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Development of a Local Wisdom-Based Android Web-Learning Model for Digital Literacy Skills and Student Self-Confidence in the Digital Learning Era

Andra Saputra[1,3], Khairunnisa[2]
[1] Institut Seni Indonesia Padangpanjang
[2] Institut Seni Indonesia Padangpanjang
[3] andrasaputra552@gmail.com

ABSTRACT

This research aims to develop an Android-based web-learning model integrating Minangkabau local wisdom to improve students' digital literacy skills and self-confidence in the digital learning era. The research employed a Research and Development method with the 4D model (Define, Design, Develop, Disseminate). During the definition phase, a survey was conducted with 100 students at ISI Padangpanjang to identify their levels of digital literacy and self-confidence. The design phase focused on developing learning syntax, designing the application interface, and integrating local cultural values. The product was developed as an Android application, then validated by three experts, tested for practicality by 20 students and two lecturers, and tested for effectiveness using a pretest-posttest design. The results showed that the developed model achieved an average validity score of 90.2%, categorized as very valid. The practicality test yielded an average score of 90.3% from both students and lecturers, categorized as very practical. Effectiveness testing using a paired t-test showed a significant increase in digital literacy ($t = 8.52$; $p = 0.000$) and student self-confidence ($t = 9.01$; $p = 0.000$). These findings demonstrate that integrating technology with local cultural values can create meaningful learning experiences, improve digital skills, and strengthen students' character. This research highlights the importance of digital learning innovations that are not solely technically oriented but also rooted in cultural values, thus supporting the Freedom to Learn policy and strengthening student identity in the digital age.

Keywords: Web-learning; Android; Local Wisdom; Digital Literacy; Self-Confidence.

INTRODUCTION

The development of digital technology in the 21st century has brought significant changes to the world of education, particularly in higher education institutions, which are increasingly adopting web-based learning and Learning Management Systems (LMS) (Astriyani et al., 2021; Junanto & Afriani, 2016; Karpudewan & Meng, 2017; Astiti et al., 2023). This technology provides students with the flexibility to access learning resources anytime and anywhere, without being limited by time and space (Donkin & Kynn, 2021; Muji et al., 2024). This is theoretically expected to support independent, collaborative learning, and one based on information management skills (Akbar & Anggraeni, 2017; Hastini et al., 2020). However, the reality on the ground shows that the use of digital learning technology

still faces serious challenges, particularly in terms of digital literacy and student self-confidence(Akbar & Anggraeni, 2017; Hanum et al., 2020; Pujiatna et al., 2020; Hidayat et al., 2018; Saputra et al., 2024).

Although today's students are classified as digital natives, various studies indicate that they do not necessarily possess adequate digital literacy skills. Digital literacy, which encompasses the ability to search for, understand, evaluate, and critically manage information, remains weak in the aspect of content evaluation. An initial survey of students at the Indonesian Institute of the Arts in Padangpanjang showed that only 70% of students had adequate skills in evaluating digital content, while the areas of information search, device use, and information organization ranged from 74–77%. These limitations indicate that even though access to technology is increasingly open, not all students are able to use it critically and responsibly.

In addition to digital literacy skills, students' self-confidence also remains a challenge. Self-confidence, which encompasses decision-making skills, a positive self-concept, and the courage to express opinions, is a crucial factor in successful learning. Survey results show that only 72% of students are capable of making independent decisions. This low self-confidence is evident in the phenomenon of students tending to be passive in discussions, lacking the courage to express their opinions, and relying more on instant results from artificial intelligence (AI) rather than constructing knowledge independently. This inevitably impacts active engagement and the quality of the learning experience.

On the other hand, existing online learning models tend to be oriented toward passive content delivery, for example through text, video, or simple interactive quizzes. This approach facilitates the distribution of materials, but fails to meet students' needs for contextual, interactive learning that builds self-confidence. Therefore, innovative learning models are needed that focus not only on technological aspects but also consider the psychological and social dimensions of students within their cultural context.

Integrating local cultural values (local wisdom) is one strategic approach to addressing this challenge (Mayasari, 2017; Ahsan et al., 2016; Irjayanti & Lord, 2024) . Various studies have shown that cultural values internalized in the learning process can increase students' emotional attachment to the material being studied, while strengthening motivation and active participation. In the Minangkabau context, values such as deliberation and consensus, mutual cooperation, nature as a teacher, and honesty can be integrated into digital learning designs (Armiati et al., 2020; Asmidar; Andra, 2025). These values are relevant for building digital literacy skills and fostering student self-confidence through a more meaningful and character-building learning process.

The theoretical foundation of this research rests on several educational theories. First, constructivism theory (Piaget, Vygotsky), which emphasizes the importance of active student involvement in constructing knowledge through learning experiences. Second, Bandura's self-efficacy theory, which explains that self-confidence is formed through successful learning experiences, social reinforcement, and modeling. Third, UNESCO's digital literacy framework (Hidayati et al., 2020; UNESCO, 2021), which encompasses the ability to access, evaluate, and use information critically. Fourth, culture-based education theory emphasizes the importance of integrating local values into learning to build student character. These four theories served as the foundation for designing an Android-based web-learning model integrating local wisdom.

Based on the theoretical review and needs analysis, a research gap emerged between current online learning models and the needs of students in the digital era. Existing models are passive, focused on delivering material, and fail to accommodate cultural values that can strengthen students' digital and psychological skills. Therefore, innovation is needed in the form of an Android-based learning model that not only improves digital literacy but also fosters student self-confidence through the integration of Minangkabau cultural values.

This research aims to develop an Android web-learning model based on Minangkabau local wisdom to improve students' digital literacy skills and self-confidence. The developed model will be validated by experts, tested for practicality by students and lecturers, and assessed for its effectiveness in improving learning quality. With this approach, the research is expected to produce a valid, practical, and effective learning model that will contribute to the development of a culture-based higher education system in the digital era.

The significance of this research lies in its contribution to providing innovative solutions to the challenges of digital learning in higher education. First, this research produces a learning model relevant to the needs of students in the digital era. Second, this research contributes to improving students' digital literacy skills, particularly in critically evaluating content. Third, this research strengthens students' self-confidence through learning based on collaboration, reflection, and local wisdom. Fourth, this research supports the Merdeka Belajar policy by presenting contextual, character-based, and culture-based digital learning. Therefore, this research is expected to serve as a reference in developing digital learning models oriented towards strengthening both academic competence and student character.

METHOD

This research used a Research and Development (R&D) approach with the 4D model (Define, Design, Develop, Disseminate). This model was chosen because it allows for systematic development of learning products, from needs analysis, design, development, to feasibility testing and dissemination (I MadeTegeh; I Nyoman Jampel; Ketut, 2014; Putra, 2012).

In the Define stage, researchers conducted an initial survey of 100 students at the Institut Seni Indonesia Padangpanjang (ISI Padangpanjang) to determine their levels of digital literacy and self-confidence. The survey used a Likert-scale questionnaire with four indicators of digital literacy (information search, device use, information organization, and content evaluation) and four indicators of self-confidence (self-efficacy, independent decision-making, positive self-concept, and courage to express opinions). The Design stage focused on developing the syntax of an Android-based learning model integrated with Minangkabau cultural values such as alam takambang jadi guru (teacher), musyawarah mufakat (mutual cooperation), mutual cooperation (gotong royong), self-introspection (malu nan baiyo), and honesty. This stage also involved designing the web-learning application interface, emphasizing simplicity, intuitiveness, and interactivity, featuring Minangkabau motifs. The research instruments used included an expert validation sheet, a student and lecturer practicality questionnaire, and an effectiveness instrument to measure improvements in digital literacy and self-confidence. Next, the Development stage involved developing an Android-based web-learning application prototype. The resulting product was validated by three expert validators: an educational technology expert, a learning design expert, and a

Minangkabau culture expert. A practicality test was then conducted on 20 student users and two lecturers teaching related courses. The final stage, Disseminate, aimed to publish scientific articles in Sinta-indexed national journals and register Intellectual Property Rights (IPR) as a form of protection for the research results.

Research Sample and Data

The research sample consisted of 100 students in the initial survey, three expert validators in the validation test, 20 students in the user practicality test, and two lecturers in the educator practicality test. The research data was divided into primary data derived from questionnaires, expert validation, and practicality questionnaires, and secondary data obtained through literature studies and documentation.

Data Collection Techniques

Data collection was conducted using several techniques: (1) a questionnaire survey to measure students' digital literacy and self-confidence; (2) observations of student interactions using the application; (3) interviews with lecturers and students to obtain qualitative input; (4) expert validation using a structured assessment instrument; and (5) a practicality questionnaire to measure ease of use and student engagement in learning.

Data Analysis Techniques

Data analysis was conducted using descriptive quantitative and qualitative methods. Quantitative data from the questionnaire, validation, and practicality results were calculated using the formula:

$$P = \frac{\sum x}{N \; x \; Smax} x \; 100\%$$

Description: P = Percentage of final score, ∑X = Total score obtained, N = Number of respondents, Smax = Maximum score

Table 1. Model Feasibility Criteria

Percentage Range	Category
85% – 100%	Very Valid / Very Practical
70% – 84%	Valid / Practical
55% – 69%	Fairly Valid / Fairly Practical
< 55%	Not Valid / Not Practical

Qualitative data from interviews, observations, and validator input were analyzed thematically to improve the model design. The product was declared valid if the average expert validation score was ≥ 80%, practical if the average practicality test score was ≥ 80%, and effective if there was a significant increase in students' digital literacy and self-confidence after the model was implemented (Sugiyono, 2014; Riduwan, 2011).

DISCUSSION

Define Stage

Initial survey results indicate that students' digital literacy is quite good in information search (77%) and device use (75%), but low in content evaluation (70%).

Students' self-confidence is relatively limited, especially in decision-making (72%). Through observations of the learning process, several phenomena were discovered:

1. Most students remain passive in discussions and only briefly access the material through AI.
2. Students are more motivated when learning is linked to everyday experiences or familiar cultural values.

Based on quantitative and qualitative data, it can be concluded that students need a digital learning model that improves digital literacy, strengthens self-confidence, and is based on local cultural values.

Define Stage

The research results from the Design stage are:

1) Syntax Results of the Local Wisdom-Based Android Web-Learning Model

Table 2.
Syntax of the Local Wisdom-Based Android Web-Learning Model

Stage	Learning Activities	Local Wisdom Integration
Orientation	Students log in, access introductory materials, and are given an introduction to local culture.	Natural philosophy evolved into a teacher
Exploration	Students search for and access various digital resources through the e-library.	The value of the king of customs and consensus (consultation)
Collaboration	Students engage in discussions through online forums and work on group projects.	Cooperation
Reflection	Students engage in self-reflection using digital journals.	Comfortable shame (introspection)
Evaluation	Students take interactive quizzes and self-assessments.	Value honesty (honest)

2) Application Interface Design Results
The application is designed for Android-based learning to be easily accessible to students. The interface design emphasizes:
a) Simple & intuitive → clear navigation, familiar icons.
b) Based on local culture → use of Minangkabau motifs in the application header.
c) Interactive → discussion forum, group chat feature, gamification-based quizzes.
d) Main application features:
   1. Digital E-Library → contains text-based, video-based, and animation-based learning materials.
   2. Interactive Discussion Forum → students discuss and collaborate online.
   3. Project-Based Collaboration → students create projects based on local culture.
   4. Self-Reflection Journal → a feature for documenting learning experiences.
   5. Gamification → a points and badge system to increase motivation.

3) Integrating Local Wisdom into Content
Minangkabau local wisdom values are integrated into teaching materials through examples, case studies, and cultural illustrations, such as:
a) Using Minangkabau folklore to practice digital literacy analysis.

b) Online deliberation simulations to practice expressing opinions.
c) Case studies based on the Minangkabau creative economy (songket, carvings, culinary arts) to practice digital collaboration skills.

Develop Stage

1) Results of developing an Android-based web learning

Figure 1. Initial Development of Web-Learning on a PC

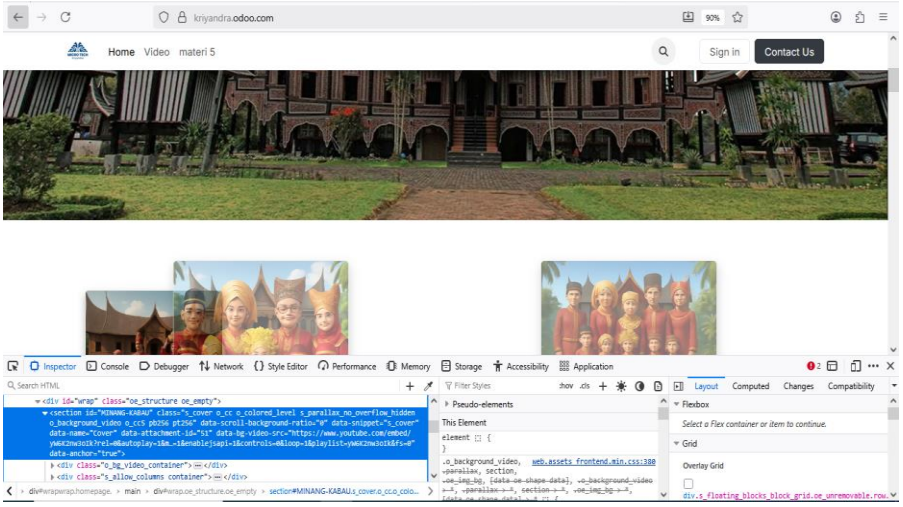
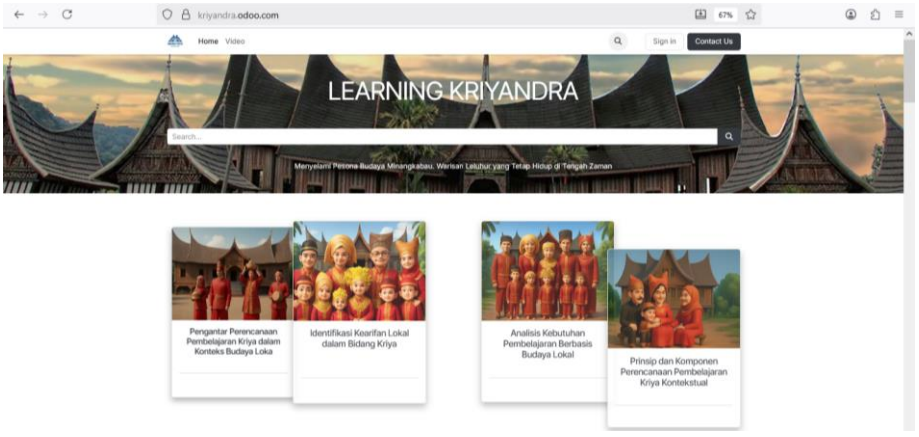


Figure 2. Initial view of web learning



2) Validity Test Results

Table 3. Validation Test Results

Assessed Aspects	Validator	Persentase	Category
Suitability for Purpose	3	88,3%	Very Valid
Suitability for Syntax	3	90,2%	Very Valid
Integration of Local Wisdom	3	89,6%	Very Valid
Interface Design	3	91,6%	Very Valid

Content Clarity	3	91,2%	Very Valid
Potential Usefulness	3	90,5%	Very Valid
Product Validity		90,2%	Very Valid

The product validity test was conducted by three validators: an educational technology expert, a learning design expert, and a Minangkabau culture expert. The validation results showed that the local wisdom-based Android web-learning model achieved an average score of 90.2%, categorized as highly valid.

In detail, the aspects assessed included suitability for objectives, appropriateness of syntax, integration of local cultural values, interface design, content clarity, and potential usefulness. For the suitability for objectives aspect, the model achieved a score of 88.3%, categorized as highly valid, indicating that the model's design aligns with the development objectives and student needs. The appropriateness of syntax aspect achieved a score of 90.2%, indicating that the learning process was designed logically and systematically.

Furthermore, the integration of local wisdom aspect achieved a score of 89.6%, indicating that the Minangkabau cultural values incorporated into the model were deemed relevant and contextual. The interface design aspect achieved the highest score of 91.6%, indicating that the application has clear navigation, an attractive appearance, and aligns with local culture-based design principles. The content clarity aspect also received a high score of 91.2%, indicating that the digital material presented was considered easy to understand and relevant to digital literacy and self-confidence.

Finally, the potential usefulness aspect received a score of 90.5%, indicating that the model is believed to have significant potential to improve digital literacy and student confidence in technology-based learning. With an overall average of 90.2%, it can be concluded that the developed learning model is highly valid and worthy of further practical testing.

3) Practical Test Results

Student Practical Test Results

Table 4. Student Practical Test Results

Aspects Assessed	Responden	Persentase	Category
Ease of use	20	89,7%	Very Practical
Content understandability	20	89,6%	Very Practical
Feature relevance	20	88,9%	Very Practical
Learning engagement	20	92,2%	Very Practical
Media appeal	20	91,3%	Very Practical
Time efficiency	20	90,1%	Very Practical
Practicality of Products by Students		90,3%	Very Practical

Practical Results of User Lecturers

Tabel 5. Lecturer Practical Test Results

Aspects Assessed	Responden	Persentase	Category
Ease of use	2	87,6%	Very Practical
Content understandability	2	88,9%	Very Practical
Feature relevance	2	86,9%	Very Practical
Learning engagement	2	91,2%	Very Practical
Media appeal	2	91,5%	Very Practical

Time efficiency	2	92,1%	Very Practical
Product Practicality by Lecturer		90,3%	Very Practical

A practicality test was conducted to determine the extent to which the local wisdom-based Android web-learning product could be easily used by students and lecturers in their learning activities. The practicality test results showed that both students and lecturers responded very positively, with the model categorized as very practical overall.

The student practicality test, involving 20 respondents, yielded an average score of 90.3%, categorized as very practical. Specifically, the ease of use aspect scored 89.7%, indicating that the application was easily accessible and not confusing. The content understandability aspect scored 89.6%, indicating that the material in the application was clear and easy to understand. The feature relevance aspect scored 88.9%, indicating that the available features met learning needs.

Furthermore, the learning engagement aspect scored the highest at 92.2%, indicating that the model was able to encourage students to be more active in discussions, collaboration, and reflection. The media appeal aspect scored 91.3%, indicating that the application's interface design and display were engaging and motivated students to learn. Meanwhile, the time efficiency aspect scored 90.1%, indicating the application contributes to a more effective and efficient learning process.

Meanwhile, the practicality test conducted by lecturers involving two respondents showed consistent results with the student practicality test. The average practicality score for lecturers was 90.3%, categorized as very practical. The ease of use aspect scored 87.6%, indicating that the application is relatively easy for educators to use. The content understandability aspect scored 88.9%, while the feature relevance aspect scored 86.9%, indicating that the application's features align with the learning activities being undertaken.

Otherwise, learning engagement scored 91.2%, indicating that the model can increase student participation in digital classes. The media appeal aspect scored 91.5%, indicating the application's attractive and interactive interface for both lecturers and students. Finally, the time efficiency aspect scored the highest at 92.1%, indicating that the application has been proven to shorten learning time and increase learning effectiveness.

Overall, the results of the practicality test from both students and lecturers show that the Android web-learning product based on local wisdom that was developed has a very high level of practicality and is worthy of further implementation on a wider scale.

Desiminate Stage

At the dissemination stage, the effectiveness of the developed product was tested. Model effectiveness was measured using a pretest–posttest using a t-test.

Table 6. Effectiveness Test Results (N=30)

Variable	Pretest (M±SD)	Posttest (M±SD)	t-count	p-value
Digital Literacy	72.4 ± 6.1	82.7 ± 5.8	8.52	0.000 **
Self-Confidence	73.1 ± 5.4	84.2 ± 6.0	9.01	0.000 **

The analysis results showed a significant improvement in students' digital literacy skills after using the model. The average digital literacy score increased from 72.4 (SD = 6.1)

in the pretest to 82.7 (SD = 5.8) in the posttest. The t-test yielded a calculated t-value of 8.52 with a p-value of 0.000 ($p < 0.05$), indicating a significant difference between the pretest and posttest results. Thus, the model proved effective in improving students' digital literacy skills, particularly in content evaluation and information management. Similarly, a significant improvement was observed in the self-confidence variable. The average score increased from 73.1 (SD = 5.4) in the pretest to 84.2 (SD = 6.0) in the posttest. The t-test results showed a calculated t-value of 9.01 with a p-value of 0.000 ($p < 0.05$). This confirms that the learning model developed is able to strengthen students' self-confidence, especially in independent decision-making, positive self-concept, and courage to express opinions.

CONCLUSION

This research successfully developed an Android web-learning model based on Minangkabau local wisdom that proved valid, practical, and effective. The model's validity was reflected in expert assessments, which emphasized its suitability for objectives, syntax, integration of local cultural values, content clarity, and attractive interface design. Practicality testing demonstrated very positive responses from both students and lecturers, particularly regarding aspects of ease of use, content understandability, feature relevance, learning engagement, media appeal, and time efficiency. Furthermore, the model's effectiveness was evident in significant improvements in students' digital literacy skills and self-confidence, as demonstrated by the results of a pretest-posttest t-test. This demonstrates that integrating technology with local wisdom not only enriches the learning experience but also strengthens students' character, independence, and self-confidence in facing the challenges of the digital era.

These findings emphasize that digital learning innovation should not only focus on technical aspects but also be rooted in cultural values relevant to students' lives. Therefore, the developed model has the potential to become an alternative learning strategy in higher education that can develop academic competencies while strengthening identity. For practical implementation, lecturers are advised to adapt this model to various courses according to the learning context, so that cultural values remain alive in the digital ecosystem. From a development perspective, the application can still be refined by adding interactive features such as gamification, learning analytics, or real-time discussion forums to strengthen student engagement. For further research, this model needs to be tested on a larger and more diverse scale, including across study programs and universities, and using a mixed methods approach to gain a more comprehensive understanding of its impact on motivation, creativity, and collaboration.

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