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Development of the BiTales application to improve students' local wisdom-based digital literacy

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ABSTRAK

Pembelajaran berbasis digital yang mengintegrasikan kearifan lokal masih jarang diterapkan di Bima. Berdasarkan temuan di lapangan, pembelajaran di sekolah ini masih menggunakan pendekatan tradisional tanpa memanfaatkan teknologi untuk mengenalkan budaya lokal. Penelitian ini bertujuan mengembangkan aplikasi Bima Tales (BiTales) berbasis Android sebagai media literasi digital yang menggabungkan cerita rakyat dan nilai-nilai kearifan lokal khas Bima. Metode yang digunakan adalah Research and Development (R&D) dengan model ADDIE (Analysis, Design, Development, Implementation, Evaluation). Hasil uji validitas ahli media menunjukkan kategori "Baik" dengan skor rata-rata 4,43; sedangkan ahli materi memberi skor rata-rata 4,46. Aplikasi ini terbukti efektif dalam meningkatkan literasi digital dan pemahaman kearifan lokal siswa, terlihat dari peningkatan hasil belajar dari rata-rata pretest 50,48 menjadi 77,62 pada post-test dan pemahaman kearifan lokal dari 41,19 menjadi 75,95. Penelitian ini menunjukkan bahwa integrasi teknologi digital dengan konten budaya lokal dapat meningkatkan kualitas pembelajaran dan memperkuat identitas budaya siswa.

ABSTRACT

Digital-based learning that integrates local wisdom is rarely implemented in Bima. Based on findings in the field, learning at this school used a traditional approach without utilising technology to introduce local culture. This research aims to develop the Bima Tales (BiTales) application based on Android as a digital literacy medium that combines folklore and local wisdom values typical of Bima. The method used was Research and Development (R&D) with the ADDIE model (Analysis, Design, Development, Implementation, Evaluation). The results of the media expert validity test showed a "Good" category with an average score of 4.43, while the material expert gave an average score of 4.46. The app proved effective in improving students' digital literacy and understanding of local wisdom, as seen from the increase in learning outcomes from an average pretest score of 50.48 to 77.62 in the post-test and understanding of local wisdom from 41.19 to 75.95. This research shows that integrating digital technology with local cultural content can improve the quality of learning and strengthen students' cultural identity.

INTRODUCTION

Digital-based learning has become an inseparable need in the education system in the 4.0 Industrial Revolution era. The rapid development of information technology has affected almost all aspects of life, including the world of education, by creating great opportunities to integrate digital technology into learning to improve the quality of education and equip students to face increasingly complex global challenges. A digital learning ecosystem can transform classrooms into dynamic learning communities by providing quality learning resources, increasing accessibility, and encouraging collaboration between students and teachers. The use of digital technology makes the learning process more interactive and interesting, so it can increase students' learning motivation, improve digital literacy skills, help them reflect on their learning experiences, develop identities as active learners, and prove critical thinking and communication skills (Kim et al., 2024; Nguyen et al., 2023).

Unfortunately, in one of the schools in Bima Regency, learning is still carried out traditionally without optimal use of digital technology. Based on the field data, the teaching process at SMPN 1 Palibelo has not utilised digital devices as a learning medium, especially in recognising local wisdom values vital for students' cultural identity. This problem is becoming increasingly crucial, considering that digital literacy is an essential skill that 21st-century students must possess. Digital literacy in Indonesia, especially in rural areas, still faces major challenges due to the inequality of educational infrastructure, low pedagogical competence of educators, and limited access to technology that supports learning. Limited digital infrastructure, lack of digital literacy training for educators, and low access to digital devices are the main factors that hinder the integration of technology in education in rural areas. Therefore, it is necessary to develop more comprehensive digital literacy training for educators to improve competence and utilisation of technology in learning (Mikuskova, 2023; Soekamto et al., 2022). The lack of innovation in teaching methods also contributes to the low level of digital literacy of students in disadvantaged areas, which ultimately affects the digital skills gap between students in urban and rural areas.

Bima has a very valuable cultural wealth in the form of folklore, traditions, and arts that are full of local wisdom values. This local wisdom is not only part of the cultural heritage but also has an essential role in shaping the character and identity of students. Similar explanations by de Seta, (2024) and Dewi, (2019) revealed that interactive media based on folklore and local wisdom in digital media play a fundamental role in multiliteracy learning and cultural preservation. The use of digital applications not only introduces cultural heritage interestingly and adaptively but also improves students' visual, auditory, and digital literacy. In addition, this interactive approach helps students interpret moral, social, and historical values in folklore while expanding local cultural narratives into the digital realm to maintain traditions amidst technological developments.

Previous literature reviews have shown that the integration of digital learning with local wisdom has a positive impact on digital literacy, learning motivation, and cultural preservation. Furthermore, the use of digital media based on local wisdom plays an important role in improving digital literacy, understanding of materials, and students' critical thinking skills (Asmayawati et al., 2024; Hastuti et al., 2023; Syahfitri, 2024; Udiyana & Arnyana, 2022). Pedagogical innovation and curriculum adaptation based on local wisdom allows students to develop technological skills while understanding cultural values in the context of sustainable education. In addition, the use of interactive digital teaching materials based on local wisdom makes learning more contextual and relevant and increases students' interest in local culture. Overall, this literature confirms that digital media based on local wisdom can be an innovative strategy for improving the quality of learning and building students' cultural awareness in the digital era.

The theoretical framework in this study is based on constructivism theory, which is the basis for explaining how learning can be designed to be meaningful and relevant to students' needs. Constructivism theory, as introduced by Piaget, emphasizes that knowledge is not simply transferred from teacher to student but rather constructed through active interaction with their experiences and environment so that learning becomes more meaningful and student-centred. In line with that, social constructivism highlights the role of social interactions, such as support from teachers and peers, in building understanding (Nithideechaiwarachok & Chano, 2024; Suhendi et

al., 2021). In the context of this study, the integration of digital technology plays a role as a driver in creating a dynamic and interactive learning environment. Technology is not only a means of conveying information but also a space for exploration where students can recognize, understand, and construct new knowledge independently. Thus, this theory guides research to make technology a tool that empowers students to be more active, creative, and connected to the local cultural values that they want to preserve. This is in line with the constructivist view, which emphasizes that effective learning occurs when students actively construct their knowledge through experience and social interaction.

The novelty of this study lies in the development of an Android-based learning media that integrates digital literacy with local cultural content, creating a holistic solution that combines technology and cultural heritage in education. Bima Tales (BiTales) not only presents Bima folklore in a digital format but also encourages students to understand and preserve their culture through technology. This approach aligns with the study conducted by Arjaya et al., (2024), which highlights the importance of cultural preservation through digital learning media. Thus, BiTales serves as both a digital literacy tool and a medium for cultural preservation that can be replicated in other schools by adapting its content to local cultures, thereby expanding the reach and positive impact of digital-based learning.

The objective of this research is to develop an Android-based Bima Tales (BiTales) application, designed to be interactive and tailored to the needs of students at SMPN 1 Palibelo. This application aims to enhance students' digital literacy by incorporating technology into the learning process. Additionally, it seeks to introduce and preserve the values of Bima's local wisdom, enabling students to understand and appreciate their cultural heritage. Furthermore, this research aims to provide an innovative and relevant alternative learning medium that addresses the challenges and needs of digital-era education. This study contributes to the advancement of digital learning by integrating local wisdom, improving students' digital literacy, and strengthening their cultural identity. BiTales not only helps students develop technological proficiency but also promotes cultural preservation through interactive learning. Moreover, this research benefits teachers and policymakers in enhancing technology-based education quality. By integrating local culture into digital learning, this study aspires to shape a generation that excels academically, embraces cultural awareness, and is well-prepared to face global challenges.

METHOD

This study aims to develop and test the BiTales application as a learning medium to improve digital literacy based on the local wisdom of students in Bima. The method used was R&D (Research and Development) with the ADDIE development model (Analysis, Design, Development, Implementation, Evaluation) as shown in Figure 1. The ADDIE model was chosen because it is systematic and effective in producing products in the form of Android-based learning applications that can be used to improve digital literacy and introduce local wisdom. The ADDIE model helps analyse student needs, design applications, develop prototypes, implement in the field, and evaluate the effectiveness of the products developed. The integration of technology in this model increases the flexibility and effectiveness of learning, creates a more interactive experience, and is tailored to student needs and technological developments (Abuhassna et al., 2024; Adeoye et al., 2024).

This research was conducted at SMPN 1 Palibelo, Bima Regency, with 42 eighth-grade students as research subjects selected using purposive sampling techniques. In the small-scale trial stage, the research subjects involved 30 students from the same class to measure the feasibility of the Bima Tales (BiTales) application. The variables observed in this study included the feasibility of the Bima Tales (BiTales) application, which was evaluated through a series of media feasibility tests by media experts and material experts, as well as increasing digital literacy and understanding of local wisdom of students, which was measured through the learning outcomes of eighth-grade students (pretest and post-test). The validators in this study consisted of folklore material experts, learning media experts, and local content teachers at SMPN 1 Palibelo. The subjects of the small-scale trial in this study were 30 students from class VIII at SMPN 1 Palibelo.

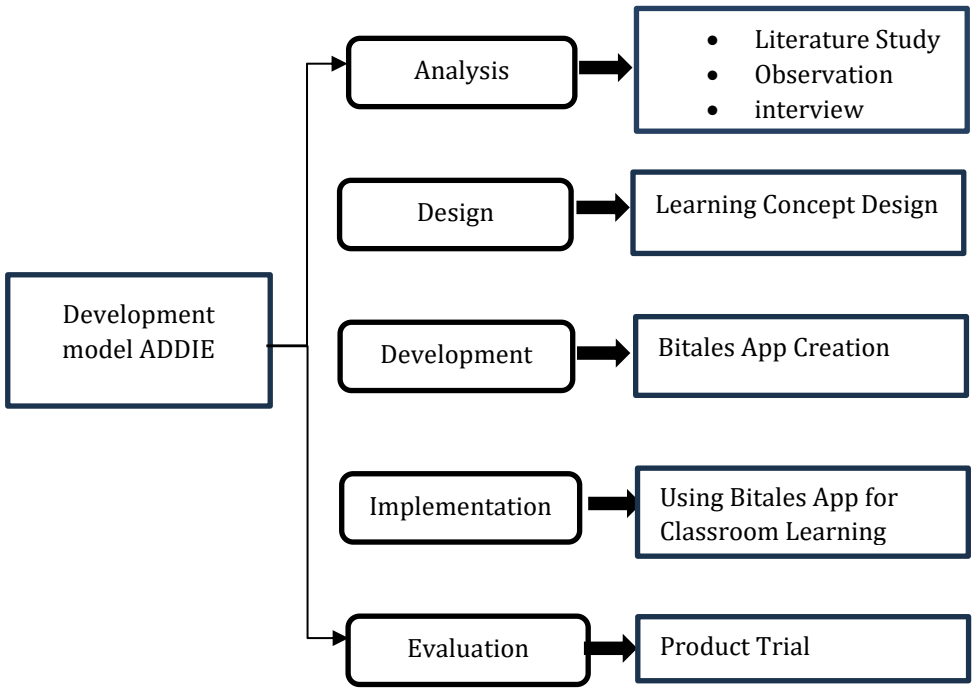

Figure 1. Development model ADDIE

The research instruments used in this study included several methods to ensure the validity and effectiveness of the Bima Tales (BiTales) application. The main instruments were a digital literacy questionnaire and a questionnaire on understanding local wisdom designed to measure the level of media and material feasibility. This questionnaire was filled out by media experts, material experts, and local content teachers in one of the schools in Bima Regency to evaluate various aspects of the application, including the relevance of the material and the quality of the media. In addition, semi-structured interviews were conducted with students and teachers to obtain direct feedback regarding their experiences in using the application and the learning process carried out. Also, instruments in the form of pretests and post-tests were used to measure digital literacy and students' understanding of local wisdom values before and after using the application.

The data collection procedure follows the ADDIE application development model, which includes five main steps. In the analysis stage, the student and teacher needs are identified, the Bima folklore material is analysed, and the main features of the application are determined. The next stage, Design, involves designing the user interface (UI/UX) and compiling a storyboard and application flow. In the Development stage, the application is developed using MIT App Inventor by integrating interactive features such as story text and audio narration to enhance the user experience. Validation is carried out to ensure that the application meets the eligibility standards as a learning medium. The assessment uses a 5-point Likert scale, with categories: 1.00–1.49 (Very Poor/Unworthy), 1.50–2.49 (Poor/Less Worthy), 2.50–3.49 (Quite Good/Worthy with Revision), 3.50–4.49 (Good/Worthy), and 4.50–5.00 (Very Good/Very Worthy). These categories are used to evaluate aspects such as visual design, ease of navigation, technical stability, and relevance of local cultural content so that the application can provide optimal benefits in learning. The Implementation stage involves testing the application on a small group of students. Teachers and students are given training to understand how to use the application, and data is collected through observation, interviews, pretest post-tests, and questionnaires. The final stage, Evaluation, is carried out to assess the results of the application trial. Improvements are made based on input from students and teachers until the application is perfected for broader use.

The collected data was analysed using a quantitative descriptive approach and statistical tests. Descriptive analysis was conducted on questionnaire data from the results of media and material feasibility tests by media experts and material experts. Furthermore, statistical tests

using the paired t-test method were applied to compare pretest and post-test scores to evaluate the impact of the application on improving digital literacy and students' understanding of local wisdom. In addition, qualitative data from interviews were analysed to assess the quality of the application in depth and to understand user feedback. This combined approach is expected to provide a comprehensive picture of the effectiveness of the Bima Tales application in achieving research objectives.

RESULTS

Relevant to the development model shown in Figure 1, some of the research results that can be explained are related to the results of product trials and the effectiveness of products in supporting digital literacy based on local wisdom. Before explaining the research results related to the data, Figure 2 displays a screenshot of the developed Bima Tales (BiTales) application. The application development stage begins with a design that leads to the integration of prominent features such as interactive story text, audio narration, and engaging visualisations. This application was designed to provide a more interactive and enjoyable learning experience.

On the initial menu display, the Bima Tales (BiTales) application provides a reading menu option that will direct you to the main menu of the Bitales application, which contains a collection of folk tales focused on stories from Bima that are presented narratively and supported by audio features to help students understand the contents of the story more deeply. In addition to the initial menu, Figure 2 displays a screenshot of the main menu of the Bima Tales (BiTales) application, which contains a selection of features, such as folklore material and the identity of the application developer. A screenshot of one of the folklore materials in the Bima Tales (BiTales) application is also there.

Product trial

Material expert test

A test by material experts took place to ensure the validity and feasibility of the developed material. The validation process involved three validators who had relevant competencies and backgrounds. The first two validators were Rahmania Oktafiana, S.Pd., and Syafrani, S.Pd., local content teachers of Bima Culture at SMPN 1 Palibelo, who had experience and expertise in teaching local culture to students. The third validator was Naila Fauziah, S.Pd., M.A., a lecturer in Indonesian Language and Literature who also had experience as an assessor in storytelling competitions (Bima regional folklore). The involvement of these experts aimed to ensure that the tested materials met academic standards, cultural relevance, and suitability for learning objectives. In the validation process, one of the suggestions for improvement given by the validators was to add more illustrations to each story. The addition aims to increase visual appeal so that application users do not get bored quickly and are more encouraged to understand the contents of the story in a fun and interactive way. The material expert test result is shown in Figure 3.

Media expert test

The media expert test assessed the technical aspects, functionality, and appearance of the developed media. This validation process involved three validators who have competence and expertise in the fields of technology and education. The first validator was M. Imam Munandar, S.Kom., M.Kom., a lecturer in Software Engineering at STKIP Taman Siswa Bima, who has expertise in developing educational software and applications. The second validator was Ilyas, S.Kom., M.Pd., a lecturer in Software Engineering at STKIP Taman Siswa Bima, with extensive experience in implementing technology to support learning. The third validator was Ardisyam Marseno, S.Pd., an Informatics teacher at SMPN 1 Palibelo, who has experience integrating technology into learning at the school level. The involvement of these three experts aims to ensure that the media meets the criteria of eligibility, ease of use, and relevance to learning needs. The media expert test result is shown in Figure 4.

Figure 2. Visualization of BiTales app

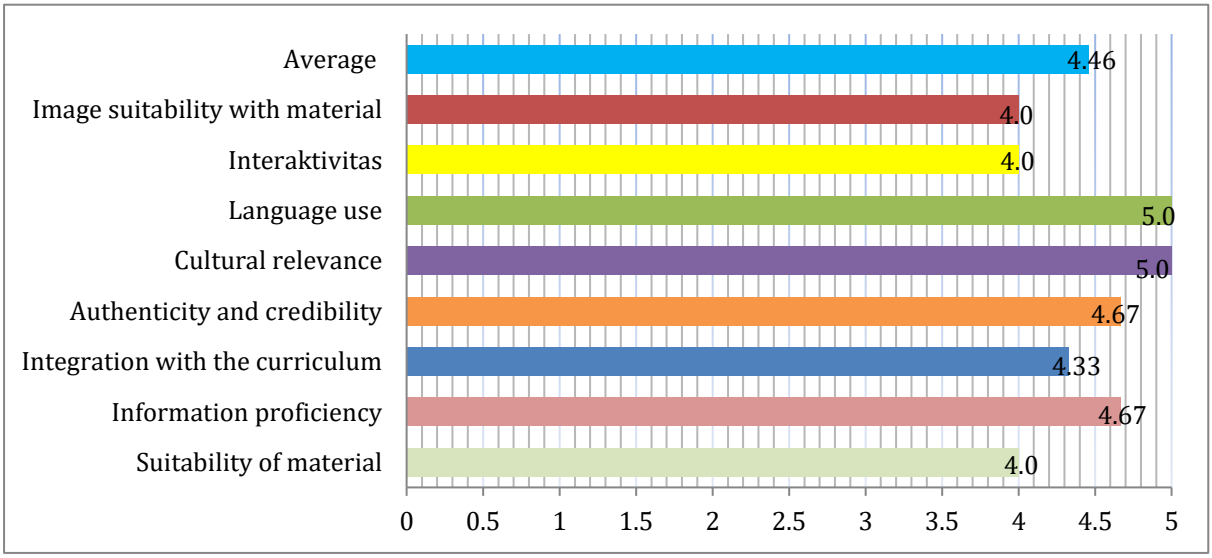

Figure 3. Result of material test

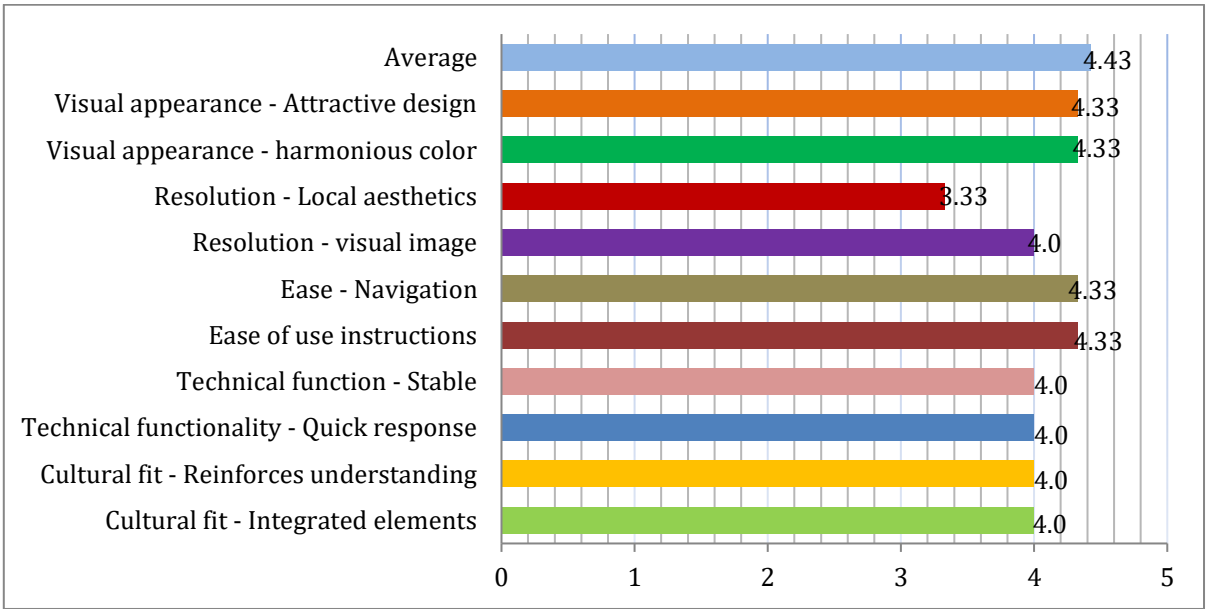

Figure 4. Result of media test

In the validation process, the validators provided suggestions for improvements to improve the quality of the media. M. Imam Munandar, S.Kom., M.Kom., suggested upgrading the consistency of the interface design, such as uniformity of color, font, and layout, so that the media display is more engaging and comfortable to use. Ilyas, S.Kom., M.Pd., recommended adding a quiz feature containing questions relevant to the materials in the application. Meanwhile, Ardisyam Marseno, S.Pd., suggested ensuring media compatibility with diverse devices so users can access the application more flexibly.

Limited class test

The trial was conducted on one class as a form of limited testing before the product was declared completely perfect. Figure 5 shows the results of the trial conducted on 30 students of class VIII at SMPN 1 Palibelo. Based on the results of the questionnaire filled out by 30 students regarding various aspects of learning media, the total average overall value was 4.17, which is included in the "good/adequate" category, indicating that the quality of the media and learning materials in the Bima Tales (BiTales) application developed is quite appropriate for use in class. However, some inputs to enhance its effectiveness existed, such as improving the quality of images to make them clearer and more interesting and adding variations of folk tales so they are more diverse and can enrich students' understanding.

Product effectivity

To measure the product's effectiveness, a pretest and post-test were conducted as part of the evaluation. The pretest aims to determine the level of students' initial understanding before using the Bima Tales (BiTales) application, while the post-test is conducted after learning with the Bima Tales (BiTales) application is complete. The results of the pretest and post-test on the level of digital literacy knowledge and local wisdom of class VIII students of SMPN 1 Palibelo are in Table 1 and Table 2.

Based on Table 1, Paired t-Test, the analysis results show that the average pretest value is 50.48, while the average post-test value increased to 77.62. The statistical test produces a significance value (p-value) <0.001, which is smaller than the significance limit ($\alpha = 0.05$), and a calculated t value of -14.975 with a degree of freedom (df) of 41. These results indicate a significant difference between the level of digital literacy of students before and after using the Bima Tales (BiTales) application. Thus, it can be concluded that the BiTales application has proven effective in supporting digital-based learning and has a positive impact on improving the digital literacy of grade VIII students at SMPN 1 Palibelo.

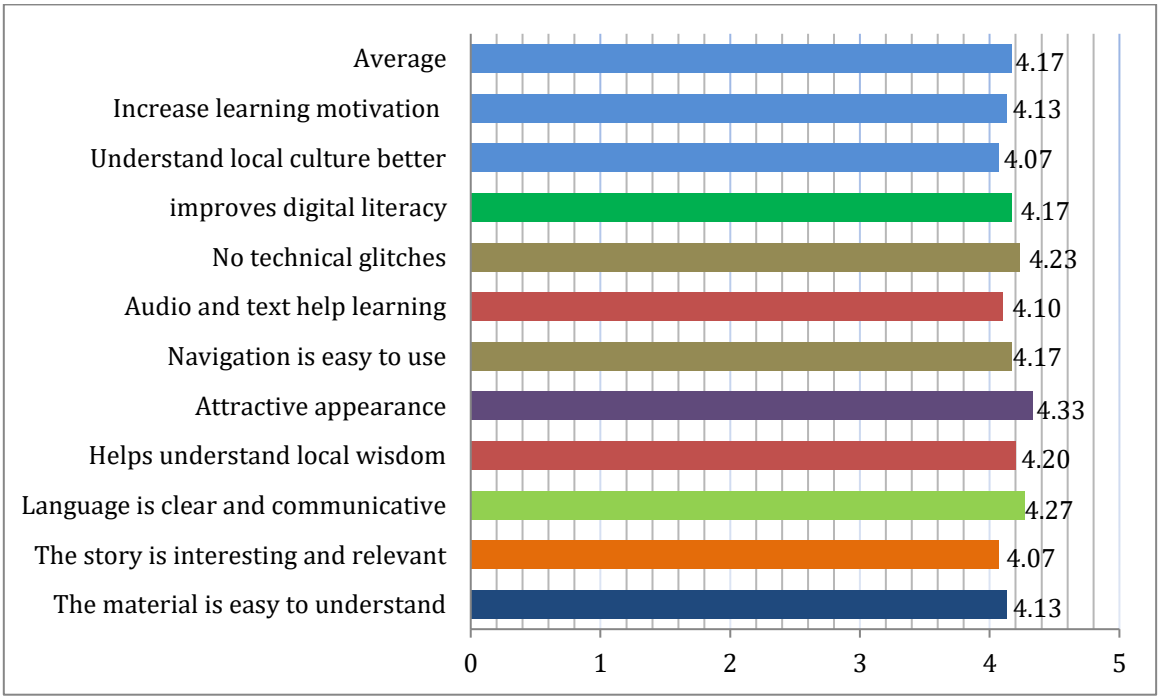

Figure 5. Result of limited class test

Tabel 1. Results of the paired t-test on the understanding level of digital literacy

Test	Subject	*Mean*	T	Df	Sig. (2-tailed)
Pretest	42	50.48			
			-14.975	41	< 0.001
Post-test	42	77.62			

Tabel 2. Paired t-test results on the local wisdom understanding level

Test	Subject	*Mean*	T	Df	*Sig. (2-tailed)*
Pretest	42	41.19			
			-20.304	41	< 0.001
Post-test	42	75.95			

Based on Table 2, Paired t-Test Results, the average pretest value is 41.19, while the average post-test value increases to 75.95. The statistical test results show that the significance value (p-value) <0.001, which is smaller than the significance limit (α = 0.05). In addition, the calculated t value of -20.304 with a degree of freedom (df) of 41 indicates a significant difference between the pretest and post-test results. Thus, it can be concluded that there is a significant increase in the average score after using the Bima Tales (BiTales) application. These results prove that the Bima Tales (BiTales) application is effective in supporting digital learning based on local wisdom and has a significant impact on increasing students' understanding of local wisdom values.

DISCUSSION

This study has succeeded in developing the BiTales application as a digital learning media that integrates Bima's local wisdom to improve students' digital literacy while preserving local culture. The trial results show that Bima Tales (BiTales) is effective in increasing learning motivation, student engagement, and understanding of the material being taught. Increased participation and learning evaluation results reflect the effectiveness of this application, in line with the findings (Ranbir, 2024; Valverde-Berrocoso et al., 2021) revealing that the integration of digital technology in education creates a more flexible, interactive, and innovative learning environment. However, challenges such as limited infrastructure and the digital literacy gap are still obstacles. This study adds elements of local wisdom to digital learning to increase relevance and student engagement and maintain cultural identity in the digital ecosystem.

In line with research by Ridho et al., (2021) and Timotheou et al., (2023), the integration of local culture in digital learning not only improves students' critical thinking skills but also deepens their understanding and appreciation of local wisdom around them. Digital transformation in education has increased the accessibility and effectiveness of learning through the application of diverse digital technologies. However, challenges such as the digital divide, school readiness, and lack of integration of cultural aspects in the learning system are still obstacles. This research fills this gap by combining digital technology and local cultural content, creating a more comprehensive approach to learning.

The digital competence of educators and the integration of technology in learning increases the effectiveness of education. Teachers' digital competence supports virtual learning and the development of digital media such as Bima Tales (BiTales) to improve student literacy. In addition, the integration of technology in learning not only increases student motivation and engagement but also preserves local culture through media such as folklore, which enriches the learning experience and maintains the sustainability of cultural heritage in the digital ecosystem (Angelaki, 2024; Hizam et al., 2021; Siswanto et al., 2022).

Research by Suprapto et al., (2021) and Wang, (2024) highlighted the challenges in the integration of educational technology, especially the gap between teaching policies and practices in the regions with limited technical support and pedagogical training. In addition, curriculum reform that accommodates education policies and local wisdom is a decisive factor in ensuring effective and contextual technology implementation. The integration of cultural values in learning not only maintains local identity but also strengthens students' character, helps them understand the social environment, and prepares them to face global challenges with a culture-based

perspective. Lestari et al. (2024) and Payadnya et al. (2024) reported that local wisdom-based approaches play a consequential role in supporting the sustainability of education by maintaining traditional values in the learning process, ensuring the relevance of the material to students' daily lives.

Integration of local wisdom in learning not only improves students' cultural understanding but also strengthens essential skills such as creativity and digital literacy. The flexible and adaptive STEAM approach allows students to explore ideas and connect academic concepts with local wisdom, thus effectively increasing creativity. Likewise, local wisdom-based digital literacy has been shown to not only strengthen students' digital skills but also deepen their understanding of local culture. This supports the development of Bima Tales (BiTales), which adapts a similar method by integrating local Bima culture to improve students' digital literacy (Fuad et al., 2024; Sagala et al., 2024).

This study extends the findings from Budiarto et al., (2020) and Saphira, (2022) that integrate local wisdom in education as a quest for student character building based on Pancasila values and develop digital learning innovations based on local potential. In the context of developing the BiTales application, this approach not only aims to improve students' digital literacy but also strengthens their cultural identity. In addition, the use of interactive multimedia based on local wisdom is an effective strategy for creating learning that is more innovative and relevant to the digital era. By combining elements of Bima local culture into the Bima Tales (BiTales) application, this study attempts to create a more contextual and intriguing learning environment for students.

Digital learning media based on local wisdom plays a vital role in improving student understanding and learning outcomes. The use of interactive media, such as animations based on local wisdom, not only makes learning more engaging but also strengthens student involvement in understanding the materials more deeply (Bulkani et al., 2022; Putra & Mudra, 2022). This study adapts a similar approach to teaching cultural values through Bima folklore, which not only supports digital literacy but also strengthens students' cultural identity. This approach supports Krualunteerayut et al., (2024) and Munajah et al., (2023) who emphasised that local wisdom-based digitalisation not only improves students' skills but also enriches the learning experience through technology integration. In addition, local wisdom-based learning models have proven effective in strengthening students' character, increasing their understanding of cultural and religious values, and developing critical thinking skills.

Overall, this study shows that the integration of digital technology and local wisdom in learning media can improve students' learning motivation, digital literacy, and cultural understanding. Digital-based applications that adapt local cultural elements are proven to not only improve academic competence but also form a stronger cultural awareness among students. The prominent finding of this study is the effectiveness of Bima Tales (BiTales) in improving digital literacy and students' understanding of Bima's local wisdom. Application users showed a significant increase in class participation and learning outcomes, proving that the integration of digital technology with local cultural content creates a more engaging and relevant learning environment for students. Secondary findings indicate that the use of the Bima Tales (BiTales) application helps students develop 21st-century skills such as problem-solving, critical thinking, and collaboration. This application provides an interactive platform that encourages students to interact with content and peers, thereby improving their social and cognitive skills. In addition, this study found that the integration of local wisdom in digital learning media can increase students' sense of identity and cultural pride. By learning local folklore and traditions through the application, students become more aware and appreciate their cultural heritage, which is paramount for cultural preservation in the era of globalization.

Based on the findings of this study, it is recommended that educators and developers of learning media integrate digital technology with local cultural content to enhance students' digital literacy and preserve local wisdom. In addition, educators need to upgrade their digital competence in order to utilise technology effectively in learning, supported by training and professional development. The government and stakeholders in the field of education are also expected to participate in supporting the development and implementation of digital learning

media based on local culture, especially in areas with low digital literacy and cultural richness that need to be preserved.

CONCLUSION

This study successfully developed the Android-based Bima Tales (BiTales) application as a digital literacy learning media that integrates Bima's local wisdom. The research findings revealed that the application effectively improved students' digital literacy and cultural understanding, as reflected by a significant increase in learning outcomes between the pretest and posttest and positive validations from the media and material experts. This application, through the presentation of audio narratives, interactive texts, and cultural illustrations, creates an interesting and contextual learning environment, thereby increasing student motivation and engagement. However, this study is limited to a relatively small sample size and interactive features that still need to be further developed. Therefore, it is recommended that further research expand the implementation in various educational units and develop gamification and personalization features to accommodate individual student needs. The practical implications of this study indicate that the integration of digital technology with local cultural content can be an effective model for improving the quality of learning while preserving cultural heritage, which supports the development of 21st-century competencies in a sustainable manner.

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Authors contributions

The authors made significant contributions to the study's conception and design. The authors were in charge of data analysis, interpretation, and discussion of results. The final manuscript was read and approved by the authors.

Conflict of interest

The authors declare that there is no potential conflict of interest.

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Data availability statement

All data are available from the authors.

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