

Development of Flipbook Electronic Teaching Materials for Implementing the Scientific Approach in Indonesian Language Learning for Vocational High School Students

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ABSTRACT

The rapid advancement of information technology has significantly transformed educational practices, particularly in the shift from conventional to digital learning models. In response to this transformation and the implementation of online learning policies by the Ministry of Education and Culture, this study aims to develop electronic teaching materials using a scientific approach for Indonesian language instruction in Class XI of vocational high schools. This research employed a development research design using the 4D model by Thiagarajan, which includes the stages of Define, Design, Develop, and Disseminate. However, the study focused solely on the first three stages due to time and resource constraints. The teaching materials were developed in the form of flipbook-based electronic modules and subjected to expert validation. Three domains were assessed: content (by material experts), language (by linguists), and visual design (by graphic experts). The validation results showed that the electronic flipbook teaching materials achieved an average feasibility score of 83.32%, which falls into the "Very Appropriate" category. Feedback from experts indicated strong alignment with curriculum standards, appropriate language usage for the target audience, and effective visual presentation. In conclusion, the developed flipbook-based electronic teaching materials are highly suitable for use in Class XI Indonesian language instruction, particularly in online learning contexts. Future research should focus on the dissemination stage and include empirical testing of learning outcomes with students to determine effectiveness in real classroom settings.

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1. INTRODUCTION

Education is a fundamental pillar in shaping individuals and societies, as affirmed in Law Number 20 of 2003 concerning the National Education System in Indonesia. The law defines education as a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential in various domains—including spiritual, moral, intellectual, and social competencies—to become productive members of society (Hung, Kinshuk, & Chen, 2018). In line with this vision, the Indonesian government has implemented the 2013 Curriculum, which emphasizes student-centered learning and encourages active student participation in knowledge construction (Kusumayuni & Agung, 2021).

The shift from teacher-centered to student-centered paradigms is a response to the demands of 21st-century education, where digital literacy, critical thinking, and self-directed learning are key competencies. Technology has drastically altered the educational landscape, leading to a transformation in how instruction is delivered and received. This shift has been further accelerated by the government's push for online learning, especially during the COVID-19 pandemic, as reinforced by various regulations and circulars from the Ministry of Education and Culture (Rahmawati & Sujono, 2021). As a result, digital teaching materials have become not only a complementary resource but a necessity in contemporary classrooms.

One of the core competencies emphasized in the 2013 Curriculum is scientific literacy. Scientific literacy is defined as the ability to apply scientific knowledge to identify questions, acquire new knowledge, explain phenomena, and draw evidence-based conclusions (Calado, Scharfenberg, & Bogner, 2015; Hidayat & Dewantara, 2021). Alongside literacy and numeracy, scientific literacy is a key indicator of educational quality. In the classroom context, fostering scientific literacy requires teaching materials that engage students in inquiry, critical thinking, and contextual application of knowledge.

To support this pedagogical goal, teachers must serve not only as facilitators of learning but also as designers of instructional content. According to social constructivist theory, particularly Vygotsky's perspective, learning occurs most effectively when students interact with peers, teachers, and the environment in meaningful ways (Liu & Matthews, 2005). This theory emphasizes the importance of social and cultural contexts in shaping knowledge construction, which has significant implications for the design of teaching materials. Teaching resources should be contextual, interactive, and accessible, particularly in socio-educational settings that increasingly rely on digital tools.

In practice, however, many existing instructional materials—especially printed books and static modules—fall short in addressing the needs of today's learners. Printed materials often lack visual appeal, are less interactive, and are not easily portable, making them less engaging for digital-native students. Conversely, the increasing ubiquity of smartphones and laptops among students presents a valuable opportunity for integrating mobile-accessible and interactive digital teaching materials into the learning process (Aswirna & Ritonga, 2020; Rokhayati, Prasasti, Maruti, & Irawan, 2022b).

In response to these challenges and opportunities, the Indonesian government has undertaken curriculum reform, notably from the 2004 curriculum to the revised 2013 Curriculum in 2017. This reform includes all education levels, including Vocational High Schools (SMK), where students are prepared for the workforce through competency-based learning. In this context, Indonesian language learning remains a crucial component of the curriculum. Effective teaching materials—especially those designed with a scientific approach—are essential to enhance students' communication, critical thinking, and cultural understanding.

The use of digital tools such as flipbook software has emerged as a promising innovation in this regard. Flipbook applications offer the advantage of creating visually appealing, interactive, and portable learning materials. They can embed multimedia elements such as audio, video, animations, and hyperlinks, which are conducive to active learning and content retention (Wicaksono, Supriyono, & Akhyar, 2021a). Moreover, e-books and digital teaching materials developed with flipbook software can be aligned with the standards set by the National Education Standards Agency (BSNP), particularly in terms of content validity, language accuracy, and graphic design (Ningsih & Agung, 2024a; 2024b).

Electronic teaching materials also provide practical benefits: they are cost-effective, environmentally friendly, and can be distributed without physical constraints (Siswanto, Maretha, & Alghiffari, 2024). These attributes make them suitable for use in online and hybrid learning environments, supporting both synchronous and asynchronous learning modes.

Previous research has demonstrated the effectiveness of flipbook-based e-books in enhancing student engagement and comprehension. For example, Rokhayati et al. (2022b) reported that flipbook-based e-books used in Indonesian language instruction achieved expert validation scores above 86%, indicating their suitability for educational use. Additionally, student feedback revealed high levels of satisfaction and perceived learning gains.

Building upon this foundation, the present research aims to develop flipbook-based electronic teaching materials tailored to the needs of Class XI students at Mulia Hati Insani Vocational School. These materials are designed to support the implementation of scientific approach learning in Indonesian language instruction. Specifically, this study has two objectives: (1) to describe the development process of the flipbook-based electronic teaching materials, and (2) to assess the feasibility and appropriateness of these materials for classroom use based on expert evaluations in the domains of content, language, and visual design.

Given the urgent need for adaptive and engaging teaching materials in vocational education, this study contributes to ongoing efforts to improve instructional quality and learner outcomes through innovative digital resources. The findings are expected to provide useful insights for educators, curriculum developers, and policymakers seeking to optimize the integration of technology in education.

2. METHOD

This study employed a research and development (R&D) design using the 4D model developed by Thiagarajan et al. (1974), which consists of four stages: Define, Design, Develop, and Disseminate. However, due to limitations in resources and time, the research was conducted only until the Development stage. The final stage—Dissemination—was not implemented, as the researcher was constrained by logistical and institutional limitations, similar to what has been described in previous studies (Indaryanti, Harsono, Utama, Murtiyasa, & Soemardjoko, 2025; Iqbal & Rahim, 2023; Utaminingsih, Intania, Aida, Salama, & Sukma, 2024).

The subjects of this development research were three experts representing key areas relevant to the development of the flipbook-based teaching materials. The material expert was a lecturer in the Elementary School Teacher Education program at Setiabudhi University, Rangkasbitung, and an active Indonesian language teacher at SMAN 1 Cimarga. The language expert was a lecturer from the Indonesian Language Education Department, Faculty of Teacher Training and Education (FKIP), Universitas Negeri Makassar (UNM). Lastly, the graphics expert was a lecturer from the Department of Indonesian Language Education, FKIP, Universitas Sultan Ageng Tirtayasa (UNTIRTA).

To collect data, the researchers used two types of instruments: open-ended and closed-ended questionnaires (Alam, 2021; Jentoft & Olsen, 2019; Moser & Korstjens, 2018). The open-ended questionnaire functioned as a suggestion sheet, allowing each expert to provide qualitative feedback and recommendations for improving the teaching materials. In contrast, the closed-ended questionnaire was used to measure the feasibility of the product quantitatively through expert validation.

The expert validations were analyzed using descriptive quantitative methods, utilizing a Likert scale ranging from 1 (Not Feasible) to 5 (Very Feasible). The validation process was structured according to specific criteria for each expert domain. For the material expert, the evaluation focused on aspects such as the relevance and comprehensiveness of the content, material accuracy, contextual alignment, legal compliance, cognitive skill alignment, and effectiveness of material presentation. The language expert assessed dimensions such as language appropriateness relative to student cognitive development, readability, motivational potential, clarity, logical flow of ideas, conformity with standardized Indonesian (KBBI and PUEBI), and the appropriateness of terminology and symbols. Lastly, the graphics expert

examined aspects including the layout and typography of both the cover and content, as well as the effectiveness of illustrations in supporting the learning material.

This multi-aspect validation approach ensured that the developed flipbook-based teaching materials met standards of quality not only in terms of content accuracy and pedagogical alignment, but also language clarity and visual design. Each expert's assessment was crucial in producing a revised product that aligned with national education standards and supported the goals of Indonesian language instruction in vocational high schools.

Table 1. Likert Scale-Based Value Assessment

Qualification	Score
Very Appropriate	5
Appropriate	4
Fair	3
Inappropriate	2
Very Inappropriate	1

Source: Riduwan (2016)

$$\text{Percentage} = \frac{\text{total score of data collection results}}{\text{Maximum score}} \times 100\%$$

Next, the percentage results from the validation data will be explained using percentages according to the following qualifications.

Table 2. Interpretation of Eligibility Scores Based on Percentage

Percentage	Qualification
81%-100%	Very Appropriate
61%- 80%	Appropriate
41%- 60%	Fair
21%-40%	Inappropriate
0-20%	Very Inappropriate

Source: Riduwan (2016)

3. FINDINGS AND DISCUSSION

3.1 Research result

3.1.1 Teaching Material Development Process

The findings of this study are presented in accordance with the stages of the 4D development model—Define, Design, and Develop—to address the previously formulated research problems. The development of electronic flipbook-based teaching materials was carried out systematically to ensure alignment with the needs of learners and the demands of the 2013 Curriculum.

In the Define stage, the researchers conducted five types of analysis to lay the groundwork for the teaching material development. First, a front-end analysis was carried out through preliminary studies to identify the main challenges students face in learning Indonesian, particularly the lack of engaging and comprehensive materials that support higher-order thinking. Second, a learner analysis was conducted by presenting contextual cases to assess students' characteristics, such as their cognitive development and learning preferences. This step helped tailor the materials to students' developmental readiness and critical thinking capacity. Third, a task analysis was performed by integrating HOTS-based (Higher Order Thinking Skills) questions into the content, aimed at determining the types of skills students are expected to master throughout the learning process. The fourth step involved a concept analysis, which helped identify and organize core Indonesian language concepts to be included in the teaching materials, such as general linguistic knowledge, writing techniques, and language

structure. Finally, a formulation of learning objectives was carried out, resulting in a clear set of competency indicators to guide the structuring of materials and evaluation components.

The Design stage focused on determining the appropriate format and structure for the electronic flipbook. The design was adapted to align with the standards established by the National Education Standards Agency (BSNP, 2014), while also accommodating practical needs such as accessibility and student engagement. At this stage, the researchers produced Draft 1 of the teaching materials, consisting of modules organized thematically, incorporating multimedia features, and aligned with core competencies.

In the Development stage, the teaching materials in Draft 1 were submitted for expert review and validation. Feedback was obtained from material, language, and graphic design experts. Based on the input and validation results, necessary revisions were made to improve the quality, clarity, and visual appeal of the product, resulting in Draft 2, the finalized version of the electronic flipbook teaching material. The expert validation process confirmed that the developed teaching materials were appropriate for use in the classroom and aligned well with curriculum goals, content standards, and students' learning needs. These materials are now positioned as a viable learning resource to support the implementation of the scientific approach in Indonesian language instruction at the vocational high school level.

3.1.2 Feasibility of Teaching Materials

The material expert validator in this research is a lecturer in the Elementary School Teacher Education course at Setiabudhi Rangkasbitung University and a class XI Indonesian language teacher at SMAN 1 Cimarga. The average material feasibility score obtained was 88.49% with the qualification "Very Appropriate". The results of material validation are described in the following diagram.

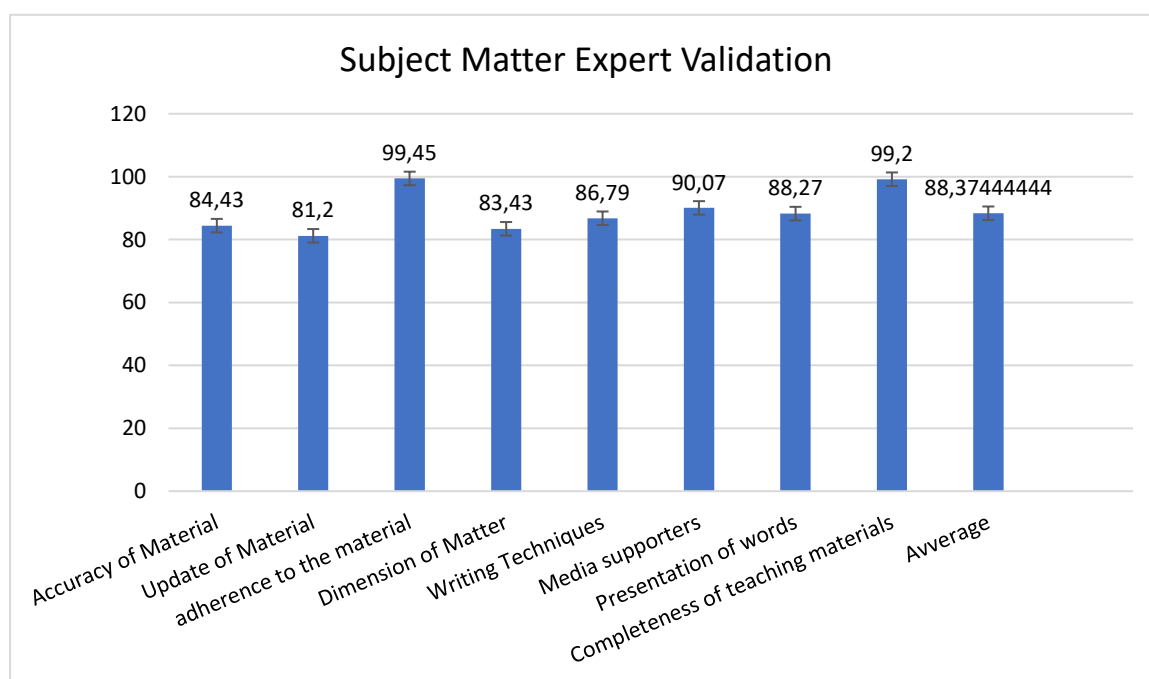


Figure 1. Aspects of Material Expert Validation

Source: Processed by researchers (2024)

The language expert validator in this research is a lecturer at the Indonesian Language Department, FBS UNESA. The average language feasibility score obtained was 81.16% with the qualification "Very Appropriate". The results of the linguist validation can be described through the following diagram.

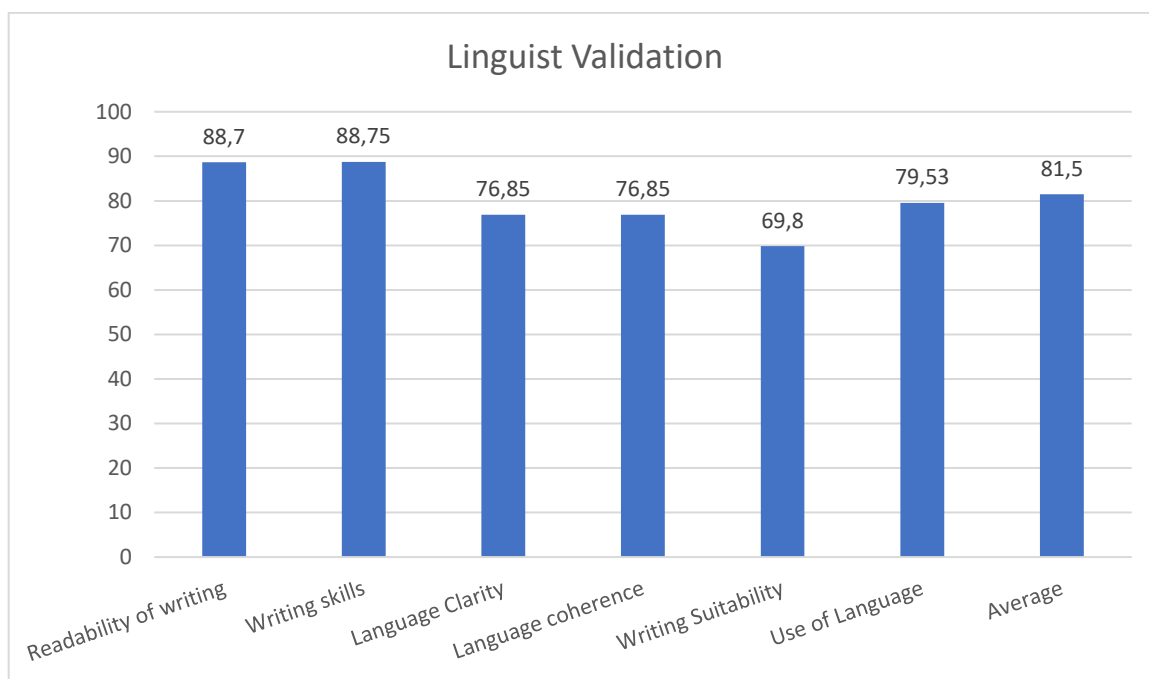


Figure 2. Aspects of Linguist Validation

Source: Processed by researchers (2024)

The graphic expert validator in this research is a lecturer at the Department of Technology and Education, FIP UNESA. The average graphic feasibility score obtained was 82.6% with the "Very Appropriate" qualification. The graphical validation results can be described through the following diagram.

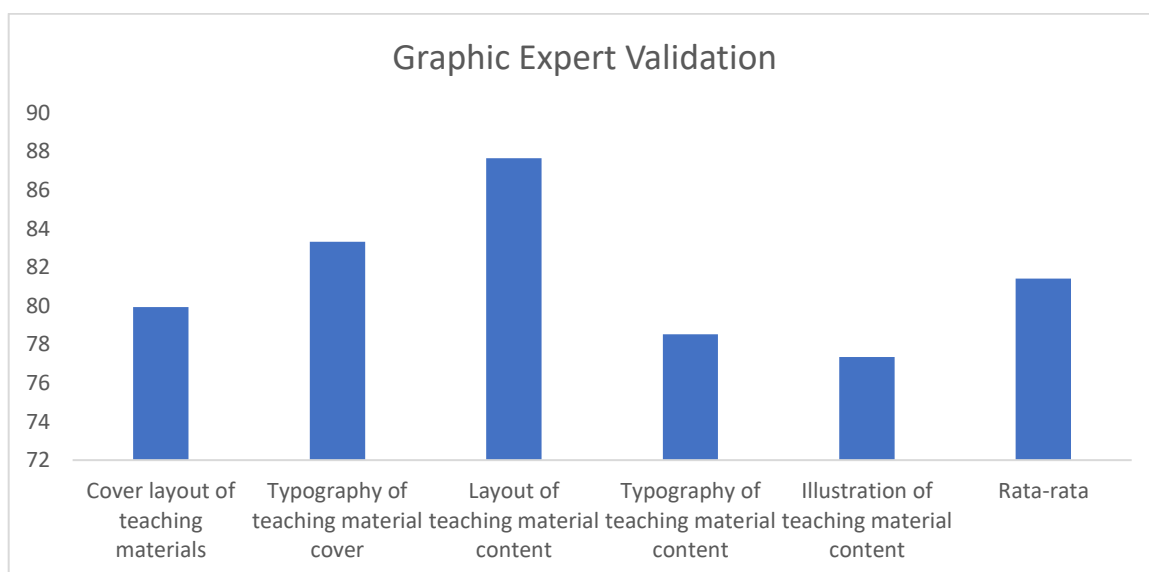


Figure 3. Graphic Expert Validation Aspects

Source: Processed by researchers (2024)

From the results of the validation assessment by each expert, the flipbook electronic teaching materials in the Indonesian language can be seen as the following average scores.

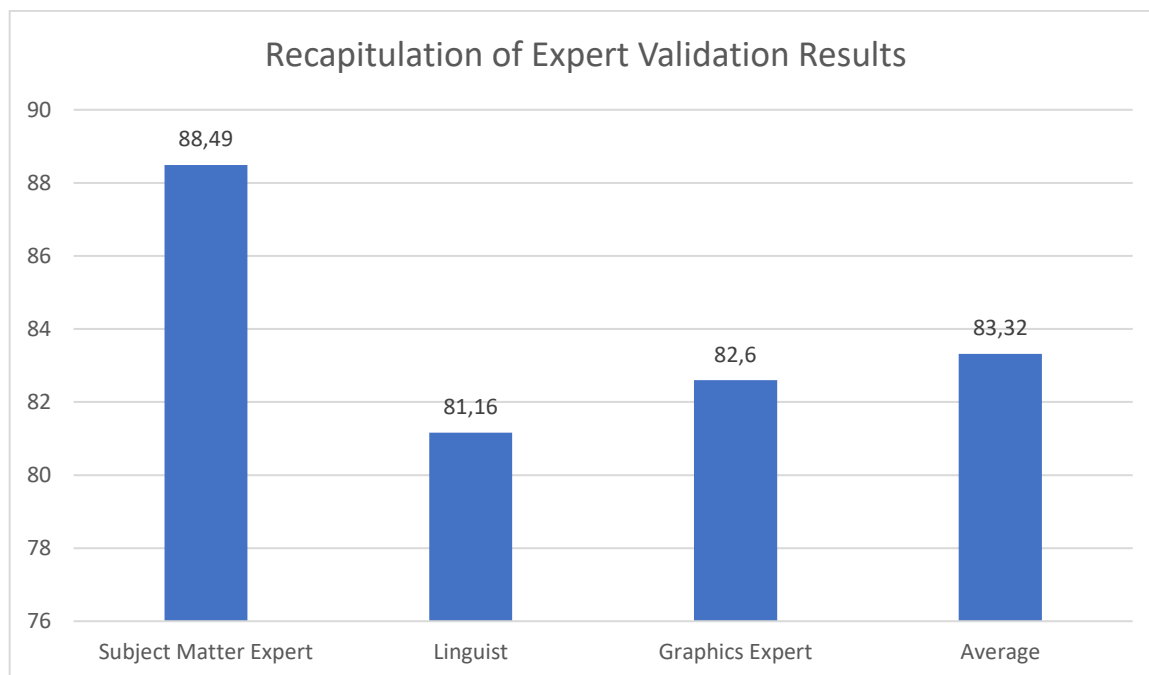


Figure 4. Recapitulation of Expert Validation

Source: Processed by researchers (2024)

3.1.3 Teaching Material Development Process

The development of the flipbook-based electronic teaching materials was conducted systematically through the stages outlined in the 4D development model. The Definition stage consisted of five types of analysis. First, the front-end analysis involved a preliminary study at SMK Mulia Hati Insani to identify problems encountered in the learning process. Although the school had implemented the revised 2013 curriculum using a scientific or problem-based learning model, the available teaching materials were found to be inadequate. Teachers largely relied on worksheets, and students were asked to complete assignments without access to comprehensive learning resources. Moreover, no specific teacher-guided materials were available, indicating a clear gap in instructional support. As a solution, the researchers initiated the development of electronic teaching materials that aligned with the 2013 Curriculum and supported scientific approach-based learning.

The second phase was the analysis of student characteristics, which focused on students aged between 15–16 years. These students demonstrated strong collaboration skills, the ability to reason and communicate, and performed relatively well in academic assessments. Based on these findings, the teaching materials were designed to incorporate both theoretical and practical exercises, including individual and group-based activities, grounded in real-life contexts to stimulate students' critical thinking and problem-solving skills.

Next, a task analysis was conducted to identify the learning activities and question types students were expected to master. The developed materials included exercises such as case-based assignments, language skill practices using various writing strategies, scientific writing tasks, and end-of-chapter competency tests in multiple-choice and essay formats. These tasks were aligned with higher-order thinking skills (HOTS), reinforcing students' analytical and reflective abilities.

The concept analysis focused on the core competencies KD 3.13–3.16, which encompass general Indonesian language concepts, assessment techniques, writing practices, and text development. This analysis produced a concept map to help students grasp the structure and flow of learning content.

Lastly, the formulation of learning objectives translated these competencies into measurable indicators, guiding the construction of content and evaluation tools embedded in the teaching materials.

The Design stage focused on formatting and organizing the teaching materials in line with the National Education Standards Agency (BSNP) 2014 guidelines. The format included essential components such as the cover, introduction, usage instructions, material positioning map, table of contents, image and table lists, concept maps, indicators of competency achievement, material explanations, and formative practice questions. Additional components included independent exercises, summaries, competency tests (both objective and essay), answer keys, glossaries, bibliographies, profiles of Indonesian figures, and a back cover. The first draft of the teaching material was produced using Flipbook software, exported in executable, HTML, and ZIP formats, allowing access across devices such as laptops and smartphones—essential for modern, flexible learning environments.

In the Development stage, the first draft underwent expert review in three domains: material, language, and graphic design. The material expert evaluated the alignment of the content with learning indicators and curriculum standards and confirmed the material was appropriate. However, suggestions were made to revise certain student competency test questions to better reflect HOTS-based assessment. The language expert noted that while the language used was appropriate for the students' developmental stage and encouraged interaction, refinements were needed to improve clarity, coherence, punctuation, and conformity with the rules of KBBI (Kamus Besar Bahasa Indonesia) and PUEBI (Pedoman Umum Ejaan Bahasa Indonesia). The graphic expert assessed the visual components, commending the design for its attractive layout and effective typography but recommended improvements in the back cover layout and internal consistency of formatting.

Based on the feedback from these three experts, the researchers revised the content, language, and visual elements of the flipbook to produce Draft 2. The final version incorporated all suggested improvements and was subjected to validation. The validation process showed that the flipbook-based electronic teaching materials had high feasibility for use in the classroom, meeting BSNP criteria for content, language, and graphics. These results confirm that the developed teaching materials are not only aligned with the curriculum but are also appropriate, accessible, and engaging for Class XI students in vocational education settings.

Table 3. Expert Review Results and Recommendations for the Flipbook-Based Electronic Teaching Materials

No	Aspect	Results and updates
1	Materials Expert	Material Description In the feasibility component, the content is relevant to the revised 2013 curriculum. There is independent training as an implementation of scientific approach learning. However, the students' competency test questions did not match the HOTS questions, so improvements needed to be made.
2	Linguist	Language The content appropriateness component for language needs to be considered in writing effective punctuation/functions, conjunctions/conjunctions, words and sentences so that there needs to be improvements in these aspects by paying attention to the KBBI and PUEBI.
3	Graphic Expert	Graphics Based on the results of the graphic expert's review, it is necessary to pay attention to the typography in the contents of the teaching materials so that there must be improvements, especially on the back cover, apart from that, the neatness of the contents of the teaching materials also needs to be paid attention to.

The feasibility of the developed flipbook-based electronic teaching materials for Indonesian language learning was determined through expert validation, focusing on three key aspects: content appropriateness, language suitability, and visual/graphic design quality. The assessment instruments were adapted from the 2014 BSNP (Badan Standar Nasional Pendidikan) guidelines to ensure alignment with national education standards.

The material validation was conducted by two experts: Dr. Dine Trio Ratnasari, M.Pd., a lecturer in the Faculty of Teacher Training and Education (FKIP) specializing in elementary education, and Mrs. Lina Hendriyani, M.Pd., an experienced Indonesian language teacher at SMAN 1 Cimarga. The average validation score for the material aspect was 88.49%, which falls into the "Very Feasible" category according to the criteria outlined by Perdana, Zakariah, and Alasmari (2023), which consider scores between 81%–100% as highly suitable. This strong result was attributed to the high relevance of the teaching materials to the 2013 curriculum, as well as their comprehensive and standard-aligned content. These findings are consistent with previous studies, such as Carrete-Marín and Domingo-Peñañiel (2022) and Febriati, Jaya, and Nurhikmah (2022), who reported similar validation scores in the development of contextual-based materials. However, unlike these studies—which used QR code integration—this research focused on flipbook technology to support scientific approach-based learning.

The language validation was carried out by Dr. Eka Anggraini, M.Pd., a lecturer at the Faculty of Languages and Literature specializing in Indonesian language education. The average language feasibility score was 81.16%, again placing it within the "Very Feasible" range. This assessment covered aspects such as the use of communicative and interactive language, appropriateness to the students' cognitive level, clarity of sentence structure, and conformity with KBBI (Kamus Besar Bahasa Indonesia) and PUEBI (Pedoman Umum Ejaan Bahasa Indonesia). These findings align with previous research by Kirana (2020), which reported a language feasibility score of 91.42% for scientific approach-based e-books, as well as Perdana et al. (2023), who recorded a similar language suitability score of 90.0%. These comparisons reinforce the validity of the language components developed in this study.

For the graphic design aspect, validation was conducted by Dr. H. Masrupi, M.Pd., a lecturer at the Faculty of Teacher Training and Education. The average score from the graphic expert was 82.6%, again categorized as "Very Feasible". The evaluation focused on layout design, font selection, typography, and the visual clarity of images and illustrations. Recommendations from the expert included slight revisions to the back cover layout and internal formatting. The results are consistent with previous research by Octaviana (2017), which developed science approach-based textbooks with a validation score of 81.66%. A distinction of the present study lies in its use of flipbook applications, which allow for interactive and multimedia-rich content, thus offering enhanced student engagement compared to traditional printed textbooks.

Additionally, similar validation levels were achieved in research conducted by Vonti, Ganeswara, Rahmah, and Rosyid (2024), who developed digital teaching materials for journal entries and achieved a high feasibility score of 90.44%. While their work focused on accounting content, the positive outcomes further support the growing relevance and effectiveness of digital-based instructional tools, including flipbooks.

Based on the overall validation results from material, language, and graphic experts, the developed flipbook-based teaching materials achieved a composite average score of 83.32%, meeting the "Very Feasible" qualification according to BSNP standards. These results indicate that the product is suitable for use in teaching Indonesian language materials for Class XI students at SMK Mulia Hati Insani. The validation process confirms that the instructional content not only aligns with the required curriculum but also demonstrates high quality in presentation and accessibility, making it a valuable resource for enhancing learning outcomes in vocational education settings.

Discussion

The results of this study support the idea that effective instructional materials must have not only strong content but also visually appealing and well-structured designs to maintain student interest and

engagement. As argued by Halidjah and Pranata (2021), an attractive layout can enhance students' motivation to learn. In this research, the developed flipbook was deliberately designed with a clean, accessible format that aligned with the pedagogical needs of vocational high school students. Although prior studies, such as those referenced above, developed flipbooks for English language instruction in elementary school, the underlying design principles remain relevant—simplicity, clarity, and coherence contribute significantly to learning outcomes.

Each section of the flipbook in this study was built around key competencies outlined in the Indonesian curriculum. The content was tailored to address the core elements of scientific approach learning: observing, questioning, experimenting, associating, and communicating. These were reflected in the structure of the materials, which included problem-based tasks, real-life case studies, and higher-order thinking skills (HOTS) questions. This design ensures that students not only receive information but are also encouraged to process, apply, and reflect on it critically—skills essential in vocational and 21st-century education contexts.

The integration of multimedia elements, such as images and hyperlinks, is also consistent with recent findings that emphasize the benefits of multimodal learning environments. Flipbooks, particularly in digital formats, have been found to enhance comprehension and retention due to the combination of visual and auditory stimuli (Dewi, 2022; Alzamil, 2021). Although this particular study did not implement sound or video features extensively, the format chosen (Flipbook in exe, HTML, and ZIP formats) supports future enhancements, including audio for listening practice or video demonstrations, which can be especially valuable in language learning.

Moreover, contextualizing instructional content was emphasized through the use of real-life examples and thematic relevance. This approach is aligned with the theories of integrated skill instruction, as noted by Howard and Major (2004), who suggest that teaching materials should simultaneously support multiple learning domains. In this study, even though the focus was on Indonesian language learning, the integration of reading, writing, and critical thinking skills in a single platform provided students with holistic learning experiences, similar to integrated models used in other disciplines.

A notable feature discussed in related research is the use of songs to promote vocabulary retention and student confidence (Sulistiyani, Prasetyo, Hanum, & Rizki, 2022). While this study did not incorporate musical elements, the idea supports the broader notion that emotionally engaging materials—whether through sound, narrative, or visuals—can positively impact motivation and learning attitudes. This is particularly relevant for online and hybrid learning models where student isolation can diminish engagement. Materials designed with warmth, clarity, and interactivity may help counter this issue by creating a more relaxed and student-friendly atmosphere (Sulistiani & Sukmawati, 2024).

Several prior studies have also validated the use of e-modules and flipbooks as effective tools for improving student outcomes and learning independence. For instance, Dewi (2022) and Karkera & Chamundeshawari (2018) highlight that e-modules enriched with digital features support differentiated instruction and accommodate diverse learning styles. The results of the current study are in line with these findings, as the expert validation process confirmed that the flipbook-based teaching materials were not only feasible but highly appropriate in terms of content quality, linguistic clarity, and graphic presentation.

While earlier studies focused on elementary-level or general subject teaching materials, this research contributes specifically to vocational high school education, where students need practical, job-oriented competencies. The scientific approach embedded in this flipbook development aligns with government efforts to improve critical thinking and problem-solving skills among vocational students through active learning models.

In conclusion, the research confirms that flipbook-based electronic teaching materials can be a valuable instructional innovation, especially when aligned with national curriculum standards and designed with student-centered pedagogy in mind. These materials offer flexibility for online access,

promote independent learning, and support the development of key competencies required in modern education. Future developments may further enhance these materials by integrating audio-visual content and conducting field trials to evaluate direct impacts on student performance.

4. CONCLUSION

This research concludes that the development of flipbook-based electronic teaching materials for Class XI Indonesian language learning at SMK Mulia Hati Insani was successfully carried out using the 4D development model by Thiagarajan (1974), encompassing the stages of define, design, and develop. The final product was validated by material, language, and graphic experts, resulting in an overall qualification of "Very Eligible", indicating that the teaching materials are highly appropriate for classroom use. The flipbook format effectively integrates curriculum content with interactive design, aligning with the scientific approach outlined in the 2013 Curriculum. However, the study was limited to the development stage due to time constraints and the unavailability of students for classroom trials, making it impossible to proceed to the dissemination and implementation phases. Therefore, future research is recommended to continue with the dissemination stage, including field testing to evaluate the effectiveness of the teaching materials in actual classroom settings. Additionally, further development can focus on other topics within Indonesian language instruction and incorporate broader technological features, such as multimedia integration, to enhance learning outcomes.

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