2024). However, many developed GBL media are generic and do not sufficiently incorporate local cultural elements into their learning content.

In the context of local culture-based education, the ethno-edugames approach has emerged as a solution that combines local wisdom with educational game mechanics. Research by Ameliya et al., (2025) and Nurhaliza et al., (2025), which implemented applications that highlight folklore and local wisdom, showed that these applications can improve students' creative and critical thinking skills. Furthermore, they can improve material understanding and learning outcomes, and teachers have very positive perceptions of the effectiveness of using ethno-edugames in learning (Fitri et al., 2023; Kumala & Agarica, 2024; Muliadi et al., 2024). However, most available GBL media are still generic and do not incorporate local cultural context. This results in a weak connection between students' learning experiences and their regional cultural identity, especially in Central Kalimantan.

Specifically in Dayak culture, there are noble philosophies such as Pintar Tuntang Harati (intelligent and kind-hearted) and Handep Hapakat (mutual cooperation and togetherness) that are highly relevant in shaping students' character. Unfortunately, the implementation of these values in digital learning media is still very limited. Based on previous research and development reports in Central Kalimantan, teachers and students reported that contextual learning media containing Dayak culture were almost unavailable. In response to this need, the Mahilung Mobile Learning application was developed as an ethno-edugames medium that combines thematic learning materials with Dayak cultural values such as Pintar Tuntang Harati and Handep Hapakat. Although this application has gone through a series of design and development processes, important aspects that must be ensured before widespread implementation are the level of media feasibility and user acceptance (teachers and students). Expert validation is required to ensure that the content, display, and

technical aspects of Mahilung meet learning media standards. Meanwhile, the implementation trial aims to determine the extent to which this application is used well in the classroom and accepted by teachers and students in the GBL context. Based on this urgency, this study specifically focuses on (1) assessing the feasibility of the Mahilung application based on validation by material and media experts, and (2) analyzing the implementation and responses of teachers and students to the use of Mahilung in GBL-based thematic learning.

B. Methods

This study employed an evaluative approach with a quantitative descriptive design supported by a brief qualitative analysis of open-ended comments. The evaluative approach was chosen because the research objective was to evaluate the feasibility of the Mahilung Mobile Learning product through expert review and assess its acceptance and initial effectiveness through field trials with teachers and students. This approach aligns with the principles of usability evaluation, which emphasize the involvement of key users in the evaluation process.

The research instrument used was an expert validation checklist and assessment items that assessed content validity aspects, including the adequacy and relevance of the material to Core Competencies (KI)/Basic Competencies (KD)/Indicators; presentation and language; technical media aspects, including display, navigation, and programming; and usability effectiveness, including ease of installation, offline capability, and ergonomics. The second instrument, a teacher response questionnaire, assessed the suitability of the material, pedagogical feasibility, practicality of implementation, and presentation aspects. The student response questionnaire assessed ease of use, clarity of instructions, appropriateness of language/images, learning motivation, and perceptions of learning. Each item was assessed using a 1-5 Likert scale (1 = poor … 5 = excellent). Instructions for completion and assessment criteria are included. Observation sheets and field notes to record the installation process, technical issues, and student behavior during use.

The respondents were selected through purposive sampling based on their professional roles and involvement in the implementation of fifth-grade thematic learning at the study site. The research subjects consisted of expert validators and trial users. The expert validators, consisting of two material experts and two media experts, were selected purposively based on their experience and track record of publications/work. The product trial subjects were two material and media experts, six teachers from two elementary schools, and 31 fifth-grade elementary school students from SD 14 Palangka Raya and SD Tumbang Rungan, Palangka Raya City, Central Kalimantan Province. The data collection procedure consisted of three stages:

1. Stage A. Expert Validation
   a. The Mahilung prototype (APK + short manual) was sent to two subject matter experts and two media experts.
   b. Each expert completed an the expert validation sheet and provides written comments (recommendations for revision).
   c. The Item Content Validity Index (I-CVI) was calculated for each item and the Scale-level CVI (S-CVI) for each domain using methods recommended in the literature (see explanation in the Analysis section). If the I-CVI is <0.78 (for three to five experts), the item is revised.

Procedure rationale: The formative evaluation model (Tessmer) recommends expert review as an initial layer to identify conceptual errors and design improvements before extensive user testing.

2. Stage B. Revision Product

Researchers held revision meetings based on expert input, and improvements were made (animations, mini-game instructions, next button settings, institutional logos, etc). All revisions were documented.

3. Stage C. Limited Trial (Implementation)
   a. The application was distributed to teachers and students at the two selected elementary schools. The teachers guided the installation (via WhatsApp sharing/manual installation) and recorded any installation issues.
   b. Usage session: Students used the application during 1–2 hours of teacher-facilitated thematic learning. Field observations were conducted by researchers.
   c. After the session, teachers and students completed a response questionnaire, the researchers collected observation sheets and open-ended comments.

Data analysis in this study used a mixed-methods approach to analyze the data. Qualitative data were used to describe the revision input, while quantitative data were used to measure product feasibility and user responses through the instrument. Interview data, observation notes, and open-ended comments on the questionnaire were analyzed using thematic analysis: (1) data transcription; (2) initial coding (open coding); (3) grouping codes into themes; and (4) triangulation with quantitative findings to support product revision decisions. This approach facilitates the integration of process and outcome evidence into a mixed-methods design (Peters & Fàbregues, 2024). Quantitative analysis was performed using Likert scores on the validation sheet and questionnaire, which were calculated as a feasibility percentage. Content validity was assessed by assessment by at least one subject matter expert and one media expert; qualitative input was used to refine items and content (a procedure consistent with common R&D instrument validation practices) (Rassul & Kh, 2023). The reliability of the instrument (questionnaire) was estimated by calculating internal consistency (e.g., Cronbach's alpha) if the number of items and test samples was

sufficient. Reliability values are reported in the results section if calculated.

C. Results and Discussion

Results

The results of this study are presented in two main sections: (1) expert validation of the feasibility of the Mahilung Mobile Learning application and (2) implementation results for teachers and students through limited trials. The presentation of the results was supplemented by quantitative data and qualitative findings from validators' comments and field observations.

The satisfaction questionnaire was completed by teachers and students after they used the application. In general, the aspects assessed in the teacher satisfaction questionnaire were: (1) The suitability of the material to Core Competencies (KI), Basic Competencies (KD), Indicators and learning objectives; (2) The quality aspect of the application was seen from the criteria of learning media, practical functions and application design; (3) The effectiveness aspect was related to suitability of learning needs, could train students' learning independence, and the application could be used offline; and (4) The presentation aspect was seen from the suitability of the images to the material, ease of selecting the application menu and ease of use. Meanwhile, the aspects assessed in the student satisfaction questionnaire were: (1) media aspects related to ease, clarity of instructions and materials, suitability of language, suitability of images and videos, and color combination; (2) the learning aspect contained the ability to learn independently, increase knowledge and insight, motivate and create a sense of pleasure and help understand the learning material. The assessment scale uses a Likert scale with five scales, namely a score of 5 for very good, a score of 4 for good, a score of 3 for quite good, a score of 2 for less good and a score of 1 for not good.

The validation results for the Mahilung M-Learning media were assessed based on content quality, presentation, and language. Validator 1 scored 96%, categorizing it as very suitable, and Validator 2 scored 100%, categorizing it as very suitable. The validation results for the Mahilung M-Learning media were assessed based on appearance, programming, effectiveness, and usability. Validator 1 scored 86%, categorizing it as very suitable, and Validator 2 scored 93%, categorizing it as very suitable. The following is a comparison of the results of the material validation and

the media validation M-Learning Mahilung

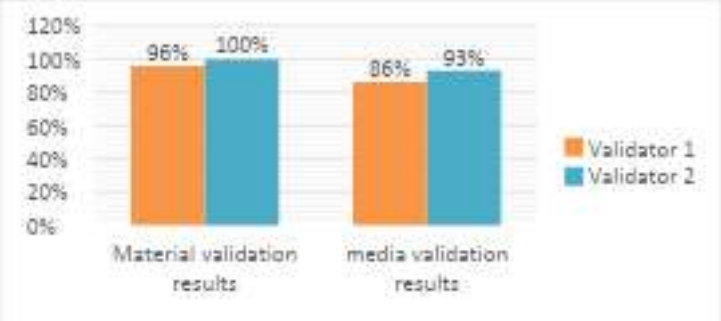

Figure 1. Comparison of Validation Results *M-Learning* Mahilung

After the Mahilung M-Learning Media was validated by the validator, the research team held a revision meeting for the Mahilung M-Learning media in accordance with the suggestions and criticisms from the validator. The following improvements were made based on the criticisms and input from the validators: addition of the developer agency logo and its class, animation that is in line with the topic title to make it more interesting, making image objects that discuss moving material, so that users know the object is the material presented on the slide, adding reinforcement questions to the Pancasila student profile material through a case, displaying the geographical and astronomical location of Indonesia on a map of the State of Indonesia directly so that students understand the direction of its location, adding reinforcement exercises to the unity and unity material in the community in the form of problem solving, in the Mini Games menu adding game work instructions.

The Mahilung M-Learning Media trial was conducted for students of Palangka Raya 14 Elementary School and Tumbang Rungan Elementary School. During the trial, students were asked to bring their mobile phones to school with permission from their parents, coordinated by their class teachers. The trial began with the joint installation of the Mahilung M-Learning media that had been shared in the Whatsapp Group by the class teacher. After installing, students listened to directions from the research team to use the application by introducing the features in the media. After getting to know the existing features, students tried using the Mahilung M-Learning media for 2 hours of learning facilitated by the class teacher and school. Not only that, the trial was also carried out by students who were not in school due to flooding conditions in their homes. However, based on the responses from parents and students themselves, they felt helped by the Mahilung M-Learning media that had been developed.

Following the product trial, researchers distributed teacher and student response questionnaires regarding the use of the Mahilung M-Learning application. This questionnaire was intended to assess and determine the application's suitability as a learning medium in grade V, using the theme "Our Friend's Environment,"

developed for limited face-to-face learning at the Watershed Elementary School. The teacher response questionnaire was completed by six teachers, with the following aspects assessed: (1) the suitability of the material to competency competencies (KI), core competencies (KD), indicators, and learning objectives; (2) the quality aspect; (3) the effectiveness aspect; and (4) the presentation aspect.

The results of the teacher response questionnaire regarding the app's suitability as a learning medium in grade V, using the theme "Our Friend's Environment," developed for limited face-to-face learning at Watershed Elementary School, can be seen in the following chart.

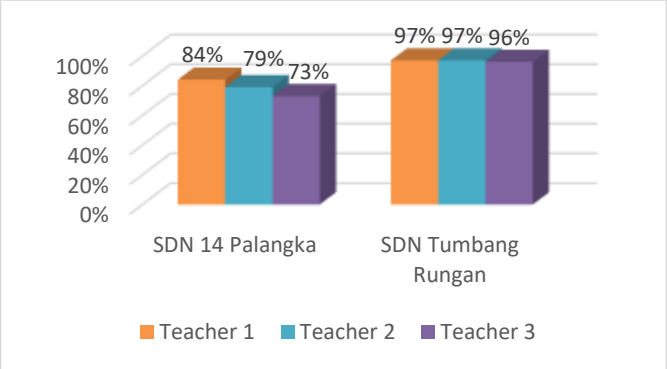

Figure 2. Teacher Response to Eligibility Application *M-Learning* Mahilung

Based on Figure 2, we can see the results of the teacher responses at SDN 1 Palangka, with Teacher 1 scoring 84%, categorized as very good, Teacher 2 scoring 79%, categorized as good, and Teacher 3 scoring 73%, categorized as good. Meanwhile, at SDN 1 Tumbang Rungan, Teacher 1 scored 97%, categorized as very good, Teacher 2 scored 97%, categorized as very good, and Teacher 3 scored 96%, categorized as very good. The Mahilung M-Learning application achieved a classical feasibility score of 88%, categorized as very good, with some input and suggestions from teachers during the trial.

Meanwhile, 31 students completed the student response questionnaire, which assessed the following aspects: (1) media aspects and (2) learning aspects.

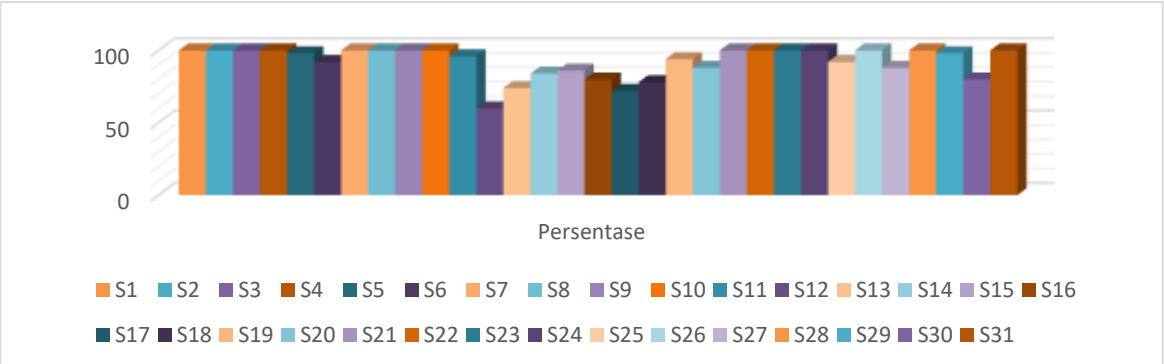

Figure 3. Response Student To Eligibility Application M-Learning Mahilung

Based on Figure 3, it can be seen that the response results of 27 students said that the Mahilung M-Learning application was declared to have received very good criteria for use in learning, and four students said that the Mahilung M-Learning application was declared to have received good criteria. Classically, the percentage of feasibility of the Mahilung M-Learning Application received a score of 92% with very good criteria.

The meeting was held to evaluate the application's shortcomings based on the results of previous trials, including setting the application's usage time and changing the next button setting so that it could be used only after the user had finished reading the slide. This was based on the researcher's observations during the media trials, which showed that some students were more focused on getting points without listening to the material in the application.

Discussion

The findings of this study indicate that the expert validation results of the Mahilung Mobile Learning application have very high feasibility in terms of material and media, with a score of 98% (material) and 89.5% (media). This figure indicates that the learning content, presentation flow, visual display, and integration of Dayak cultural values have met the quality standards of modern digital learning media. This is in line with recent studies that emphasize that effective digital educational media must have good visual design and interactivity, intuitive navigation, and content that is appropriate to the pedagogical and cultural needs of students. For example, in reviews by Firmansyah et al., (2024); Ishak et al., (2023) it is stated that digital educational media designed by considering factors such as design quality, interactivity, pedagogical aspects, updated and relevant content can significantly improve student learning performance. Therefore, the high validation of Mahilung not only shows that this application is technically and materially feasible, but also meets the criteria of today's educational media that is relevant, interactive, and culturally contextual, which are important aspects for learning media to be truly effective and accepted by users.

The excellent teacher response (88%) indicates that Mahilung is not only content-appropriate but also practical for use in learning. Teachers considered the application easy to implement, relevant to thematic learning needs, and helpful in addressing the limitations of digital resources in schools—particularly in river basins (DAS) with network constraints. This aligns with Ningsih & Adesti, (2020) findings that the development of mobile learning that can run without an internet connection expands access to education in remote areas. The offline-first feature makes Mahilung appropriate to the local context and teachers' practical needs, thus supporting the integration of local cultural values without increasing teachers' workload. Thus, Mahilung is not only positively received technically and aesthetically, but also

affectively and pedagogically by users in the field.

The very high student response score (92%) indicates that Mahilung is able to increase student engagement, motivation, and understanding. Student interaction with familiar games, challenges, and cultural content is in line with motivational theory in GBL, which states that game elements such as points, levels, and feedback increase intrinsic engagement. In addition, the presentation of Dayak culture through art, music, motifs, and stories fosters emotional closeness that increases interest, self-confidence and strengthens cultural literacy. strengthens learning outcomes and critical thinking skills which are 21st-century skills through exploration and reflection of values, and creates contextual, fun, and relevant learning experiences to students' lives (Cahya Susaniari & Santosa, 2024; Farah Abdul Qadir et al., 2024; Jasmaniah et al., 2024; Nadeem et al., 2023; Wirawan et al., 2024).

Findings from expert validation, teacher responses, and student responses collectively indicate that Mahilung addresses the gap identified in the introduction, namely the lack of contextual and culturally-based digital learning media. However, challenges were also identified, such as the behavior of some students who rushed to complete the game in order to gain points. This demonstrates the need for the teacher's role as a facilitator to maintain the learning focus on understanding the material, as Anderton & King, (2016) remind us that GBL requires pedagogical guidance so that competition does not obscure learning objectives.

Theoretically, the findings of this study strengthen the framework of constructivism, sociocultural theory, and experiential learning, that game-based learning that includes local cultural artifacts can enhance the construction of meaning, social interaction, and contextual learning experiences. Practically, Mahilung offers an ethno-edugames model that can be replicated for other local cultures in Indonesia, is an effective digital medium for integrating cultural literacy in thematic learning, and provides a concrete example of the application of 21st-century learning innovations in areas with limited access to technology.

D. Conclusions

The Mahilung Mobile Learning application, a Dayak cultural value-based ethno-edugames medium, has proven to be highly feasible and effective for Game-Based Learning (GBL)-based thematic learning in elementary schools. Expert validation demonstrated high feasibility (98% from material experts; 89.5% from media experts), reinforced by teacher (88%) and student (92%) responses that affirmed Mahilung is engaging, easy to use, and culturally relevant. These positive impacts stem from the integration of local Dayak values into the content, interactive game mechanics, and a mobile design that enables contextual and participatory learning tailored to student characteristics. Mahilung has practical significance as a digital learning medium that

bridges cultural preservation with modern pedagogy. This application is low-cost, easily replicated, and supports teachers in integrating the values of Pintar Tuntang Harati and Handep Hapakat into their lessons, enabling wider implementation in schools with similar cultural contexts. However, this study is limited by its small sample size, short trial duration, and limited research location within the city of Palangka Raya. Further research is needed, involving a broader longitudinal trial to assess the long-term impact on learning outcomes and cultural literacy, adapting Mahilung to other local cultures, and developing teacher guides to support more systematic integration in schools.

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