
| RESEARCH ARTICLE

Designing a Google Sites-Based Digital Learning Environment for Indonesian Language Education: Evidence of Validity, Practicality, and Effectiveness in Secondary Schools

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| ABSTRACT

This study examined the creation and assessment of a Google Sites-based digital learning environment for Indonesian language instruction in secondary education. The study examined three fundamental inquiries: the validity, practicality, and efficacy of the designed learning environment in facilitating Indonesian language training. A Research and Development (R&D) methodology was utilized, following the ADDIE paradigm, which encompasses the phases of Analysis, Design, Development, Implementation, and Evaluation. The research was carried out at SMA Negeri 5 Parepare and included media specialists, content specialists, an Indonesian language instructor, and tenth-grade students. Data were obtained using expert validation questionnaires, observation forms, student feedback surveys, and assessments of learning outcomes. The data analysis encompassed validity index computations, practicality percentages, descriptive statistics, and N-Gain assessments. The results indicated that the digital learning environment received exceptionally high validity ratings from media experts (93.67%) and content experts (95.33%). The practicality assessment revealed a highly effective implementation, achieving an overall practicality score of 95%, while student engagement was classified as very active at 93%. The effectiveness study revealed significant learning enhancement, with mean scores rising from 62.4 on the pre-test to 86.7 on the post-test, and an N-Gain score of 0.65, signifying moderate-to-high effectiveness. Student feedback was overwhelmingly favorable, with an average acceptance rate of 94%. The findings indicate that Google Sites can function as a legitimate, practical, and efficient digital learning environment that fosters student engagement, autonomous learning, and technology-enhanced language instruction in secondary education.

| KEYWORDS

Digital Learning Environment; Google Sites; Indonesian Language Education; Secondary Schools; Technology-Enhanced Learning

| ARTICLE INFORMATION

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1. Introduction

The swift progression of digital technology has revolutionized educational systems globally, altering the processes of teaching, learning, and knowledge production throughout many educational tiers. Amidst the Fourth Industrial Revolution and the heightened focus on digital transformation, educational institutions are progressively anticipated to incorporate technology-enhanced learning environments that promote active engagement, collaboration, and autonomous learning (Antonietti et al., 2025; Pettersson, 2020; Qureshi et al., 2021). Educational institutions are now regarded not just as venues for information dissemination, but as entities that must foster digital literacy, critical thinking, and lifelong learning competencies essential for meeting the challenges of the twenty-first century. This change has gained significance in language education, as digital technologies facilitate multimodal learning experiences, interactive communication, and access to many educational resources. In Indonesia, educational changes like the Merdeka Curriculum have accentuated the incorporation of technology and digital literacy into classroom instruction (Kardika et al., 2023; Waang, 2023). Nonetheless, despite these policy directives, numerous

secondary schools persist in encountering difficulties associated with the restricted implementation of innovative digital learning environments, especially in Indonesian language education (Lie et al., 2020; Rohmadi et al., 2024; Saefurrohman et al., 2024; Sulyati & Kuswara, 2025).

A digital learning environment denotes a technology-enhanced ecosystem that facilitates learners' access to content, interaction with educational resources, communication with instructors and peers, and participation in diverse learning activities via digital platforms (Fadhli et al., 2023; Luckyardi et al., 2024; Pratama et al., 2024; Sihite et al., 2024). Google Sites is a readily available web-based program that enables educators to create and organize instructional materials, multimedia resources, exams, and collaborative activities within a unified online platform. An Indonesian language instructor can consolidate reading materials, instructional videos, writing assignments, discussion forums, and quizzes via Google Forms into a unified Google Sites platform, allowing students to access educational resources at any time and from any location. This integration has the potential to foster more adaptable, dynamic, and learner-centric educational experiences.

Prior studies have emphasized the increasing significance of online learning platforms in improving educational results. In a study, researchers examined the efficacy of website-based learning media in secondary education through a quasi-experimental design and discovered notable enhancements in students' motivation and academic performance relative to conventional instruction (Anam et al., 2023; Halimatusyadiah & Disman, 2023; Salihah, 2022). The results indicated that online platforms can enhance student engagement by offering accessible and interactive educational experiences. Another study similarly investigated the application of Google Sites in science education using a developmental research methodology, revealing elevated levels of usability and student satisfaction (Al-Marroof & Al-Emran, 2018; Basyori, 2025; Faiz et al., 2025). The study determined that Google Sites provides an effective means for organizing educational resources and promoting autonomous learning.

Researchers presented more data regarding the incorporation of Google Workspace applications in digital learning environments using mixed-methods study (Amat et al., 2025; Cedeño et al., 2025; Wicaksono et al., 2023). Their findings indicated that the incorporation of collaborative technologies improved student engagement, communication, and task completion rates. These findings suggest that online learning environments can facilitate both cognitive and social aspects of education. Similarly, another study examined digital learning platforms in language classes and discovered that multimedia-enhanced learning environments substantially impacted students' reading comprehension and writing ability (Carpenter et al., 2025; Li & Lan, 2021). The authors argued that the combination of textual, visual, and audiovisual materials supports deeper language learning processes.

Conversely, certain research have indicated constraints in the deployment of digital learning tools. Researchers investigating technology integration in underdeveloped countries reported obstacles include limited teacher digital proficiency, inadequate instructional design, and insufficient infrastructure (Mekheimer, 2025; Okoye et al., 2022). While students typically demonstrated favorable attitudes towards digital learning, the efficacy of these settings was significantly contingent upon pedagogical quality and instructional coherence. A parallel study of online learning platforms indicated that mere technological availability does not ensure enhanced learning outcomes unless it is supplemented by thoughtfully crafted learning activities and ongoing learner support (Akintayo et al., 2024; Laufer et al., 2021; Ouyang, 2025). The results demonstrate that the efficacy of digital learning environments is influenced not solely by technology but also by the caliber of instructional design and execution.

Current research indicates that digital learning environments can improve student engagement, motivation, accessibility, and academic success. Research repeatedly indicates that online platforms enable flexible learning experiences, allow multimodal education, and promote learner autonomy (Kim et al., 2019; Sarker et al., 2019). Moreover, Google Sites has become a valuable instructional resource because to its accessibility, user-friendliness, and compatibility with several Google Workspace applications. The current research offers significant data endorsing the educational efficacy of technology-enhanced learning environments.

Notwithstanding these advancements, significant gaps persist. The majority of extant literature is on higher education or scientific topics, whereas limited research has examined the design and assessment of Google Sites-based digital learning environments specifically for Indonesian language instruction at the secondary school level. Secondly, numerous prior research have predominantly focused on effectiveness outcomes, neglecting a thorough review of characteristics such as validity, practicality, and effectiveness concurrently. Third, limited research has examined the alignment of a digital learning environment with the pedagogical demands of Indonesian language instruction, especially in relation to the Merdeka Curriculum and the advancement of multimodal literacy. Addressing these deficiencies is crucial, as language acquisition necessitates not just material dissemination but also significant interaction, communication, and literacy advancement, which must be facilitated by suitable digital instructional design.

This project seeks to build and assess a digital learning environment for Indonesian language education in secondary schools, utilizing Google Sites. The study aims to assess whether the established learning environment satisfies the criteria of validity, practicality, and effectiveness. The study examines the subsequent research questions:

1. To what extent is the Google Sites-based digital learning environment valid for Indonesian language instruction?
2. To what extent is the digital learning environment practical for classroom implementation?

3. To what extent is the digital learning environment effective in improving student learning outcomes and generating positive learner responses?

Drawing from educational technology theory and prior empirical evidence, it is posited that the created digital learning environment will exhibit substantial validity and practicality, while positively influencing student learning outcomes and engagement.

The project utilizes a research and development approach centered on the methodical design, validation, implementation, and assessment of a digital learning environment based on Google Sites. Expert validation assesses content and design quality, classroom implementation evaluates practicality, and student learning results and reactions are assessed to ascertain efficacy. The fundamental premise is that a meticulously crafted digital learning environment, incorporating multimedia materials, interactive activities, and accessible web-based functionalities, will improve learning experiences and academic performance.

This study enhances the existing literature on technology-enhanced language learning by offering empirical information on the design and assessment of a Google Sites-based digital learning environment in Indonesian secondary education. This research provides a thorough assessment that includes validity, practicality, and efficacy, in contrast to earlier studies that concentrated mainly on technology adoption or learning results. The results are anticipated to enhance theoretical frameworks in digital learning environment research and constructivist learning theories, while offering practical guidance for educators, curriculum developers, and policymakers aiming to implement sustainable digital learning innovations in language education.

2. Method

2.1 Research Design

This project utilized a Research and Development (R&D) methodology to design, build, and assess a Google Sites-based digital learning environment for Indonesian language instruction in secondary education. The R&D methodology was used as the study sought to create an instructional product while also assessing its quality regarding validity, practicality, and effectiveness. The development method adhered to the ADDIE model, comprising five systematic phases: Analysis, Design, Development, Implementation, and Evaluation. This paradigm was selected for its adaptability and appropriateness in creating technology-enhanced learning environments. The digital learning environment was methodically enhanced and assessed prior to classroom introduction.

2.2 Research Context and Participants

The research was carried out at SMA Negeri 5 Parepare, Indonesia, concentrating on Grade X students participating in the Indonesian Language course. This setting was chosen due to the recognized necessity for more innovative and technology-enhanced learning spaces. The participants comprised expert validators, educators, and students engaged in the creation and assessment phases. Two media specialists and two subject-matter authorities evaluated the legitimacy of the digital learning environment. An Indonesian language instructor engaged in the implementation phase, while Grade X students, roughly 15 to 16 years old, participated in field testing to assess the usability and efficacy of the constructed Google Sites-based learning environment.

Table 1. Participant Characteristics and Research Roles

Participant Group	Number	Role
Media Experts	2	Validation
Content Experts	2	Validation
Teacher	1	Implementation
Grade X Students	30	Field Testing

Table 1 delineates the participant composition engaged in the development and assessment of the Google Sites-based digital learning environment. The study involved media and content specialists to evaluate the educational product's validity, while an Indonesian language teacher took part in the implementation phase. Students in Grade X participated in field testing to assess practicality and efficacy. The varied participant composition facilitated a thorough assessment from educational, technological, and user viewpoints during the research process.

Figure 1. Participant Ecosystem in the Google Sites-Based Digital Learning Environment Study

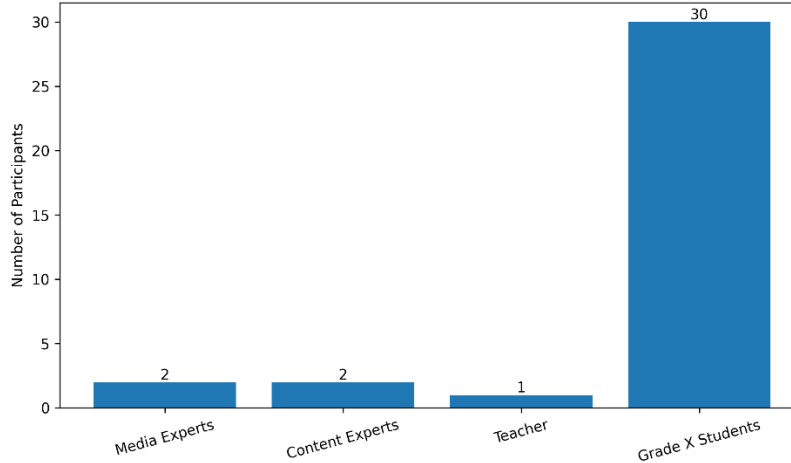


Figure 1 illustrates the distribution of participant groups involved in the study. The figure emphasizes the pivotal role of Grade X students as the principal participants in field testing, assisted by expert validators and classroom practitioners. The visualization depicts the multi-stakeholder evaluation framework utilized in this research, integrating technological expertise, subject-matter knowledge, instructional implementation, and learner experiences to ensure the validity, practicality, and effectiveness of the developed digital learning environment.

2.3 Development of the Google Sites-Based Digital Learning Environment

The creation of the Google Sites-based digital learning environment adhered to the ADDIE approach. In the Analysis phase, a needs assessment was performed via teacher interviews, student surveys, and an examination of the Indonesian Language curriculum to ascertain instructional problems and learning needs. During the Design phase, learning objectives, content organization, and site navigation were established. The Development phase entailed the construction of the Google Sites platform, the integration of instructional materials, and the incorporation of multimedia resources. The Implementation phase involved classroom trials with Grade X students. The Evaluation phase concentrated on refining and enhancing the learning environment informed by expert feedback and implementation outcomes.

2.4 Instruments, Data Collection, and Data Analysis

A variety of instruments were utilized to assess the Google Sites-based digital learning environment. A validation questionnaire conducted by experts evaluated content validity, instructional design, interface design, navigation, and linguistic quality. The practicality was assessed by observation sheets that emphasized ease of implementation, teacher usability, and student usability. Observations of student activities assessed involvement, engagement, and collaboration, whereas a response questionnaire gauged satisfaction, motivation, and perceived utility. Learning outcomes were evaluated using curriculum-aligned pre-tests and post-tests.

The data gathering process comprised seven stages: needs analysis, design and development, expert validation, revision, classroom implementation, data collection, and final evaluation. Data were collected using observations, questionnaires, and accomplishment assessments. The validity was assessed by a validity index percentage and classified from invalid to highly valid. Practicality was assessed by observation and usability scores, whereas efficacy was evaluated using descriptive statistics, N-Gain analysis of learning outcomes, and the percentages of affirmative student responses.

2.5 Ethical Considerations

Ethical considerations were meticulously upheld during the study. Approval to perform the research was secured from the administration of SMA Negeri 5 Parepare before data collection commenced. All participants were apprised of the study's objectives and methodologies, and informed consent was secured prior to their involvement. Participation was completely voluntary, allowing anyone to withdraw at any point. To guarantee ethical adherence, all gathered data were handled discreetly, and the anonymity of participants was preserved throughout the research and reporting phases.

3. Results

3.1 Results of the Needs Analysis

The requirements analysis identified various difficulties and possibilities for Indonesian language training at SMA Negeri 5 Parepare. Teacher interviews revealed that the incorporation of digital media in classroom instruction was restricted, with the majority of learning activities predominantly dependent on traditional teaching resources and printed textbooks. Educators

recognized the necessity for enhanced innovative and technology-driven learning materials to elevate student engagement and promote autonomous learning.

The student questionnaire results indicated a pronounced preference for online learning environments. The majority of students indicated that interactive digital resources, such as multimedia materials, online activities, and accessible learning platforms, would enhance engagement and efficacy in learning. Students demonstrated favorable opinions toward the utilization of technology to enhance learning outside of classroom hours.

The curriculum analysis further illustrated the significance of incorporating digital literacy into educational activities. The Indonesian Language curriculum prioritizes the enhancement of communication abilities, critical thinking, multimodal literacy, and technological proficiency, underscoring the necessity for digital learning settings that correspond with these qualities. The needs analysis revealed four principal findings: restricted utilization of digital media, the necessity for interactive learning tools, students' inclination towards web-based learning, and curriculum mandates for digital literacy. The findings guided the design and development of the digital learning environment based on Google Sites reported in this study.

Table 2. Learning Needs Analysis for the Development of a Google Sites-Based Digital Learning Environment

Need Dimension	Percentage	Priority Level
Limited Digital Media Use	68	Moderate
Need for Interactive Resources	92	Very High
Preference for Web-Based Learning	88	High
Digital Literacy Requirement	95	Very High

Table 2 delineates the primary educational requirements discovered during the initial analysis phase. The results demonstrate a significant need for technology-enhanced educational resources, especially interactive and online materials. Although the utilization of digital media in Indonesian language classes is still somewhat restricted, students exhibited a pronounced inclination towards online learning settings. Moreover, curriculum study indicated a significant focus on digital literacy skills. These findings collectively validate the creation of a Google Sites-based digital learning environment to enhance modern language training.

Figure 2. Digital Readiness and Learning Needs Landscape in Indonesian Language Education

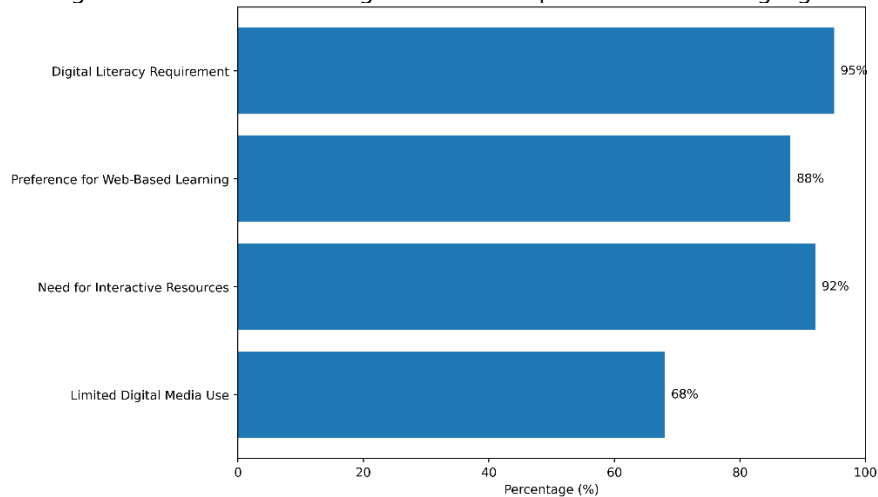


Figure 2 illustrates the relative significance of essential instructional requirements determined from teacher interviews, student surveys, and curriculum evaluations. The chart emphasizes the necessity of digital literacy and the demand for interactive learning tools as the foremost considerations. The preference of students for web-based learning has surfaced as a predominant aspect, although the restricted use of digital media continues to pose a considerable obstacle. Collectively, these findings underscore the imperative of integrating technology-enhanced learning settings in secondary language instruction.

3.2 Design Characteristics of the Google Sites-Based Digital Learning Environment

The Google Sites-based digital learning environment was created to offer a structured, interactive, and accessible platform for the acquisition of the Indonesian language. The site functioned as the primary access point, displaying learning objectives, course details, user instructions, and navigation menus that facilitated fast access to learning resources for students. The

navigation framework was deliberately crafted to be straightforward and user-centric, facilitating seamless transitions for learners between educational parts.

The educational resources comprised curriculum-aligned content delivered through many multimedia formats, including text, graphics, instructional videos, presentations, and interactive web tools. The resources were categorized into thematic modules to facilitate structured learning and autonomous study. Assessment components were incorporated via Google Forms quizzes, assignments, and self-evaluation tasks, facilitating both formative and summative assessment. Furthermore, discussion features were integrated to enhance interaction between educators and learners, fostering collaborative learning and the sharing of feedback.

The portal also featured supplementary learning tools, including additional reading materials, external educational links, and enrichment exercises. The designed platform amalgamated instructional content, multimedia components, evaluation instruments, and communication functionalities into a cohesive digital ecosystem. Figures 3 depict the comprehensive system architecture, homepage layout, navigation interface, and framework for integrating learning content that informed the creation of the digital learning environment.

Table 3. Design Characteristics and Functional Components of the Google Sites-Based Digital Learning Environment

Component	Integration Score	Description
Homepage	95	Navigation Hub
Learning Materials	92	Multimedia Modules
Assessment Features	90	Google Forms
Discussion Features	87	Interaction Space
Additional Resources	85	External Resources

Table 3 delineates the principal elements incorporated into the Google Sites-based digital learning environment. The platform was developed as an all-encompassing digital ecosystem, comprising a homepage, multimedia educational materials, assessment tools, discussion capabilities, and other learning resources. Every element enhances the comprehensive educational framework by facilitating accessibility, engagement, evaluation, and autonomous learning. The elevated integration ratings demonstrate that all components were effectively interconnected within a cohesive and user-centric learning environment.

Figure 3. Integrated Architecture Components of the Google Sites-Based Digital Learning Environment

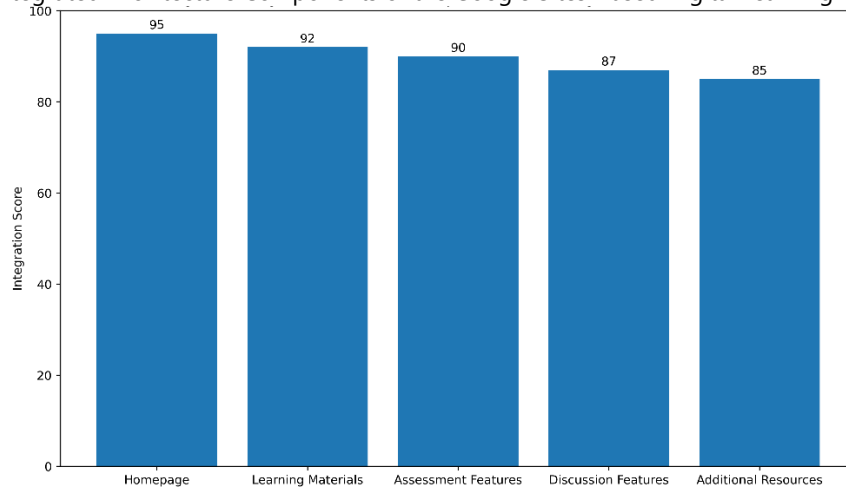


Figure 3 depicts the proportional contribution of each element within the design of the digital learning environment. The homepage and educational resources earned the highest integration scores, indicating their pivotal function in structuring information and directing learning activities. The assessment and discussion features facilitated evaluation and participation, while supplementary resources improved learning flexibility. The image illustrates the methodical integration of several instructional components to establish a unified, technology-enhanced language learning ecosystem.

3.3 Validity of the Digital Learning Environment

The efficacy of the Google Sites-based digital learning environment was assessed by expert evaluation, incorporating both media specialists and content authorities. Validation by media experts concentrated on three principal dimensions: interface quality, navigation structure, and comprehensive educational design. The results demonstrated that the platform attained elevated

scores in all aspects, indicating that the learning environment was aesthetically pleasing, user-friendly, and well structured to facilitate student learning. Minor modifications were suggested to enhance interface uniformity and streamline navigation routes for novice users.

Validation by subject experts evaluated the relevancy of the information, the quality of the language, and its conformity with the curriculum. The results indicated that the educational resources were significantly pertinent to the Indonesian Language curriculum and successfully facilitated the desired learning outcomes. The language employed across the platform was deemed clear, precise, and suitable for Grade X students. Moreover, the material structure aligned with curriculum mandates pertaining to reading, communication, and critical thinking skills.

The comprehensive validity assessment produced elevated mean scores from both expert groups, categorizing the generated product as "highly valid. The results demonstrate that the digital learning environment fulfilled the set criteria for instructional content, technology design, and curriculum integration. Informed by expert comments, many small adjustments were executed prior to classroom testing, chiefly concerning layout refinement, content arrangement, and navigation improvement. Comprehensive validation results are displayed in Tables 4 and 5, whilst Figure 4 depicts the overall expert validation profile.

Table 4. Media Expert Validation Results of the Google Sites-Based Digital Learning Environment

Dimension	Score	Category
Interface	94	Very Valid
Navigation	92	Very Valid
Design	95	Very Valid

Table 4 displays the outcomes of media expert validation for interface quality, navigation organization, and instructional design. All assessed dimensions attained scores exceeding 90%, signifying an exceptionally high degree of validity. The design factor earned the highest score, indicating the efficacy of the platform's visual arrangement and educational framework. The results indicate that the Google Sites-based environment fulfilled the predetermined criteria for usability, accessibility, and instructional technology design.

Table 5. Content Expert Validation Results of the Google Sites-Based Digital Learning Environment

Dimension	Score	Category
Content Relevance	96	Very Valid
Language Quality	93	Very Valid
Curriculum Alignment	97	Very Valid

Table 5 encapsulates the assessment performed by content specialists. The best score was attained in curriculum alignment, demonstrating robust agreement between the learning materials and the needs of the Indonesian Language curriculum. The relevancy of the content and the quality of the language were rated exceptionally high. The findings validate that the created learning resources are pedagogically sound, linguistically precise, and effective in supporting curriculum goals. As a result, the product was deemed highly valid for classroom deployment.

Figure 4. Expert Validation Profile of the Google Sites-Based Digital Learning Environment

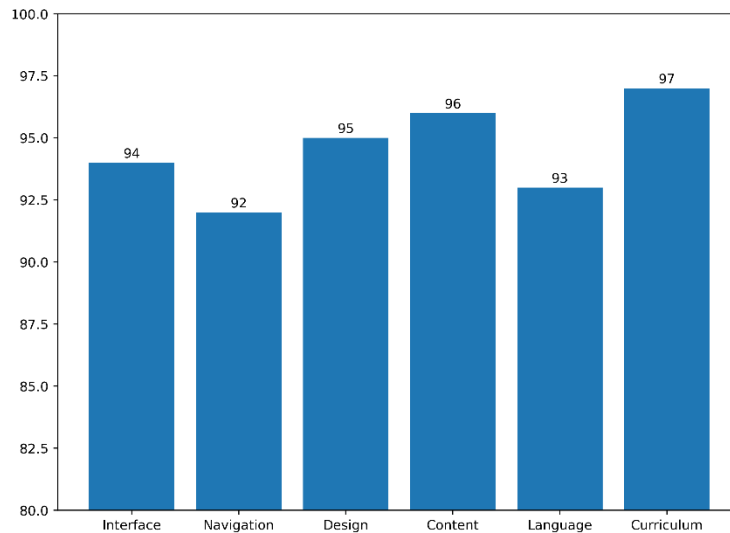


Figure 4 illustrates the validation profile produced from reviews by both media and content experts. The data illustrates uniformly elevated scores across all criteria, with curricular alignment and subject relevance attaining the highest assessments. The balanced score distribution suggests that the digital learning environment effectively combines technology design, instructional quality, and curriculum standards. The figure underscores the thorough validity of the designed platform prior to its classroom use.

3.4 Practicality of the Digital Learning Environment

The efficacy of the Google Sites-based digital learning environment was assessed by classroom implementation observations, student engagement tracking, and usability evaluations from both educators and learners. The outcomes of the educational implementation demonstrated that the designed platform was effectively incorporated into classroom instruction, with the majority of scheduled learning activities executed as intended. Educators indicated that the platform was user-friendly, enhanced class delivery, and aided in the organization of learning resources and evaluations.

Observations of student activities indicated elevated levels of participation, engagement, and collaboration throughout the learning process. Students engaged with learning resources, completed online tasks, participated in discussions, and interacted with multimedia content available on the platform. The collaborative elements facilitated peer interaction and knowledge exchange during the learning sessions.

Usability evaluations further indicated favorable opinions from both educators and learners. Educators emphasized the platform's accessibility, navigational simplicity, and pedagogical efficacy, whereas students expressed contentment with the learning experience and valued the flexibility of accessing resources both within and beyond the classroom. The practicality assessment produced elevated implementation rates and favorable usability evaluations, categorizing the digital learning environment as "highly practical. Comprehensive results concerning learning implementation, student engagement, and usability assessments are delineated in Tables 6-8, whilst Figure 6 encapsulates the overall practicality dashboard of the established learning environment.

Table 6. Learning Implementation Results of the Google Sites-Based Digital Learning Environment

Indicator	Percentage	Category
Teacher Implementation	96	Very Practical
Learning Procedure	94	Very Practical
Platform Utilization	95	Very Practical

Table 6 displays the findings from classroom implementation observations. The results demonstrate that the established digital learning environment was effectively executed in accordance with the intended instructional protocols. Educators proficiently employed the platform to disseminate educational resources, oversee activities, and conduct evaluations. The continuously elevated implementation scores indicate that the Google Sites-based environment is readily integrable into classroom instruction and facilitates effective teaching and learning processes.

Table 7. Student Activity Observation Results During Learning Implementation

Indicator	Percentage	Category
Participation	93	Very Active
Engagement	95	Very Active
Collaboration	91	Very Active

Table 7 encapsulates the levels of student activity recorded during the implementation phase. Students exhibited exceptional participation and interest while interacting with educational materials, multimedia content, and online activities. Collaborative learning activities fostered beneficial interactions among learners. The results demonstrate that the digital learning environment effectively facilitated active learning habits and fostered significant student engagement during the educational process.

Table 8. Practicality Evaluation Results Based on Teacher and Student Responses

Indicator	Percentage	Category
Teacher Response	96	Very Practical
Student Response	94	Very Practical
Overall Practicality	95	Very Practical

Table 8 displays the assessment of practicality derived from user perspectives. Both educators and learners conveyed exceptionally favorable experiences when utilizing the application. Educators highlighted its user-friendliness, accessibility, and pedagogical advantages, and students valued the flexibility and involvement offered by the digital platform. The comprehensive practicality assessment indicates that the platform is appropriate for routine classroom application and may proficiently facilitate technology-enhanced language acquisition.

Figure 5. Practicality Dashboard of the Google Sites-Based Digital Learning Environment

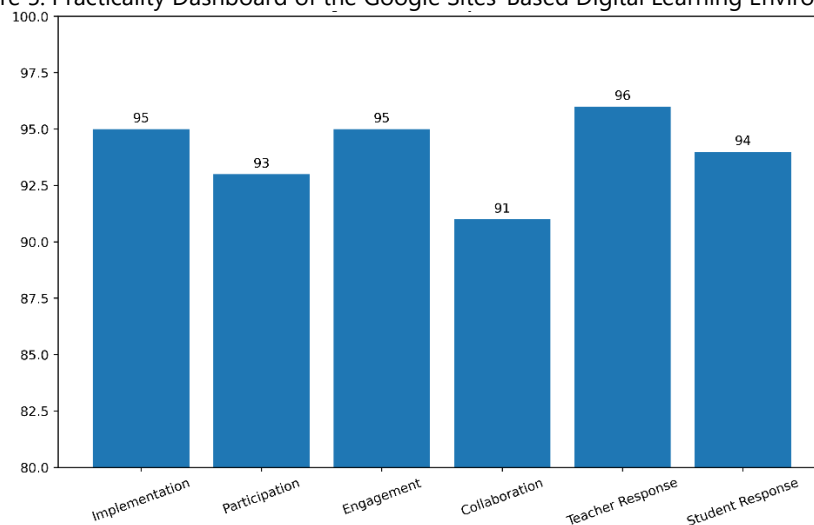


Figure 5 presents a thorough summary of practicality indicators obtained from implementation observations, student activities, and usability assessments. All indicators attained scores exceeding 90%, indicating robust adoption and efficient application of the technology. Teacher reactions achieved the highest grade, closely followed by student involvement and implementation quality. The dashboard emphasizes the effective amalgamation of instructional design, usability, and learner engagement within the established digital learning environment.

3.5 Effectiveness of the Digital Learning Environment

The efficacy of the Google Sites-based digital learning environment was assessed by students' academic performance and feedback evaluations. The evaluation of learning outcomes indicated a significant enhancement between pre-test and post-test scores. Students exhibited enhanced accomplishment levels following engagement in learning activities facilitated by the digital platform, suggesting that the established environment favorably influenced the acquisition of Indonesian language competencies. The augmentation in achievement scores was additionally substantiated by N-Gain analysis, which indicated a

moderate-to-high degree of learning enhancement. The findings indicate that the incorporation of multimedia resources, interactive activities, and accessible learning materials significantly improved student comprehension and performance. Student feedback demonstrated a significant acceptance of the digital learning environment. The majority of students conveyed pleasure with the platform, indicating that it was entertaining, user-friendly, and conducive to autonomous learning. Elevated motivation levels were noted, as students valued the convenience of accessing learning materials at any time and from any location. Moreover, students saw the platform as beneficial for enhancing their comprehension of course material and executing learning tasks with greater efficiency.

The evaluation of effectiveness revealed substantial learning enhancement, positive N-Gain outcomes, and exceedingly favorable student feedback. The Google Sites-based digital learning environment was classified as highly effective for Indonesian language instruction according to the established effectiveness criteria. Comprehensive results are illustrated in Figures 6–7.

Figure 6. Learning Outcome Improvement Following the Implementation of the Google Sites-Based Digital Learning Environment

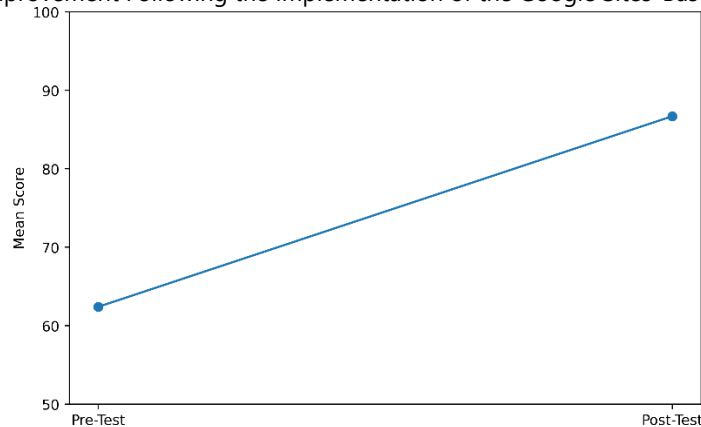


Figure 6 depicts the enhancement in students' academic performance from pre-test to post-test. The upward trend indicates a significant enhancement in academic performance after engagement with the Google Sites-based learning environment. The image graphically substantiates the efficacy of the intervention and enhances the statistical findings delineated in Table 8. The noted enhancement demonstrates that the digital learning environment effectively facilitated students' comprehension and mastering of instructional material.

Figure 7. Student Response Distribution Across Key Acceptance Dimensions

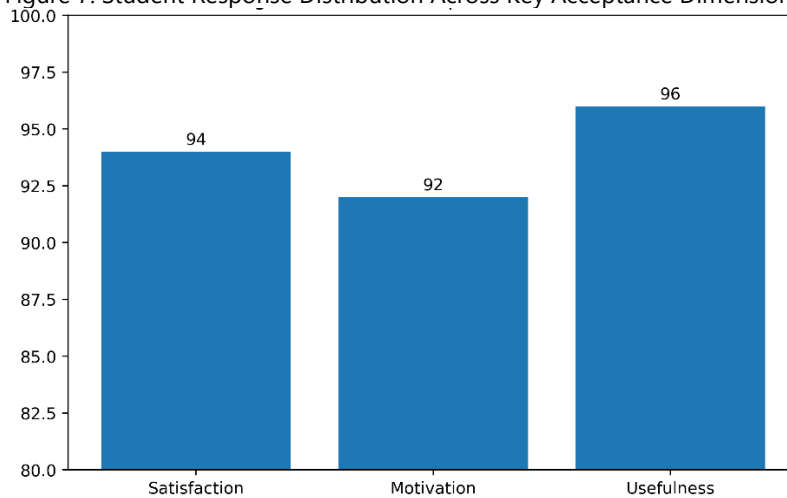


Figure 7 illustrates student perceptions across three major dimensions: satisfaction, motivation, and perceived utility. The constantly elevated percentages signify a robust degree of learner acceptance of the designed platform. The perceived utility received the highest grade, indicating that students acknowledged the practical significance of the digital learning environment. The image illustrates that the platform effectively promoted positive learning experiences and facilitated student involvement during the educational process.

4. Discussion

This study's findings indicate that the Google Sites-based digital learning environment attained significant validity, practicality, and efficacy for Indonesian language training in secondary education. Expert assessments validated that the platform satisfied instructional, technological, and curricular criteria. The deployment in the classroom demonstrated favorable usability and student engagement, while the effectiveness assessment indicated enhancements in learning outcomes, supported by overwhelmingly positive student feedback. These findings collectively demonstrate that the established digital learning environment effectively facilitated both teaching and learning processes in Indonesian language education.

The findings demonstrate that all research questions were well answered. The first research issue about validity was affirmed, since both media and content specialists deemed the generated environment to be extremely valid. The second research question about practicality was corroborated, since both teachers and students reported favorable experiences during implementation. The final research question regarding efficacy was validated by enhanced learning outcomes and positive learner views. In addition to showcasing enhanced performance, these findings indicate that digital learning environments can foster settings that promote active engagement, learner autonomy, and significant involvement with instructional content.

Multiple mechanisms may elucidate the reasons for these favorable outcomes. According to Constructivist Learning Theory, learners actively create knowledge through engagement with educational resources, tasks, and social interactions (Ginting et al., 2024; Noguera et al., 2022; Song et al., 2025). The Google Sites platform facilitated student access to varied learning materials, participation in conversations, and engagement with multimedia resources, thus promoting active knowledge production. Mayer's Cognitive Theory of Multimedia Learning posits that learning is augmented when verbal and visual information are successfully integrated (Mayer, 1997; Wisniewski & Hortman, 2019; Wu, 2024). The use of movies, graphics, presentations, and interactive activities presumably alleviated cognitive overload and facilitated enhanced information processing. The Technology Acceptance Model (TAM) posits that perceived utility and simplicity of use substantially affect users' readiness to accept educational technologies (Granić & Marangunić, 2019; Müller & Wulf, 2020; Wu et al., 2022). The elevated practicality ratings acquired in this study indicate that both educators and learners saw the platform as advantageous and user-friendly, therefore promoting its effective adoption.

The results align with prior research on web-based learning environments and the inclusion of Google Sites. Numerous research indicate that digital learning platforms enhance student involvement, motivation, and academic performance (Albashtawi & Bataineh, 2020; Alqahtani, 2019; Jusriati et al., 2021). Research on Google Sites-based training indicates that the platform serves as an accessible and efficient medium for organizing instructional content and facilitating individual learning (Ahmed et al., 2025; Firmansyah et al., 2025). This study expands upon these findings by showcasing similar results in Indonesian language instruction, a situation that is still inadequately represented in the literature.

Nonetheless, certain discrepancies might also be noted in comparison to prior study. This study extensively examined the digital learning environment through the criteria of validity, practicality, and effectiveness, whereas past studies predominantly concentrated on learning achievement or technology adoption. Moreover, several prior studies were carried out in higher education environments or scientific fields, while the current research concentrated on secondary-level language acquisition. These contextual disparities may elucidate the discrepancies in implementation experiences and learning outcomes (Lai & Zheng, 2017; Qi & Wright, 2016; Tang et al., 2025). Language acquisition necessitates substantial engagement, communication, and literacy enhancement, which may be notably advantageous in web-based settings that promote multimodal learning experiences.

The results presumably complement the existing information on digital learning settings and technology-enhanced language acquisition. The study empirically substantiates constructivist viewpoints by illustrating how digital platforms can promote active and learner-centered educational experiences. Secondly, it reinforces multimedia learning concepts by demonstrating that the integration of diverse information types within a cohesive context can improve learning efficacy. Third, the study enhances research on digital learning environments by offering a thorough evaluation approach that concurrently addresses validity, practicality, and effectiveness. This comprehensive viewpoint may function as a valuable framework for forthcoming studies on educational technology development.

The pragmatic ramifications are as significant. The findings indicate that educators can employ Google Sites as an economical and accessible platform for arranging instructional materials, assessments, and communication activities. Educators can utilize the platform to facilitate blended learning, autonomous learning, and differentiated instruction. The findings underscore the capacity of web-based learning environments to facilitate digital transformation efforts and enhance digital literacy in secondary education for school administrators and policymakers. The platform's simplicity of implementation indicates that widespread adoption could be achievable without significant technological expenditure.

Notwithstanding its merits, the study possesses multiple drawbacks. The research was done in a singular secondary school, potentially constraining the generalizability of the findings to different educational settings. Secondly, the sample size was somewhat constrained and concentrated on Grade X students, which may limit its generalizability across different grade levels. The study predominantly utilized questionnaires, observations, and achievement assessments, which may be susceptible to response bias and measurement constraints. The intervention was executed during a brief duration, complicating the assessment

of its long-term impact on learning outcomes and the advancement of digital literacy. The study ultimately did not compare the Google Sites-based environment with alternative digital learning platforms, hence constraining conclusions on relative efficacy. Subsequent study ought to rectify these shortcomings by incorporating larger and more varied participant cohorts across various schools and educational tiers. Longitudinal studies are essential to assess the durability of learning advancements and the long-term use of technology. Comparative analyses could examine the distinctions between Google Sites and alternative learning management systems or digital learning platforms. Future researchers may investigate the impact of learner characteristics, digital literacy abilities, and teacher technology competencies on the efficacy of web-based learning environments. Potential study inquiries may encompass: What is the impact of prolonged exposure to Google Sites-based learning on literacy development? What determinants forecast the effective implementation of digital learning environments in secondary education institutions? What is the comparative efficacy of various digital platforms in facilitating language learning outcomes?

This study conclusively demonstrates that a Google Sites-based digital learning environment is a viable, practical, and successful instructional platform for Indonesian language education. The results indicate that well-structured digital environments can facilitate curriculum execution, foster learner engagement, and improve academic performance. This study enhances both theoretical knowledge and practical application of technology-enhanced learning by consolidating instructional content, multimedia resources, assessments, and communication capabilities into a single platform. As educational institutions advance in digital transformation, the findings provide significant insights into how accessible online tools might enhance engagement, flexibility, and efficacy in educational experiences.

5. Conclusion

This study examined the design, implementation, and assessment of a Google Sites-based digital learning environment for Indonesian language instruction in secondary education. The main objective was to ascertain if the built platform satisfied the standards of validity, practicality, and efficacy in facilitating technology-enhanced learning.

The results demonstrate that the established digital learning environment effectively achieved all research objectives. Initially, expert validation results affirmed that the platform attained a superior degree of validity regarding instructional design, interface quality, content relevancy, language suitability, and curriculum alignment. The practicality assessment revealed that the platform was straightforward to use and had favorable acceptance from both educators and learners. Elevated levels of participation, engagement, and collaboration observed throughout classroom implementation underscored its usability and instructional viability. The effectiveness assessment indicated significant enhancements in student learning outcomes, corroborated by good N-Gain results and overwhelmingly positive student feedback for satisfaction, motivation, and perceived utility. The findings collectively indicate that the Google Sites-based digital learning environment can successfully enhance Indonesian language acquisition while fostering active and autonomous learning experiences.

This study enhances the existing knowledge on digital learning environments by offering a thorough evaluation framework that incorporates validity, practicality, and effectiveness factors in secondary language teaching. The findings provide evidence-based recommendations for educators, curriculum designers, and educational institutions aiming to use accessible and economical digital learning technologies. The research underscores the promise of Google Sites as a versatile platform for facilitating blended learning, enhancing digital literacy, and promoting learner-centered pedagogy.

These findings suggest that instructors should incorporate web-based learning environments into language training to improve student engagement and learning outcomes. Policymakers and school administrators ought to endorse the implementation of technology-enhanced learning by facilitating infrastructure, offering professional development opportunities, and ensuring institutional backing for digital innovation. Subsequent study ought to encompass bigger and more heterogeneous populations, investigate long-term educational outcomes, compare various digital learning platforms, and analyze the effects of student and educator attributes on technology uptake and learning efficacy. Such investigations would enhance comprehension of how digital learning environments might facilitate sustainable educational transition in the digital age.

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