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ORIGINAL RESEARCH PAPER

Developing an English web-based learning application for senior high school students

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Abstract
This research focuses on the development of LearningMu, a web-based English learning application designed for senior high school students in rural areas, particularly Belitung Regency, Indonesia. The initiative was motivated by persistent obstacles such as limited digital facilities, low student engagement in conventional classrooms, and the lack of cultural contextual learning resources. A research and development method was applied with the ADDIE development approach, enabling iterative refinement of the system based on continuous feedback from both teachers and students. The primary goal was to create an interactive, user-friendly, and accessible platform that supports autonomous learning. Trial implementation involving 30 students and three English teachers demonstrated that LearningMu provides an attractive interface, straightforward navigation, and locally relevant materials. The integration of multimedia resources, gamified quizzes, and monitoring features is hoped to enhance students' motivation, language comprehension, and collaboration between schools and parents. Overall, the findings suggest that LearningMu is an effective and innovative tool to reduce educational disparities in underserved communities, and its modular design offers potential for wider adoption in similar contexts.

Keywords: autonomous learning, educational technology, English as a foreign language

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INTRODUCTION

The rapid advancement of digital technology has brought significant changes to the field of education, particularly in the teaching of English as a foreign language. In regions such as Belitung Regency, challenges still persist, including limited infrastructure, unequal access to learning resources, and varying teaching quality, all of which contribute to students' low learning outcomes. As a result, learners' English proficiency tends to lag behind. The use of technology can provide a more inclusive solution, as it enables students to learn independently and with greater flexibility (Ahmadi, 2018; Nurmayanti & Suryadi, 2023; Van et al., 2021). In response to this, the LearningMu digital platform was developed, specifically designed to support independent English learning for students at SMA Muhammadiyah Tanjungpandan, a private senior high school in Belitung.

Conventional teacher-centered learning models often limit students' active participation and provide little opportunity for contextual learning. Research findings indicate that student-centered approaches that emphasize learner autonomy are more effective in enhancing communicative competence as well as cultural understanding (Albelbisi & Yusop, 2019; Edisherashvili et al., 2022; Luo & Zhou, 2024). The LearningMu platform adopts this approach

by allowing students to regulate their own learning pace in accordance with their individual learning styles. Moreover, the integration of multimedia such as videos, audio, and interactive activities has been proven to boost motivation while developing language skills across the four core competencies: listening, speaking, reading, and writing (Liu & Hu, 2024). Bashori et al. (2022) and Chen (2024) also affirm that web-based learning can reduce speaking anxiety and improve language retention, particularly for English as a foreign language (EFL) learners.

In its development process, the research team employed a research and development with ADDIE stages, which enabled iterative improvements through direct user feedback. This approach ensured that the final product better met the needs of both teachers and students (Li & Abidin, 2024). They highlight the importance of aligning system functions with pedagogical goals, while recommend repeated testing to guarantee usability and instructional relevance (Pinto et al., 2021). Pinto et al. (2021) emphasizes that gamification and visual interactivity can increase user engagement, while Brom et al. demonstrate that well-designed emotional and visual elements can enhance comprehension and learning satisfaction (Kaifeng & Pengbo, 2024; Mutlu-Bayraktar, 2024).

In addition, parental involvement is an essential aspect considered in the development of this platform. The progress-monitoring feature facilitates collaboration between home and school. This aligns with the findings of Da Silva and Ferreira Da Silva, who argue that technology can foster greater parental participation in children's education (Linus et al., 2025). Juhary's research further emphasizes that systems with user-friendly designs are more likely to be adopted by both students and parents (Dahal et al., 2023).

Overall, the development of LearningMu through a prototyping model demonstrates significant potential in enhancing the quality of EFL learning in rural and underserved areas such as Belitung. Dahal et al. found that iterative development models can improve both the effectiveness and scalability of learning (Lu & Shen, 2023; Shahdat et al., 2024). Similarly, the digital platforms such as Learning Management Systems (LMS) can surpass traditional learning when designed and evaluated properly (Tutyandari & Purnamaningwulan, 2023).

The main contribution of this study is the introduction of an English learning platform tailored to the socio-cultural realities and infrastructural limitations of rural Indonesia. The platform combines (1) student-centered autonomous learning, (2) multimedia integration for the four language skills, (3) gamification strategies to enhance engagement, and (4) parental monitoring features to strengthen home-school synergy. Together, these elements address the limitations of conventional LMSs and teacher-centered instruction.

This study was conducted at SMA Muhammadiyah Tanjungpandan, Belitung, a school located in an area with limited educational infrastructure, making the development of the LearningMu platform highly contextual. Relevant previous studies, such as Indrayadi et al. (2022), revealed that English teachers in rural Indonesian schools were still able to implement online learning despite facing challenges such as poor internet connectivity and limited learning devices. They also highlighted that EFL students in remote areas encounter obstacles such as unstable internet access and minimal parental support; however, learner autonomy plays a key role in overcoming these issues. The inclusion of these studies shows that the field challenges identified in the LearningMu research are not isolated cases but rather part of a broader phenomenon within the digital education ecosystem in rural Indonesia. Thus, the research context in Belitung further strengthens the relevance and validity of this study's findings.

RESEARCH METHOD

This study employed the prototyping method in the ADDIE framework as the primary approach in developing the web-based English learning platform, LearningMu (see Figure 1). This model was chosen because it is iterative and user-centered, making it well-suited to the dynamic needs of educational technology systems. Through this method, continuous improvements can be

made based on direct feedback from end users, ensuring that the resulting platform truly aligns with the needs of both students and teachers.

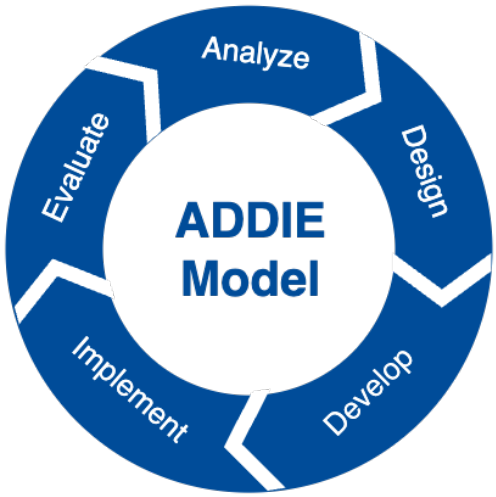

Figure 1. ADDIE model (Spatioti et al., 2022).

This study developed LearningMu, a web-based English learning platform for the students at SMA Muhammadiyah Tanjungpandan, Belitung, through a research and development approach. The process began with needs analysis, identifying limited resources, low participation, and lack of independent learning media. A low-fidelity prototype and UML diagrams guided initial design. The platform was built using HTML, CSS, JavaScript, and Laravel, featuring interactive texts, quizzes, pronunciation, and grammar tips. Trials with 30 junior high school students and three teachers showed their responses regarding usability, relevance, and multimedia integration. The responses were then analyzed by conducting a statistic calculating validity and reliability by converting the average score gained from the response both teachers and students. The scale of interpretation was adopted from Awang et al. (2016) as presented in Table 1.

Table 1. Scale interpretation criteria

Likert Scale		Validity and Practicality Criteria	
Score	Category	Score	Category
4 – 5	Category	81 – 100	Very valid/ Practical
3 – 4	Very valid/ Practical	61 – 80	Valid/Practical
2 – 3	Valid/Practical	41 – 60	Valid/Practical Enough
1 – 2	Valid/Practical Enough	21 – 40	Less Valid/Practical
0 – 1	Less Valid/Practical	0 – 20	Not Valid/ Practical

The results of the validity and reliability test were then converted and interpreted using the criteria above. Then, iterative refinements improved navigation, gamification, and accessibility. The final product was implemented with parental and teacher monitoring tools.

RESULTS AND DISCUSSION

Results

Based on the development method applied, the research findings can be described through six development stages as follows.

Initial planning and deeds analysis

The needs analysis was carried out through interviews and discussions with teachers and students at SMA Muhammadiyah Tanjungpandan. The results revealed major challenges in English learning, namely limited access to digital resources, low student engagement in traditional classrooms, and the absence of independent learning media. These findings formed the basis for defining the core features of LearningMu, which include interactive materials, progress monitoring, a responsive interface, and cross-device accessibility.

Initial (quick) design

At this stage, a low-fidelity prototype was developed to illustrate the structure and interface of the system. UML diagrams (use case, activity, and sequence) were also created to visualize user interactions, learning processes, and communication between system components (see Figure 2). This design was later refined based on feedback from experts and peers.

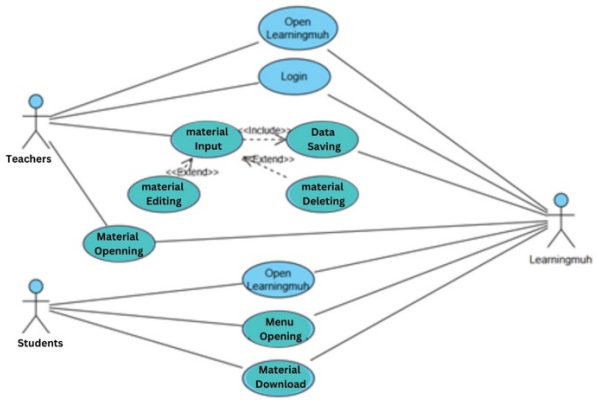

Figure 2. The use of case diagram of LearningMu.

Furthermore, the activity diagram of the LearningMu is presented in Figure 3.

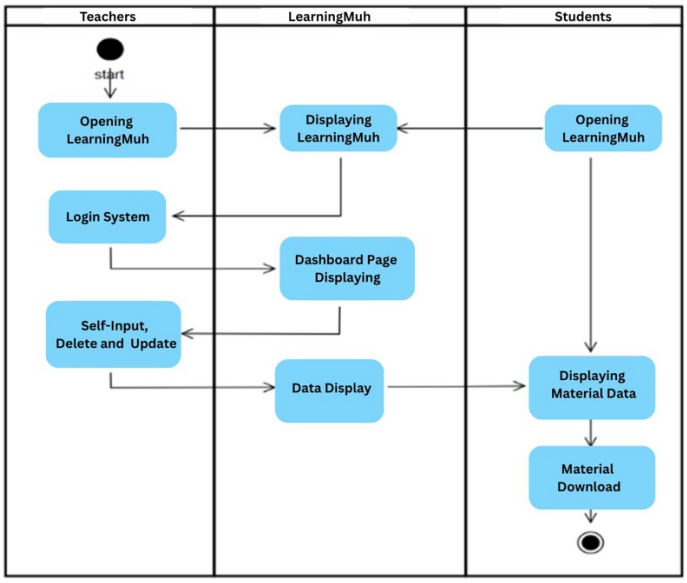

Figure 3. The activity diagram of LearningMu.

Also, it generates activities as illustrated in Figure 4.

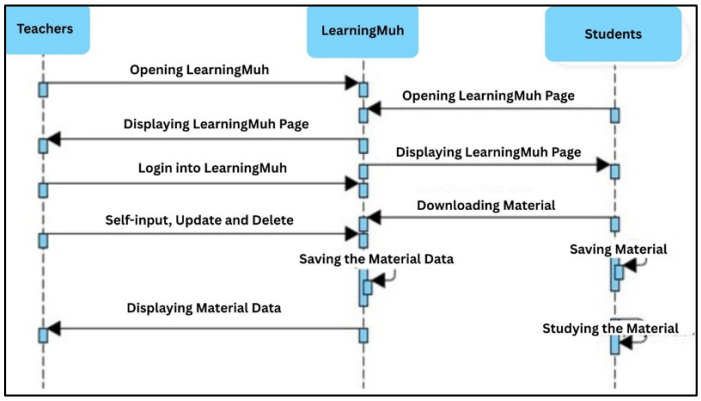

Figure 4. The sequence diagram of LearningMu.

Prototype development

The LearningMu website was developed using HTML, CSS, and JavaScript, integrated with a content management system (CMS). The initial content included locally based reading texts, pronunciation exercises, grammar materials, and interactive quizzes. A login system for students, teachers, and parents was added, along with automatic progress monitoring features. As part of this stage, system interface visualizations were created to demonstrate the tangible results of prototype development (see Figure 5).

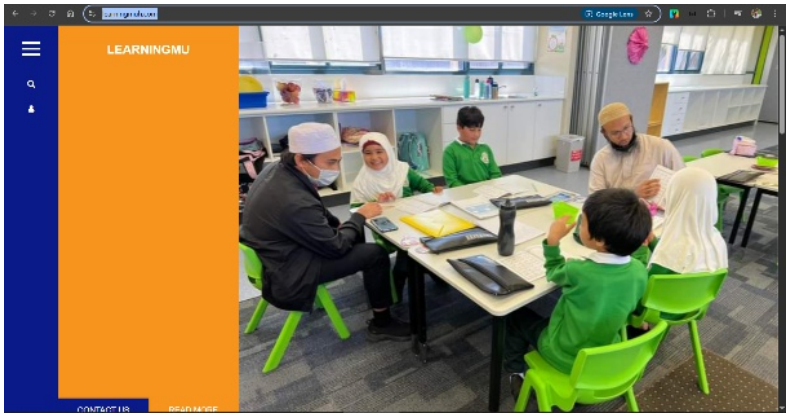

Figure 5. The homepage display of LearningMu.

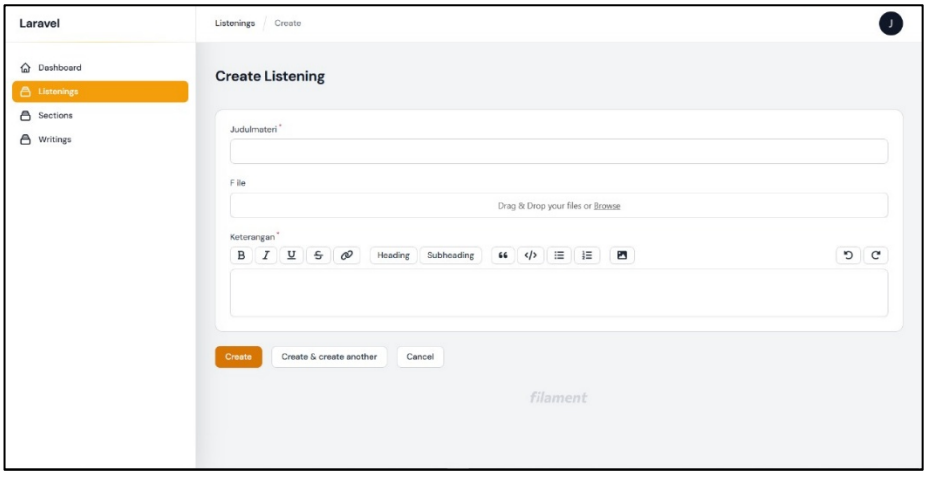

Figure 6. The CRUD listening page.

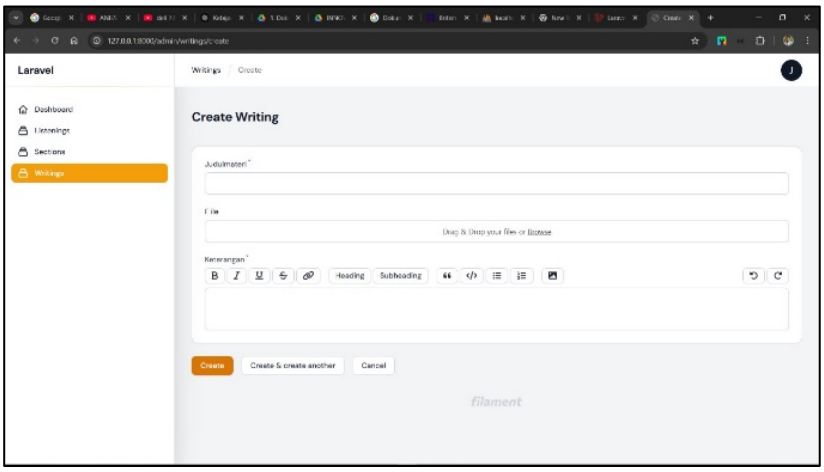

Figure 7. The CRUD writing page.

The platform also has features to organize activity pages for learning the listening skills (see Figure 6) and writing skills (see Figure 7). These visualizations highlight that the platform has already integrated its core functions as outlined in the initial design, ranging from access to learning materials to content management features for teachers.

Evaluation and user feedback

The evaluation stage was carried out to assess the quality of the LearningMu prototype in terms of validity and practicality. The evaluation involved 30 students and three English teachers as users, as well as media experts and instructional experts as validators. The assessment focused on aspects of usability, content relevance, visual appeal, and system stability.

The validity test results showed that the LearningMu website achieved an average score of 4.05 (on a 1–5 scale), categorized as valid. The evaluated components included design layout, ease of use, content attractiveness, and system management. Specifically, the ease-of-use aspect obtained the highest score (4.3), classified as highly feasible, indicating that the website's navigation and features were easily understood by users.

Table 2. Validity test

Component	Indicators	Average (1–5)	Category
Display	a. Color and Typography	3.6	Valid
	b. Clear and consistent layout		
	c. Attractive visual aesthetics		
	d. Quality of images/graphics		
The ease of use	a. Intuitive navigation	4.3	Strongly valid
	b. Easily accessible features		
	c. Clear usage instructions		
	d. Fast loading time		
Appeal	a. Interactive and relevant content	4.3	Strongly valid
	b. Ability to stimulate curiosity		
	c. Effective use of multimedia elements		
	d. Potential to enhance learning motivation		
Website & management	a. System stability	4.0	Strongly valid
	b. Responsiveness across devices		
	c. Ease of content updates		
	d. Data security		
	Average	4.05	Valid

In addition, a practicality test was conducted to determine the extent to which the website was easy to use for both students and parents. The results showed an average score of 3.72, categorized as practical. The assessment covered visual appeal and ease of use. Students gave a higher score (3.85) compared to parents (3.6), indicating that the platform was more responsive to the learners' needs.

Table 3. Practicality test

Item	Indicators	Students Score	Parents Score	Average
Display	a. Attractive visual design b. Use of colors and icons c. Neat and clear layout d. Responsive interactive elements	4.0	3.7	3.85 (Practical)
Ease of Use	a. Intuitive navigation b. Easily accessible features c. Clear instructions d. Learning process easy to follow	3.7	3.5	3.6 (Practical)
	Average	3.85	3.6	3.72 (Practical)

Overall, the evaluation results indicate that LearningMu meets the criteria of being both valid and practical. This confirms that the developed system not only aligns with instructional design standards but is also easy to use for students, teachers, and parents as primary users.

Iterative revision

User feedback was utilized to improve the quality of the system. Navigation was clarified, colors and layouts were standardized, and additional features were incorporated, such as gamified quizzes, pronunciation audio, and a point system. Access speed was also optimized to accommodate the limited internet connectivity in rural areas.

Final product implementation

The final version of LearningMu (V1.0) (https://learningmuh.com/) was officially launched, equipped with complete features covering the four language skills (listening, speaking, reading, writing), multimedia, interactive quizzes, and dedicated dashboards for teachers and parents. Teachers are able to monitor student achievement, while parents can track their children's learning progress. This implementation was supported by a sequence diagram design that ensures smooth interaction between the front-end and back-end systems.

The final implementation demonstrated that LearningMu not only supports student autonomy in learning but also enhances collaboration between teachers and parents in the educational process. This aligns with Da Silva and Ferreira Da Silva (Linus et al., 2025), who argue that parental involvement through technology can reinforce children's learning.

Discussion

The development of LearningMu demonstrate that the research and development approach is highly effective in producing a digital learning application that is responsive to user needs and contextual challenges (Syawal et al., 2025). Compared to traditional classroom practices, LearningMu offers greater flexibility, accessibility, and interactivity, which are crucial for students in areas with limited educational infrastructure. The iterative nature of prototyping allowed continuous refinement, ensuring that the final version not only met academic standards but also addressed practical usability issues identified by students, teachers, and parents. This aligns with previous studies emphasizing that user-centered design leads to more sustainable and effective learning technologies (Banat et al., 2023).

The results also highlight several key strengths. First, the platform's usability stood out, with high scores for navigational ease and intuitive features, making it accessible even for students

with limited prior exposure to digital tools. The incorporation of multimedia elements, such as audio pronunciation and gamified quizzes, significantly enhanced learner engagement and motivation, which are often difficult to sustain in conventional classrooms. Another strength is the inclusion of teacher and parent dashboards, which extend the platform's impact beyond individual learning to a more collaborative monitoring system (Brown, 1992; Martinez-Maldonado, 2019). This integration fosters accountability and shared responsibility for student progress, a feature not commonly found in many web-based learning platforms.

Despite these strengths, the study also revealed notable weaknesses. Although the platform was rated valid and practical, the overall scores suggest there is still room for improvement. Parents, for instance, reported slightly lower satisfaction compared to students, which may reflect difficulties in navigating digital platforms or the need for clearer instructional guidance. This indicates that while the system is highly effective for learners, additional support mechanisms are necessary for parents to fully utilize its features. Moreover, the reliance on stable internet connectivity remains a limit, particularly in rural Belitung where network infrastructure is inconsistent (Juriana & Firdaus, 2023; Zubaidah, 2023). Without adequate support, this challenge could reduce the inclusivity and reach of the platform.

When compared to traditional methods, LearningMu demonstrates superior adaptability and learner engagement, yet its effectiveness is still shaped by contextual limitations. The findings suggest that future developments should focus on optimizing offline features, simplifying interfaces for older users, and expanding scalability to other educational contexts. Overall, the study confirms that LearningMu is an effective, user-friendly, and contextually relevant tool, but one that requires continuous enhancement to maximize its long-term impact in improving English learning outcomes.

CONCLUSION

This study concludes that the research and development method is effective for developing the web-based English learning application LearningMu, designed for students of SMA Muhammadiyah Tanjungpandan, Belitung. The development process, which included needs analysis, initial design, prototype construction, evaluation, refinement, and implementation, successfully produced a system that addresses the main challenges of conventional learning in regions with limited infrastructure.

The validity test yielded an average score of 4.05, categorized as valid, indicating that design appearance, ease of use, content interactivity, and system management meet the required standards. Meanwhile, the practicality test resulted in an average score of 3.72, categorized as practical, proving that LearningMu is easy to use for both students and parents, particularly in terms of visual appeal, intuitive navigation, and clear instructions.

The final implementation further demonstrated that LearningMu not only supports independent learning across the four language skills (listening, speaking, reading, and writing) but also enhances the role of teachers and parents in monitoring students' learning progress. Thus, it can be affirmed that the utilization of web-based technology through LearningMu has the potential to serve as an innovative solution for improving the quality of English language learning, particularly in areas still facing educational infrastructure limitations. However, the final product is not totally perfect. Further research and development are still urgent to create the perfect version of this development. Thus, future research may play an important role in this development.

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DECLARATION

Author contribution

All authors contribute in the research and/or writing the paper, and approved the final manuscript.

Haiyudi	Conceptualizing the research idea, leading the investigation, setting up the methodology, analyzing the data, and writing the original draft.
Suprayuandi Pratama	Assisting the investigation, reviewing the validity of the methodology, developing the product of LearningMu, and enriching the data analysis.

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Conflict of interest

All authors declare that they have no competing interests.

Ethics declaration

We as authors acknowledge that this work has been written based on ethical research that conforms with the regulations of our institutions and that we have obtained the permission from the relevant institutes when collecting data. We support the International Journal on Education Insight (IJEI) in maintaining the high standards of personal conduct, practicing honesty in all our professional practices and endeavors.

The use of artificial intelligence

We do not use any generative AI tools to write any part of this paper.

Additional information

Not available.

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