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Developing a FlipHTML5-Based Digital Module Integrating Local Wisdom for Teaching Descriptive Texts in Junior High School

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ABSTRACT

Descriptive-text instruction in junior high schools often relies on generic materials that lack cultural relevance and digital interactivity. This study addresses that gap by developing local-wisdom-based teaching materials for descriptive-text learning, delivered through the FlipHTML5 digital platform. The research aims to produce materials that are valid, practical, and effective in supporting English as a Foreign Language (EFL) learning. Using a Research and Development (R&D) approach with the ADDIE model (analysis, design, development, implementation, evaluation), the study first conducted a needs analysis with 220 students to identify instructional challenges. Product trials were then carried out with 30 students, involving one-to-one testing, small-group trials (10 students), and field trials (20 students). Instruments included expert validation rubrics (content, language, media), practicality questionnaires (teachers and students), and pre-/post-tests of descriptive-text writing. Data were analyzed using descriptive statistics and the N-gain formula to measure learning improvement. Results indicate that the developed materials achieved a very valid category with an average expert score of 94.96%, were rated practical by teachers and students (>80%), and demonstrated high effectiveness with an N-gain score of 0.79, reflecting significant improvement in students' writing skills. This research contributes to the field by providing culturally responsive EFL materials enriched with local wisdom and supported by empirical evidence of validity, practicality, and effectiveness. It also highlights the potential of digital flipbooks as innovative instructional media for junior high school contexts.

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1. INTRODUCTION

Education plays a central role in shaping individuals and society, and recent advances in information and communication technology (ICT) have transformed learning practices by enabling faster knowledge transmission and more interactive, student-centered environments (Adarkwah & Huang, 2023; Liu, 2023; Daryanes et al., 2023). Technology-supported instruction has been shown to strengthen teaching effectiveness, increase student motivation, and diversify learning activities (Fan et

al., 2020; Akram et al., 2022; Asuncion et al., 2023). Yet, despite these advances, English as a Foreign Language (EFL) instruction in Indonesian junior high schools often relies on generic textbooks that lack cultural relevance and digital interactivity.

An important aspect of effective learning is the use of authentic and engaging teaching materials. Digital resources such as e-books and interactive platforms provide contextual learning opportunities and greater accessibility (Hodson et al., 2024; Pratama et al., 2023). Integrating local wisdom into instructional materials further enhances relevance and cultural identity. In this study, *local wisdom* is operationally defined as cultural elements specific to Lahat Regency, including traditional sites, folklore narratives, culinary heritage, and local customs. Embedding these elements into descriptive-text materials situates language learning within students' immediate environment, making it more meaningful and culturally sustaining.

The development of such materials is framed by culturally responsive pedagogy and multimedia learning principles. Culturally responsive pedagogy emphasizes aligning instruction with students' cultural backgrounds, while multimedia learning highlights the benefits of multimodal resources (text, images, audio, video) for comprehension. Together, these frameworks justify the use of FlipHTML5, a digital platform that converts documents into multimedia-rich flipbooks, as a medium for delivering descriptive-text materials enriched with local wisdom.

Descriptive text is pedagogically suitable because it trains students to describe people, places, and phenomena, directly aligning with the Grade VIII curriculum standard (Kurikulum 2013), which requires mastery of descriptive writing. Preliminary observations at SMP Negeri 2 Lahat revealed that English learning relied primarily on printed textbooks lacking cultural context. A needs analysis with 220 students showed that 85% experienced difficulties understanding descriptive texts, while 89% expressed interest in materials integrating local wisdom, and 90.5% responded positively to FlipHTML5. Product trials were then conducted with 30 students (10 in small-group trials and 20 in field trials), ensuring consistency between broad needs analysis and focused testing.

Previous studies have demonstrated the effectiveness of local-wisdom-based teaching materials in Indonesian language contexts (Monica & Vianty, 2019; Azizah et al., 2021; Nugroho et al., 2019; Saputra et al., 2022). However, few have explored their application in EFL learning, and none have combined FlipHTML5 technology with Lahat cultural content. The novelty of this study lies in integrating local wisdom into English descriptive-text materials through a digital flipbook, offering students a culturally relevant and technologically supported learning experience.

Guided by this rationale, the study addresses the following research questions:

- RQ1: How valid are the developed materials according to expert evaluation?
- RQ2: How practical are the materials according to teacher and student responses?
- RQ3: How effective are the materials in improving students' descriptive-text learning outcomes?

2. METHODS

The study adopted a Research and Development (R&D) design using the ADDIE model: analysis, design, development, implementation, and evaluation. This approach was applied to create English descriptive-text materials integrating the local wisdom of Lahat Regency in a digital flipbook, and to test their validity, practicality, and effectiveness.

A needs analysis involved 220 eighth-grade students at SMP Negeri 2 Lahat, selected purposively to identify challenges in descriptive-text learning. Product trials were conducted in three stages: one-to-one testing with three students of different achievement levels, small-group testing with five students, and a field test with thirty students. Implementation took place in regular English classes across four meetings, each lasting two periods of 40 minutes.

The flipbook, developed with FlipHTML5, included objectives, model texts, exercises, and multimedia features such as images, audio, and video. Local wisdom content was drawn from teacher interviews, school documents, and cultural sources, including historical sites, traditions, culinary

heritage, and folklore. Selection emphasized curriculum relevance, authenticity, and connection to students' lives.

Validation was conducted by three experts in content, language, and media, using a five-point Likert rubric. Scores above 80% were categorized as valid. Practicality was measured through teacher and student questionnaires covering clarity, usability, and attractiveness, also on a five-point scale. Effectiveness was assessed through a one-group pretest–posttest design measuring descriptive writing performance.

Data were analyzed with descriptive statistics for validation and practicality, and the N-gain formula for effectiveness.

$$N - gain = \frac{posttest\ score - pretest\ score}{maximum\ score - pretest\ score}$$

Interpretation categories were low (<0.3), medium (0.3–0.7), and high (>0.7). Ethical procedures included school permission, parental consent where required, voluntary participation, and confidentiality of student identities

3. FINDINGS AND DISCUSSION

3.1 Research Results

At the results and discussion stage, the results of research that have been carried out in grade VIII at SMP Negeri 2 Lahat will be presented related to the development of teaching materials with local wisdom-based *fliphtml5* material *Descriptive Text*. The development of teaching materials in this study is designed with an attractive appearance and nuances of local wisdom that are closer to the daily lives of students with the aim of increasing students' interest in learning. The development of this teaching material is carried out using the ADDIE development model, which consists of five stages of development, namely: (1) analysis stage (*Analysis*), (2) the design stage (*Design*), (3) development stage (*Development*), (4) implementation stage (*implementation*), and (5) the evaluation stage (*Evaluation*) (Izzah *et al*., 2023).

3.2 Results of the Analysis Stage (Planning)

3.2.1 Analysis of Student Needs

The analysis of student needs was carried out by involving 30 students to identify their needs in the learning process. This process includes collecting data through a questionnaire to find out the difficulties faced, learning preferences, and materials or skills that need to be improved. The results of the analysis are used to design more effective learning strategies, according to the characteristics and needs of students. Thus, learning can be more relevant, interesting, and support the achievement of educational goals optimally.

Based on the needs analysis, students experience difficulties in learning, which can be seen from their answers who tend to refer to digital teaching materials. This shows that they rely heavily on the materials available online to understand the concepts being taught. This difficulty mainly occurs in *descriptive text* materials, so more interactive and contextual digital teaching materials are needed to help students understand the structure, vocabulary, and proper use of language. Thus, the development of appropriate digital teaching materials can support a more effective learning process and increase students' understanding of *descriptive texts*.

3.2.2 Analysis of Educator Needs

Based on the results of the questionnaire, not only did students experience difficulties in learning, but also educators faced challenges in using printed teaching materials. This obstacle can hinder the effectiveness of the learning process, especially in delivering *descriptive text material* in an interesting and interactive manner. Therefore, educators need digital teaching materials that are

easily accessible and more effective in supporting learning. With the availability of appropriate digital teaching materials, educators can deliver material more flexibly, increase student involvement, and make it easier to understand the concepts being taught.

3.3 Design Stage

At this stage, the researcher makes a design or makes a design that will be developed according to the results of the analysis carried out previously. In this case, the product that will be produced is a teaching material containing local wisdom based *on fliphtml5* on *descriptive text material*.

3.3.1 Compiling the Validation Sheet

Compiling a validation sheet requires an instrument that corresponds to a validation grid that includes aspects of language, materials, and media. This instrument must be designed systematically in order to be able to objectively assess the quality of teaching materials. Language validation aims to ensure that the use of words, grammar, and sentence structures is in accordance with applicable rules and is easy for users to understand. Material validation focuses on the suitability of the content with the learning objectives, the accuracy of the concept, and the relevance to the needs of the students. Meanwhile, media validation evaluates the visual appearance, readability, and ease of access to digital teaching materials. By compiling a structured validation sheet, the assessment process can be carried out systematically so that the teaching materials developed are of higher quality and effective in supporting learning.

3.3.2 Collecting Material Data

Collecting material data, *Descriptive Text* based on the local wisdom of Lahat Regency requires systematic steps so that the material compiled is relevant and authentic. This process can begin by searching through various sources, such as history books, cultural articles, and interviews with local community leaders. The data collected includes aspects of geography, culture, customs, typical culinary, and tourist attractions that are characteristic of Lahat Regency. In addition, the use of appropriate and interesting language must be considered so that the material can be understood well by students. By integrating elements of local wisdom, *Descriptive Text* Not only helps students understand the structure of the text, but also increases their appreciation of the culture of their region.

3.3.3 Creating Flowcharts and Storyboards

From the flowchart that is designed to show the structure and sequence from the beginning to the end of the use of teaching materials loaded with local wisdom-based *fliphtml5* material *Descriptive Text*.

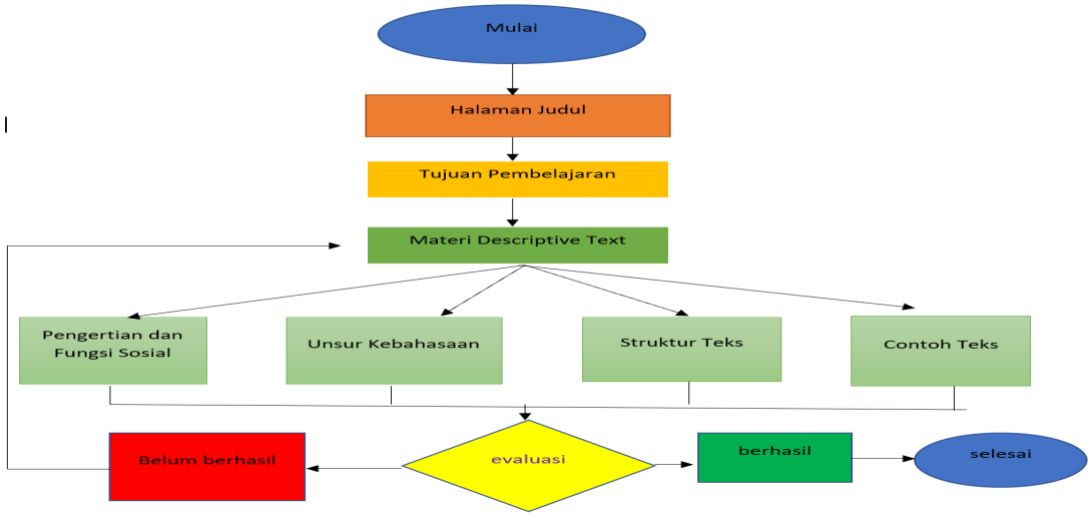

Figure 1. Flowchart Development of Teaching Materials Loaded with Local Wisdom Based on *Fliphtml5* Descriptive Text *Material*

a) Designing *a Storyboard Layout*

According to Vaughan (2011:295), *a storyboard* is a graphic summary that describes a multimedia project in *detail,* using words and rough images about each image appearance, sound, navigation choices, content of text, fonts, feedback, and others. Making *storyboards* in making a product is important, so that the manufacture of a product can be easier and better when done, and as the main reference for product development.

b) Creating a Draft (Prototype)

What is done at this stage is to make a draft of the teaching materials according to the outline of the content that has been determined. The order of this teaching material consists of the front cover, learning objectives, remarks, lighter questions, lighter videos, material pages, text examples, evaluation barcodes, development team and closing. The following is a draft of the teaching material product.

This stage is the production stage in developing products in the form of teaching materials from the form of design to the actual product in accordance with the *storyboard layout that* has been designed. First, by collecting teaching materials and materials, as well as *descriptive text* teaching materials for class VIII, and relevant internet sources.

At this stage, the development of teaching materials from *Storyboard Lay Out* then developed into a true product. At this stage, products in the form of teaching materials will be produced. The first activity carried out at this stage is to collect materials in the manufacture of teaching materials, for example: pictures related to the material, sound recordings, and animations.

Pictures and animations of each *Scene* Developed through the application *fliphtml5.* The voice actor is carried out by one person, namely the researcher himself with the help of a voice recorder through *Mobile*.

3.4 Development Stage

The development stage in the ADDIE model involves the process of making teaching materials in accordance with the design that has been prepared. At this stage, the material *Descriptive Text* based on the local wisdom of Lahat Regency is developed in digital form by considering aspects of language, materials, and media. Content preparation is carried out based on the results of analysis and design, then validated by experts to ensure quality and suitability for learning objectives. In addition, the teaching materials are also designed to be interactive and accessible, so that they can help students understand the material more effectively. Once the development is complete, the teaching materials are ready to be implemented in the learning process (Stuart and Stuart, 2023; Rosmiati, Iswara and Djuanda, 2024).

3.4.1 Performing Validation

The next stage in the development of digital teaching materials is to validate with three validators, namely linguists, materials, and media experts. Language validation aims to ensure that the use of grammar, vocabulary, and sentence structure in teaching materials is in accordance with the correct rules and is easy for students to understand. Material validation is carried out to assess the suitability of the content with the learning objectives, the correctness of the concept, and its relevance to *Descriptive Text* based on the local wisdom of Lahat Regency. Meanwhile, media validation aims to evaluate the design, readability, and ease of access of digital teaching materials, so that they can be used effectively in learning. The results of this validation process are the basis for revising and refining teaching materials before implementation.

3.4.2 Expert Validation Results

Instruments are made to assess the products or learning media that have been developed. The questionnaires that were tested for validity were (a) material expert instruments, (b) linguist instruments, and (c) media design expert instruments.

Overall, the media was declared viable with some minor improvements to the learning design to improve its effectiveness.

Table 1. Recapitulation of Results of the Expert Review Stage

No	Aspects	Score	Category
1	Material	100%	Highly Valid
2	Language	91.6%	Highly Valid
3	Media	93.3%	Valid
		94.96%	Highly Valid

Based on the recapitulation of the results of the Expert Review stage in Table 1, it can be concluded that the digital teaching materials developed have a high level of validity. The material aspect obtained a score of 100% and was categorized as very valid, showing that the content of the material meets the set standards without the need for revision. The language aspect received a score of 91.6%, also in the very valid category, indicating that the use of language is good, although there is still little room for improvement. Meanwhile, the media aspect obtained a score of 93.3% with a valid category, which means that the media is already feasible to use but can still be further improved. Overall, the validation results show that these digital teaching materials are ready for the implementation stage with some minor refinements.

3.5 Implementation Stage

After the validation and improvement process based on suggestions from the validator, the next stage is the implementation of media in learning. At this stage, the enhanced media will be tested in real-world situations to assess its effectiveness in supporting learning. The implementation is carried out by involving users according to the targets that have been set, so that it can be observed to what extent this media increases their understanding and engagement. The implementation stage is carried out with one-to-one, small group, and field tests.

3.5.1 One-to-One Test

It was carried out by involving three students as respondents to assess the digital teaching materials that had been developed. In this stage, each student is given the opportunity to use the teaching materials independently, so that they can explore the features, display, and content presented. During this process, students are also given an instrument sheet that contains various aspects of assessment, such as ease of use, clarity of material, interactivity, and visual appeal. After filling in the instrument, students can give feedback regarding the advantages and disadvantages of the teaching materials that they feel. The results of this will serve as a basis for developers to make further improvements to better fit the needs of users before being tested on a wider scale.

3.5.2 Small Group Test

The next stage of the test is a *small group*, which involves five children in a small group to assess the practicality of the digital teaching materials developed. In this stage, participants will use the teaching materials together in a more structured situation, allowing for interaction and discussion among them. During the trial, it was observed how they accessed, understood, and used the features in the teaching materials. In addition, participants were given assessment instruments to provide feedback related to ease of use, effectiveness of presentation, and convenience in accessing materials. The results of this *small group* stage will provide a clearer picture of practical aspects, as well as identify improvements that are needed before the teaching materials are implemented on a broader scale.

Table 2. Results of Media Practicality Instrument

Student	Interest	Motivation	Material	Display	Language	Total Score
1	4.6	4	5	5	4.5	23.1
2	4.5	4	5	5	4.5	23
3	4.6	4	5	5	5	23.6
4	4.8	4	5	5	5	23.8
5	4.6	4	5	5	5	23.6
Average	4.62	4.0	5.0	5.0	4.8	23.42

Based on Table 2, regarding the results of student responses, the average score obtained was 23.42 out of a maximum score of 25. This shows that the digital teaching materials developed received a very good response from students. The majority of participants gave high scores, indicating that this teaching material was very practical to use.

3.5.3 Field Test

The next stage is a field test, which involves 30 students to test the effectiveness of digital teaching materials in actual learning situations. At this stage, students will be given pretest questions before using the teaching materials to measure their initial understanding of the material (Padhiary *et al.*, 2024). After that, they will study the material using digital teaching materials that have been developed.

After the learning is completed, students will be given post-test questions to assess the improvement of their understanding after using the teaching materials. The comparison of pre-test and post-test results will be the main indicator in assessing the effectiveness of teaching materials in improving students' understanding. In addition, during this process, observation and feedback will be collected to find out the obstacles or advantages in the use of teaching materials. The results of this field test will be the basis for final evaluation before the teaching materials are applied more widely.

a) Pre-test Results

The researcher gives pretest questions to students before they use the digital teaching materials developed. This pretest aims to measure students' initial understanding of the material to be studied (Nurcahyanti and Tirtoni, 2023; Dewi and Setyasto, 2024; Fitri *et al.*, 2024). The questions given are arranged based on the learning indicators that have been set, so that they can provide an overview of the extent to which students have understood the concept before getting learning interventions. The pretest process is carried out individually under controlled conditions to ensure that the results obtained truly reflect the learner's initial abilities. The data from this pretest will later be compared with the results of the post-test to assess the effectiveness of digital teaching materials in improving student understanding.

Table 3. Recapitulation of Students' Pretest Results

Score	Sum	Percentage	Predicate
81-100	0 learners	0	-
61-80	3 students	9.9%	Good
41-60	16 students	38.1%	Enough
21-40	10 students	42.9%	Less
0-20	1 student	3.3%	Very less
Total (N)	**30**	100%	
Mean	**51.33**		
SD	**8.15**		

Based on Table 3 regarding the results of the students' pretest, it can be concluded that most of the students show a lack of sufficient understanding of the material being tested. A total of 42.9% of students scored between 21 and 40, indicating that they were in the underperforming category.

Meanwhile, 38.1% of students obtained a score between 41 and 60, which is included in the sufficient category. Only 3 students (9.95%) obtained a score between 61-80, which was included in the good category, but none of the participants achieved a score of 81-100. There was also 1 student (3.3%) who obtained a score between 0-20, which was included in the very poor category. These results show that students' understanding before the use of digital teaching materials still needs to be improved, which is the basis for researchers to proceed to the learning stage with the teaching materials that have been developed.

b) Post-test Results

At the post-test stage, students were given questions similar to the pretest to measure the extent of their understanding of the material after using digital teaching materials. This post-test aims to evaluate the improvement of students' understanding after they learn with the teaching materials that have been developed (Nurcahyanti and Tirtoni, 2023; Fitri *et al.*, 2024).

Table 4. Recapitulation of Students' Post-test Results

Score	Sum	Percentage	Predicate
81-100	20 students	66.7%	Excellent
61-80	7 students	23,1%	Good
41-60	3 students	9.9%	Enough
21-40	0 learners	0%	Less
0-20	0 learners	0%	Very less
Total (N)	30	100%	
Mean	88.33		
SD	13.39		

The results of the post-test will be compared with the results of the pretest to assess the effectiveness of digital teaching materials in improving students' knowledge and skills. In addition, researchers can also identify certain aspects that need to be improved or strengthened in teaching materials based on the comparison of the pretest and posttest results.

$$N - gain = \frac{88.33 - 51.33}{100 - 51.33}$$
$$= \frac{37}{48.67}$$
$$= 0.79$$

Table 5. Average Post-test, Pre-test, Ngain

Pretest Average	Post-test average	*N-Gain*
51.33	88.33	0.79
	Category	**High**

Based on the results of the average pre-test, post-test, and N-Gain, it can be concluded that the use of digital teaching materials has a significant influence on improving students' understanding. The average pretest of 51.33 shows the level of understanding of students before participating in learning with digital teaching materials. After using these teaching materials, the average post-test of students increased to 88.33, which shows a significant improvement in material comprehension. The average N-Gain of 0.79, which is included in the high category, indicates that digital teaching materials have proven to be effective in improving students' understanding. This high N-Gain value shows that most students have experienced a significant improvement after using the digital teaching materials. Thus, these results confirm that the digital teaching materials developed have succeeded in improving students' understanding.

3.6 Evaluation Stage

The final stage of evaluation involves the presentation of the final product that has been revised and developed based on feedback and previous test results. At this stage, the product is refined to meet the expected quality standards, both in terms of content, media, material, and language. The revision process includes improvements to the deficiencies found. The end result is a product that is ready to use and can provide optimal benefits according to the goals that have been set.

Discussion

This synthesis aims to contextualize findings about the effectiveness of FlipHTML5-based digital teaching materials that incorporate local wisdom in improving students' comprehension of descriptive texts. Results indicating a significant enhancement in learning outcomes (N-gain score of 0.79 and practicality score of 89%) underscore the intersecting benefits of culturally responsive pedagogy and multimodal engagement in educational practices.

The integration of local wisdom into educational materials has gained traction as an effective pedagogical approach. For instance, research by Astuti et al. highlights the needs analysis for developing teaching materials based on local wisdom, indicating that students in Lahat experience challenges in understanding descriptive texts without a culturally relevant context (Astuti et al., 2024). Similarly, the incorporation of local culture into EFL materials in discussions by Kumbara et al. shows promise in enhancing students' comprehension by making learning content more relatable to their lived experiences (Kumbara et al., 2021). These findings are consistent with the notion that culturally responsive pedagogy can significantly impact student motivation and engagement, a theme echoed across multiple studies (Handayani, 2026; (Khairiyah et al., 2021)(Hoyer et al., 2022).

Conversely, research on implementing local wisdom in reading comprehension highlights diverse outcomes depending on the educational context. For example, research efforts focused on embedding local cultural elements into reading materials have not only been effective but have also shown variability in effectiveness across different study populations, as indicated by Khairiyah et al., who employed local wisdom-based texts to boost comprehension in diverse settings (Khairiyah et al., 2021).

Multimodal learning is critical for catering to the diverse learning styles present in contemporary classrooms. The incorporation of interactive elements such as videos, animations, and QR codes into FlipHTML5-based materials aligns with theories of multimodal engagement, which champion the importance of integrating visual, auditory, and textual elements for enriched learning experiences (Kharisma et al., 2022; (Hasanudin et al., 2024). The study by Hasanudin et al. supports this perspective by demonstrating how digital platforms can enhance engagement through varied media, underscoring the effectiveness of multimodal strategies in sustaining student attention and facilitating comprehension (Hasanudin et al., 2024).

Compared with other contexts, research in EFL contexts shows that digital and interactive media are increasingly pivotal in enhancing reading and writing skills. Historical trends suggest a correlation between the use of multimedia and a rise in learner motivation and comprehension in diverse educational settings (Samat & Aziz, 2020). The unique contribution of the Lahat study lies in its specific focus on local wisdom, diverging from the more globalized focus observed in many EFL studies, thereby providing a local context to the broader narrative on effective multimedia engagement (Yawiloeng, 2021; Oktarina et al., 2022).

While the findings from the Lahat study are promising, it is crucial to acknowledge inherent limitations. The study's implementation in a single school with a small sample size (30 students) and reliance on a pretest-posttest design diminishes the generalizability of results. Previous studies, including those conducted by Valızadeh, similarly address concerns regarding the diversity and adequacy of sample sizes in educational research affecting the robustness of conclusions drawn from such studies (Valızadeh, 2022). Furthermore, issues regarding equitable access to devices and internet

connectivity are significant when considering the implementation of digital pedagogies, as pointed out by Hoyer et al. in their analysis of technological engagement in varied contexts (Hoyer et al., 2022).

The practical implications highlighted in this study reveal critical avenues for further development. There is a recognized need for comprehensive teacher training programs aimed at equipping educators with the necessary skills to effectively incorporate culturally responsive digital materials in their pedagogy. This necessity is reflected in research by Armiyanti et al., indicating a trend toward developing thematic e-modules that align with contemporary pedagogical dynamics (Armiyanti et al., 2022).

Moreover, scalability remains an essential consideration; adaptation to varying regional contexts while preserving pedagogical effectiveness is crucial for wider implementation. Encouragement of this model within curriculum frameworks can foster a robust integration of digital teaching materials, transitioning them from experimental resources into foundational components of classroom practice (Astuti et al., 2024; Oktarina et al., 2022). By embedding culturally relevant and multimodal strategies into formal education systems, educators can enhance the educational experience for students, leading to more engaging, effective, and contextually relevant learning outcomes.

This synthesis delineates the promising implications of integrating local wisdom into educational materials, particularly through digital platforms like FlipHTML5. Enhanced comprehension of descriptive texts indicates the potential of culturally responsive pedagogy and multimodal learning. While challenges remain in terms of generalizability and equitable access, the integration of local culture into the EFL context holds considerable potential for enriching language education and fostering students' engagement

4. CONCLUSION

This study validates the effectiveness of a culturally responsive, FlipHTML5-based digital module for teaching descriptive texts in an EFL context. By integrating local wisdom and multimodal features, the module enhanced student engagement and comprehension, confirming its pedagogical value. The key contribution lies in demonstrating that culturally grounded digital materials can be systematically developed, validated, and applied to improve language learning outcomes. Practically, the findings suggest that teachers and schools should invest in training to design and implement similar culturally responsive digital resources. Such initiatives can enrich classroom practice and support curriculum innovation, provided that infrastructure and access are addressed. Future research should expand beyond a single school and one-group design by including control groups, multi-school trials, and longer-term studies to assess retention and qualitative learning experiences. These steps are necessary to strengthen the evidence base and explore broader applicability. Finally, the generalizability of this study is limited due to its small sample, short duration, and contextual constraints. While the results are promising, they should be interpreted cautiously and seen as a foundation for further exploration rather than definitive proof of universal effectiveness.

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