



Transforming Students' Literacy through Metaverse-Based Ethnolinguistic Folklore of Kajao Laliddong and Bugis-Bone Cultural Values

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Abstract

Junior high school students' literacy skills remain relatively low due to the limited use of innovative learning media and the minimal integration of local cultural values into Indonesian language learning. This study aimed to examine the effect of implementing the Metaverse-based ethnolinguistic folklore of Kajao Laliddong on students' literacy skills. A quantitative approach using a quasi-experimental nonequivalent control group design was employed, involving 60 seventh-grade students at SMPN 2 Libureng, comprising an experimental class and a control class. Data were collected through pre-tests, post-tests, observations, and student and teacher response questionnaires, and analyzed using descriptive and inferential statistics, including normality testing, the Mann-Whitney U test, and N-gain analysis. The findings indicate that students who learned through the Metaverse-based ethnolinguistic approach achieved significantly higher literacy improvement than those receiving conventional instruction, with a moderate level of learning effectiveness ($N\text{-gain} = 0.67$). Students and teachers also demonstrated highly positive responses toward the learning media. The novelty of this study lies in integrating the ethnolinguistic folklore of Kajao Laliddong and Bugis-Bone cultural values into an immersive Metaverse environment, creating a culturally responsive and technology-enhanced literacy learning model. The findings contribute to the development of Indonesian language learning by demonstrating that integrating local wisdom with immersive technology can effectively strengthen students' literacy skills while fostering cultural awareness and engagement.

INTRODUCTION

Language and culture are two interconnected entities that shape a community's social identity. Language functions not only as a means of communication but also as a representation of values, ways of thinking, and the knowledge system of a cultural group (Aliyeva, 2025; Putri et al., 2024). This perspective positions language as a medium for intergenerational cultural transmission that contributes to the development of character, morality, and social understanding. Zamhari et al. (2025) stated that language and culture share a reciprocal relationship that influences human intellectual development through social interaction, while Salsabila et al. (2026) emphasized that language serves as the core of communication and the construction of cultural meaning. Such conditions indicate that language learning cannot be separated from the cultural context underlying it.

The development of 21st-century education demands learning processes that are not solely oriented toward academic competence but also toward strengthening students' local cultural identity. The government-promoted revitalization of regional languages has become a strategic effort to preserve local wisdom amid the flow of digital globalization (Putri et al., 2024). Nevertheless, the implementation of culture-based learning in schools remains predominantly textual and has yet to provide students with contextual, meaningful learning experiences. As a result, local culture is often understood merely as memorization material rather than being internalized as life values relevant to students' realities (Maturbongs & Lestari, 2025; Thresia et al., 2024).

One approach that integrates language, culture, and education is ethnolinguistics (Putro & Supriyono, 2025). Ethnolinguistic studies connect linguistic elements to sociocultural realities by exploring meanings, symbols, values, and social practices embedded in local traditions (Kacmaz & Kutlu, 2024). Ethnolinguistics enables more contextual learning because students not only study language structures but also understand the cultural values underlying them (Dirgantari & Cahyani, 2024; Saputra, 2025). Such an approach is particularly important in literacy learning, since literacy competence encompasses not only reading and writing skills but also the ability to understand a text's social and cultural contexts.

Despite various educational reforms, students' literacy achievement in Indonesia remains a major concern. Results from national literacy assessments and school-based evaluations indicate that many junior high school students continue to experience difficulties in comprehending texts, interpreting implicit meanings, and critically responding to written information. This challenge is also reflected in international assessments, where Indonesian students continue to demonstrate relatively low reading literacy performance compared with many other participating countries. These findings highlight the urgent need for innovative literacy learning approaches that are contextual, engaging, and relevant to students' learning characteristics in the digital era.

Bugis-Bone local wisdom possesses significant potential as a source of culture-based literacy learning, particularly through the folklore of Kajao Laliddong (Teng & Saleh, 2022). Kajao Laliddong is widely recognized as an intellectual figure of the Bone Kingdom whose ideas are embodied in *ada' pappaseng*, a form of advice, moral guidance, and philosophical teaching within Bugis society (Hasan & Hajrah, 2025). Cultural values such as *lemppu'* (honesty), *assitinajang* (propriety), *getteng* (steadfastness), and *reso* (hard work) are strongly reflected in the folklore (Idrus, 2025). These cultural values are not only relevant to the social life of the Bugis community but also hold strong potential as media for character building and literacy enhancement among students. However, previous studies have primarily discussed Kajao

Laliddong from linguistic, historical, and cultural perspectives, while its use as an innovative literacy-learning resource integrated with immersive educational technology remains limited.

The low integration of local wisdom in learning is influenced by teachers' limited ability to connect culture with educational technology. Most literacy instruction still relies on conventional textbook-based methods, causing students to become passive and less interested in learning materials (Agustina, 2025; Umam & Husain, 2024). Such conditions result in language learning losing its contextual dimension, which, ideally, should foster students' emotional engagement. Consequently, students' literacy skills tend to stagnate, particularly in their understanding of implicit meanings, figurative language, and moral messages in folklore texts.

The phenomenon of low student literacy skills was also identified during the School Field Introduction Program (Pengenalan Lapangan Persekolahan—PLP) at SMP Negeri 2 Libureng. Interviews with Indonesian language teachers and the vice principal for curriculum affairs revealed that students had difficulty understanding figurative language and showed little interest in reading narrative texts. These findings were reinforced by Indonesian language learning evaluations, indicating that students' literacy achievement remained below the Minimum Competency Assessment (AKM) standard. Educational Report Card data also showed that students' reading literacy skills were still categorized as low. Although various school literacy programs had been implemented, literacy improvement remained insignificant because the learning process had not yet incorporated media aligned with the characteristics of today's digital generation.

Digital transformation in education has opened new opportunities to create more interactive and contextual literacy learning through the utilization of Metaverse technology. Metaverse technology enables the creation of three-dimensional virtual environments that provide immersive learning experiences for students (Mahmadov, 2025; Wang, 2025). The visualization of Kajao Laliddong folklore within an interactive virtual space is considered capable of increasing student engagement in understanding story content, cultural values, and linguistic elements embedded in the narrative. Such an approach is highly relevant to the characteristics of the post-Generation Z era, whose learners are more familiar with visual technology and interactive digital experiences than with conventional textual learning.

Previous studies have demonstrated the effectiveness of ethnolinguistic approaches in strengthening contextual language learning and preserving local culture (Dirgantari & Cahyani, 2024; Saputra, 2025), while other studies have highlighted the educational potential of Metaverse technology in enhancing students' engagement and motivation to learn (Mahmadov, 2025; Wang, 2025). However, these studies have generally examined local wisdom and immersive technology separately. Empirical research integrating ethnolinguistic folklore, Bugis-Bone cultural values, and Metaverse technology into Indonesian language literacy learning remains scarce, particularly regarding how these elements can improve students' literacy skills through culturally responsive and immersive learning experiences. This gap indicates the need for a learning model that simultaneously integrates local cultural heritage with emerging educational technologies.

Accordingly, the novelty of this study lies in integrating the ethnolinguistic folklore of Kajao Laliddong, the cultural values of Ada' Pappaseng, and immersive Metaverse technology into a unified literacy learning model for Indonesian language education. Unlike previous studies that focused either on local wisdom or digital learning media, this study combines both dimensions to provide an interactive, contextual, and culturally responsive learning experience. Therefore, this study aims to analyze the effect of implementing the Kajao Laliddong Metaverse-based ethnolinguistic folklore on students' literacy skills. The findings are expected to contribute

to the development of innovative Indonesian language learning by demonstrating how integrating local wisdom and immersive technology can simultaneously improve literacy skills and strengthen students' cultural identity in the context of 21st-century education.

LITERATURE REVIEW

Ethnolinguistics in Literacy Learning

Ethnolinguistics is an interdisciplinary approach that connects language with the cultural context of society, thereby creating more contextual and meaningful learning experiences (Burhanuddin et al., 2025). Integration of ethnolinguistics into education enhances students' engagement in understanding texts because learning materials are associated with familiar local cultural experiences (Ayatulloh & Sulthoni, 2025). Suweni et al. (2022) explained that ethnolinguistic-based learning helps students interpret language more reflectively through cultural symbols, values, and social practices. Nevertheless, implementation of ethnolinguistics in literacy learning remains dominated by conventional text-based approaches and has not fully aligned with the characteristics of today's digital generation.

Kajao Laliddong Folklore and Bugis Bone Cultural Values

Kajao Laliddong folklore represents the local wisdom of Bugis Bone society and contains moral, social, and philosophical values (Teng & Saleh, 2022). The concept of *ada' pappaseng* within the story embodies cultural values such as *lemppu* (honesty), *getteng* (steadfastness), *assitinajang* (propriety), and *reso* (hard work), all of which are relevant to students' character development. Rosvita et al. (2025) stated that Bugis cultural values possess strong potential as media for character education and literacy development because they encourage reflective understanding of textual meaning. However, exploration of Kajao Laliddong folklore in Indonesian language learning remains limited and has not yet been developed as a technology-based literacy medium.

Student Literacy in 21st-Century Education

Twenty-first-century literacy competence extends beyond reading and writing skills to include the ability to understand, analyze, and critically interpret information. Literacy is considered a multidimensional competence that involves reading, listening, speaking, and writing in the process of meaning construction (Kaptan & Cakir, 2025; Shobirin, 2025). Despite various literacy programs implemented in schools, Indonesian students' literacy achievement remains relatively low according to recent PISA and AKM results. Consequently, literacy instruction requires more contextual and interactive innovations to enhance students' engagement in learning activities.

Metaverse as an Immersive Learning Innovation

Metaverse technology refers to a three-dimensional virtual environment that provides interactive and immersive learning experiences for students (Satria & Sutabri, 2025). Research developments over the last decade have demonstrated that the Metaverse has significant potential to enhance motivation to learn, active participation, and exploratory experiences through realistic digital visualization (Hersya & Sutabri, 2025). Mustofa et al. (2025) explained that Metaverse-based learning creates more engaging learning environments compared to conventional instructional methods. Nevertheless, the use of Metaverse technology in locally culture-based learning remains largely limited. Therefore, integrating ethnolinguistics through Kajao Laliddong

folklore within a Metaverse environment offers a new, innovative opportunity to transform students' literacy skills while simultaneously strengthening Bugis Bone cultural values.

METHODS

This study employed a quantitative quasi-experimental approach to analyze the effect of Metaverse-based ethnolinguistic Kajao Laliddong folklore on students' literacy transformation in Indonesian language learning. The research employed a Non-Equivalent Control Group Design because full randomization of subjects was not feasible, given the pre-existing classroom structure. The design involved two groups: an experimental class receiving Metaverse-based instruction in Kajao Laliddong folklore and a control class receiving conventional instruction. Both groups were administered pre-tests and post-tests to identify differences in students' literacy abilities before and after the treatment.

Table 1. Research Design

Group	Pre-test	Treatment	Post-test
Experimental	O ₁	X	O ₂
Control	O ₃		O ₄

The study was conducted over three months at SMP Negeri 2 Libureng. The research population consisted of all seventh-grade students, totaling 81 students. Purposive sampling was employed because the quasi-experimental design required intact classes that possessed comparable academic characteristics and learning conditions. The selection was based on three criteria: (1) relatively similar Indonesian language achievement based on school records, (2) comparable class size to ensure balanced statistical comparison, and (3) availability of technology-supported learning facilities required for implementing Metaverse-based instruction. Based on these criteria and recommendations from the Indonesian language teacher and the vice principal for curriculum affairs, Class VII A (30 students) was assigned to the experimental group, and Class VII B (30 students) to the control group.

The independent variable in this study was Metaverse-based ethnolinguistic Kajao Laliddong folklore containing Bugis Bone cultural values such as *lemppu* (honesty), *getteng* (steadfastness), *assitinajang* (propriety), and *reso* (hard work) presented through three-dimensional virtual visualization. The dependent variable was students' literacy ability, encompassing text comprehension, interpretation of meaning, identification of figurative language, and analysis of moral messages in Kajao Laliddong folklore. Metaverse-based learning was designed as an interactive virtual environment enabling students to explore linguistic and cultural elements immersively.

The research procedures consisted of preparation, implementation, and evaluation stages. The preparation stage involved preliminary observations, interviews with Indonesian language teachers, the identification of students' literacy problems, and the development of Metaverse-based learning instruments. Before implementation, all research instruments, including the literacy test, observation sheet, and response questionnaires, were reviewed by two experts in Indonesian language education and educational media to assess content validity. The validity assessment indicated that all instruments met the acceptable validity criteria and were suitable for classroom implementation. Instrument reliability was subsequently examined through a pilot test using Cronbach's Alpha, demonstrating satisfactory internal consistency ($\alpha > 0.70$), indicating that the instruments were reliable for data collection.

The implementation stage included administration of the pre-test, application of Metaverse-based ethnolinguistic Kajao Laliddong folklore learning in the experimental class, and conventional instruction in the control class. The experimental treatment was conducted over four instructional meetings (2×40 minutes each). Students accessed a Metaverse-based virtual learning environment containing three-dimensional visualizations of Kajao Laliddong folklore, interactive exploration of Bugis-Bone cultural settings, digital representations of story characters, and embedded literacy activities. During each session, students explored the virtual environment, identified figurative language expressions, interpreted moral messages, discussed the values of *Ada' Pappaseng*, and completed collaborative literacy tasks facilitated by the teacher. Meanwhile, the control class received conventional instruction consisting of textbook-based reading activities, teacher explanations, classroom discussions, and written exercises without the use of immersive digital media.

The evaluation stage involved administering the post-test and distributing student response questionnaires on the use of Metaverse media in literacy learning.

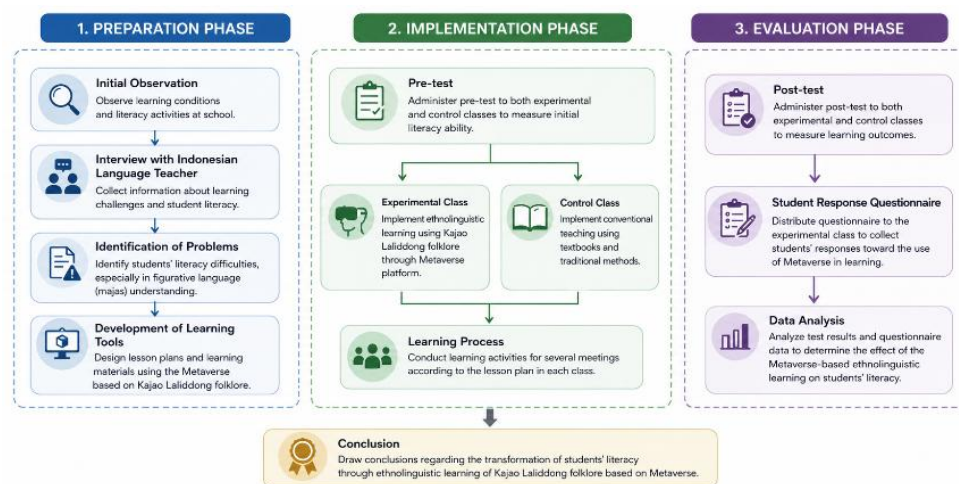


Figure 1. Research Procedures

Data collection techniques included observation, interviews, tests, and questionnaires. Observation and interviews were conducted to obtain information regarding the initial condition of students' literacy learning. The test instrument consisted of literacy questions on figurative language, administered as pre-tests and post-tests. Questionnaires were used to identify students' responses toward Metaverse-based learning.

The literacy test measured four indicators, namely text comprehension, meaning interpretation, figurative language identification, and moral message analysis. Student response questionnaires assessed media appearance, ease of use, learning motivation, and perceived learning effectiveness, while observation sheets documented teacher implementation and student participation throughout the learning process.

Data analysis employed both descriptive and inferential statistics. Descriptive statistics were used to describe the mean, standard deviation, maximum score, and minimum score of students' literacy abilities. Before hypothesis testing, data were examined using normality and homogeneity tests to determine the appropriate statistical procedures. Inferential statistics were used to test the research hypotheses using normality and homogeneity tests, and independent-samples t-tests at a significance level of 0.05. Improvements in students' literacy were analyzed

using the N-gain test to determine the effectiveness of Metaverse-based learning on students' literacy transformation. Questionnaire data were analyzed using percentage analysis to identify students' responses toward the implementation of Metaverse-based ethnolinguistic Kajao Laliddong folklore in Indonesian language learning.

RESULTS AND DISCUSSION

Research Findings

The study was conducted at SMPN 2 Libureng during the first semester of the 2023/2024 academic year. The research subjects consisted of 60 seventh-grade students, divided into two groups: Class VII A (experimental) and Class VII B (control), with 30 students in each class. Before the treatment, both groups were administered a pre-test to measure students' literacy abilities related to figurative language materials in Indonesian language learning.

The experimental group received Metaverse-based ethnolinguistic learning that integrated Kajao Laliddong folklore with Bugis Bone local wisdom values (Ada' Pappaseng). In its implementation, the Metaverse presented three-dimensional (3D) visualizations of Kajao Laliddong characters and storylines, enabling students to explore the narrative content, understand moral messages, and identify figurative language more interactively and contextually. Meanwhile, the control group received conventional instruction through lectures, reading activities, and written exercises without using Metaverse media. The learning process was conducted over four meetings, each lasting 2×40 minutes.

After the instructional process was completed, students were administered a post-test to measure improvement in literacy skills. In addition, observations of teacher activities and student response questionnaires were conducted to evaluate the effectiveness of the implementation of Metaverse media in Indonesian language learning.

1. Descriptive Statistical Analysis

Descriptive statistical analysis was conducted to provide a general overview of students' pre-test and post-test results in both the experimental and control groups.

Table 2. Pre-test and Post-test Results of the Experimental and Control Groups

Description	Pre-test		Post-test	
	Experimental	Control	Experimental	Control
Sample Size (n)	30	30	30	30
Mean	43,23	33,79	74,14	67,07
Standard Deviation	12,26	9,75	11,87	14,23

Based on the table, the experimental group obtained a pre-test mean score of 43.23 with a standard deviation of 12.26, while the control group achieved a mean score of 33.79 with a standard deviation of 9.75. After the treatment was administered, the post-test mean score of the experimental group increased to 74.14, whereas the control group increased to 67.07. The greater improvement observed in the experimental group indicates that Metaverse-based learning positively enhanced students' literacy abilities.

2. Analysis of Learning Outcomes Based on the Literacy Rubric

In addition to examining quantitative score improvement, students' literacy abilities were analyzed using a scoring rubric with three main indicators: text comprehension, argument interpretation, and critical responses to questions.

Table 3. Literacy Rubric Analysis of the Experimental Group

Indicator	Maximum Score	Mean Score	Category
Text Comprehension	4	3,2	Good
Argument Interpretation	4	3,5	Very Good
Responding to Questions	4	3,4	Very Good
Overall Mean	12	3,37	Good–Very Good

The analysis results indicated that students in the experimental group achieved the highest score on the argument interpretation indicator, with a mean score of 3.5, categorized as very good. This finding demonstrates that students were able to relate the content of Kajao Laliddong folklore to their daily life experiences and present logical arguments effectively. In the responding-to-questions indicator, students also demonstrated strong critical thinking skills through reflective, well-structured responses.

Overall, the rubric analysis revealed that the use of Metaverse technology not only improved students' learning achievement scores but also enhanced their ability to comprehend story content, interpret cultural messages, and develop critical literacy skills.

3. Inferential Statistical Analysis

The following table presents the results of the normality test for the pre-test data for both research groups.

Table 4. Results of the Pre-test Data Normality Test

Group	χ^2 count	χ^2 table	Conclusion
Experimental	13,42	11,07	Not Normally Distributed
Control	12,85	11,07	Not Normally Distributed

The normality test results indicated that the χ^2 counts for both groups were greater than the χ^2 table value at the 5% significance level, meaning that the pre-test data for both groups were not normally distributed. Since the data were not normally distributed, further analysis was conducted using the nonparametric Mann–Whitney U test. The results of the Mann–Whitney U-Test for the pre-test data are presented in the following table.

Table 5. Results of the Mann–Whitney U-Test for Pre-test Data

Group	N	Z count	Z table	Conclusion
Experimental	30	6,74	1,96	Significant Difference
Control	30	6,74	1,96	Significant Difference

The test results showed that the Zcount value exceeded the Ztable value, indicating a significant difference in the initial abilities of the experimental and control groups before the treatment was administered. To determine the level of improvement in students' literacy abilities after the learning process, an N-Gain analysis was conducted with the following results.

Table 6. N-Gain Data of the Experimental and Control Groups

Group	N	N-Gain	Interpretation
Experimental	30	0,67	Moderate
Control	30	0,23	Low

The results of the analysis showed that the average N-Gain score of the experimental class was moderate (0.67), while the control class obtained a value of 0.23, categorized as low.

These findings indicate that the improvement in students' literacy skills in the experimental class was better than that of the control class. Furthermore, the results of the independent-samples t-test on the N-Gain data revealed that the calculated t-value of 6.836 exceeded the critical t-value of 2.001 at the 5% significance level. Therefore, H₀ was rejected, and H₁ was accepted, indicating a significant difference in literacy improvement between the experimental and control classes. These findings demonstrate that Metaverse-based ethnolinguistic learning using the Kajao Laliddong folklore was more effective than conventional learning in improving students' literacy skills.

The observation results indicated that the teacher implemented the learning process in accordance with the prepared instructional design. During the core learning activities, the teacher achieved a very good category due to the ability to manage interactive Metaverse-based learning effectively. In addition, students' responses to the Metaverse-based learning implemented during the study were very positive.

Table 7. Results of Student Response Questionnaire

Assessment Aspect	Percentage (%)	Category
Media Appearance	88,5	Very Good
Ease of Use	86,7	Very Good
Learning Motivation	90,2	Very Good
Effectiveness of Understanding	91,3	Very Good
Average	89,2	Very Good

Students' responses indicated that the Metaverse media greatly improved their understanding of figurative language and made the learning process more engaging and enjoyable. The highest percentage was in the effectiveness of understanding, at 91.3%, indicating that students found it easier to comprehend the story content and moral messages through Metaverse visualization.

Discussion

The results of the study indicate that ethnolinguistic learning based on the Kajao Laliddong folktale and integrated with Metaverse technology has a positive effect on improving junior high school students' literacy skills. This improvement is evidenced by the experimental class's post-test mean score of 74.14, which is higher than the control class's 67.07. In addition, the N-gain score for the experimental class falls within the moderate-to-high category, whereas the control class is categorized as low. These findings demonstrate that integrating virtual technology with local cultural content can create a more meaningful learning experience than conventional instructional approaches.

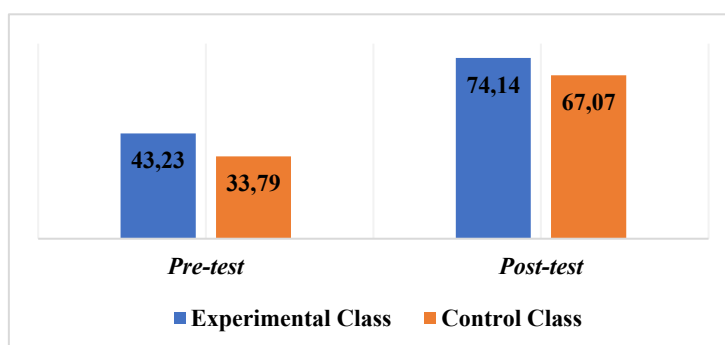


Figure 2. Differences in Learning Outcomes between the Control Class and the Experimental Class

During the learning process, students in the experimental class appeared more actively engaged in exploring the Kajao Laliddong folktale through three-dimensional visualization. Classroom discussions were more dynamic, as students did not merely read textual materials but also observed virtual representations of characters, cultural settings, and the values of Ada' Pappaseng. Students showed a high level of enthusiasm in identifying figurative language and connecting the story's cultural messages to their daily lives. This situation differed from the control class, where students tended to be more passive and focused primarily on teacher explanations and written exercises.



Figure 3. Implementation of the Learning Process

The findings of this study are in line with constructivist theory, which positions students as active agents in the learning process. Interactive learning experiences in the Metaverse assist students in constructing an understanding of literacy in a contextual and reflective manner. Firayani (2025) explains that combining text, visuals, audio, and digital interactions can enhance students' attention and information retention. This was evident when students more readily understood the meaning of figurative language, as the folktale was concretely visualized in a virtual environment.



Figure 4. Metaverse-Based Visualization of the Kajao Laliddong Folktale

The findings of this study are also consistent with Tambak et al. (2025), who state that innovative learning media can enhance students' motivation and engagement in Indonesian language learning. Saputra et al. (2025) further emphasize that integrating local wisdom fosters emotional closeness, enabling students to understand the content of texts better. These arguments are relevant to the field findings, as most students reported greater interest in learning Bugis Bone folktales compared to the general reading texts previously used.

Nevertheless, several studies indicate that the use of virtual technology does not always produce optimal learning outcomes. Nagarasan (2025) found that digital media may sometimes cause students to focus more on visual aspects than on the substance of the material. This condition can reduce the depth of text analysis if teachers are unable to structure learning activities effectively. The field findings of this study show a similar tendency in the early sessions, with some students more interested in exploring the virtual display than in understanding the story content. In this regard, the teacher plays a crucial role in maintaining students' focus on literacy objectives.

Another perspective suggests that implementing the Metaverse requires adequate technological infrastructure and teachers' competence in managing digital learning environments.

Limitations in devices and internet connectivity are often obstacles in implementing virtual learning in certain schools (Fauziah et al., 2024). However, the field conditions of this study indicate that these challenges can be minimized through the use of simple devices and collaborative group learning management. This strategy helped maintain active student engagement throughout the learning process.

The novelty of this study lies in the integration of the Kajao Laliddong ethnolinguistic folktale, the values of Ada' Pappaseng, and Metaverse technology in Indonesian language literacy learning. Previous studies generally focused on either digital media or local wisdom separately. The integration of these three elements produces a learning approach that not only improves literacy skills but also strengthens students' cultural identity. This form of learning is relevant to the challenges of 21st-century education, which requires a balance between digital literacy and the preservation of local culture.

CONCLUSION

The study shows that implementing ethnolinguistic learning based on the Kajao Laliddong folktale, integrated with Metaverse technology, is effective in improving junior high school students' literacy skills in Indonesian. The results of the analysis indicate that the experimental class achieved higher post-test and N-gain scores compared to the control class, demonstrating a significant effect of Metaverse-based media on students' ability to understand, interpret, and critically respond to texts. Field findings reveal that students were more active in discussions, enthusiastic in exploring 3D visualizations of the folktale, and more confident in expressing their opinions. Student and teacher responses were also categorized as very positive, particularly regarding learning motivation, comprehension effectiveness, and instructional attractiveness. These findings are supported by constructivist and multimedia learning theories. They are further reinforced by previous studies indicating that integrating local culture with digital technology can enhance student engagement and learning outcomes. Although immersive technology requires adequate infrastructure and teacher competence, this study confirms that integrating Bugis Bone culture through the Metaverse not only improves students' literacy skills but also strengthens local cultural preservation through contextual and interactive 21st-century learning.

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