Datokarama English Education Journal
Vol. 7 No. 1 (2026) 81-100
e-ISSN: 2723-4967

Developing an Interactive EFL Digital Vocabulary Book at MAN Palopo Using the 4D Model

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OPEN ACCESS

ARTICLE HISTORY
Received:
(31-03-2026)
Revised:
(29-05-2026)
Accepted:
(02-06-2026)

KEYWORDS
Needs Analysis, Material Development in ELT, Digital Book, Vocabulary and Phrases, 4D Model

ABSTRACT

This study developed a needs-based digital book for English vocabulary and phrases for tenth-grade students at Madrasah Aliyah Negeri Palopo. The study addressed a mismatch between learners' communicative needs and the available English-learning materials. Using a research and development design, the study adapted the 4D model through define, design, develop, and limited dissemination stages. The needs analysis involved 36 students and was supported by classroom observation, interviews, questionnaires, expert validation sheets, and user perception questionnaires. The results showed that students needed practical vocabulary for communication, pronunciation support, visual presentation, translation, and mobile-accessible materials. These findings were translated into a digital book containing thematic vocabulary, common phrase-based expressions, pictures, translations, phonetic guidance, and context-sensitive Islamic and daily-life content. Expert validation indicated that the product was feasible in terms of design, language, and material quality, with scores ranging from 4.00 to 4.42. Student and teacher responses also indicated positive practicality for limited use. The findings should be interpreted as evidence of validity and practicality, not as proof of instructional effectiveness, because no experimental test of learning gains was conducted.

Citation:
Husnaini, H., Wahibah, W., & Irfani, D. Z. (2026). Developing an Interactive EFL Digital Vocabulary Book at MAN Palopo Using the 4D Model. *Datokarama English Education Journal*, *7*(1), 81-100. https://doi.org/10.24239/dee.v7i1.163

INTRODUCTION

Vocabulary remains a central component of English as a foreign language (EFL) learning because it functions both as a cognitive resource and as a communicative tool (Yaşar & Kozoğlu, 2025). As a cognitive resource, vocabulary enables learners to recognize meanings, organize concepts, and process spoken or written input. As a communicative tool,

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vocabulary allows learners to select appropriate words and expressions for interaction, classroom participation, and discourse use (Robiya et al., 2024). Thus, vocabulary learning should not be reduced to memorizing word lists; it should develop lexical competence, including form, meaning, pronunciation, collocation, and contextual use.

The preliminary situation at Madrasah Aliyah Negeri (MAN) Palopo showed that students' spoken and written English remained limited and that classroom participation was uneven. This condition cannot be attributed to learning materials alone. It may also be related to teaching approaches, learners' strategies, motivation, and limited exposure to English outside the classroom. However, the available materials did not sufficiently support students' immediate needs for practical vocabulary, phrase use, pronunciation guidance, and visual scaffolding. Consequently, the gap between learners' needs and available materials may contribute to low engagement, especially when students already use smartphones but not consistently for language learning.

Previous studies have shown that digital learning materials can support language learning when they are pedagogically planned and grounded in learners' needs (Darmayanti et al., 2022; Xodabande & Hashemi, 2023). Ma'arif and Claudia (2021) developed an English digital book for junior high school students, while Syam and Furwana (2022) used the 4D model to develop English learning materials for Islamic education learners. These studies indicate the relevance of digital materials and systematic development models, yet they give less attention to the combined treatment of vocabulary and phrase-based expressions for senior high school students in a madrasah context.

The contribution of the present study is therefore not limited to its local setting. Conceptually, it positions vocabulary and phrases as connected elements of lexical competence: individual words provide meaning resources, while phrase-based expressions such as common chunks, collocations, and routine expressions support more natural discourse. Practically, the study shows how needs-analysis data can be translated into concrete material-design decisions, including the selection of thematic units, visual support, pronunciation symbols, and smartphone-friendly access. This strengthens the role of needs analysis as a design mechanism rather than a descriptive preliminary activity.

Based on this gap, the study aimed to develop a digital book for English vocabulary and phrases for tenth-grade students at MAN Palopo using the 4D model. Specifically, it identified students' needs, designed the digital book, examined its validity through expert judgment, and explored user perceptions of practicality. The study focused on product feasibility and limited practicality; it did not test the effect of the digital book on students' vocabulary achievement through an experimental design.

LITERATURE REVIEW

2.1. Vocabulary Learning in English Language Education

Vocabulary knowledge involves more than the number of words learners know. It includes breadth, or vocabulary size, and depth, or how well learners understand pronunciation, spelling, meaning, grammatical

behavior, collocation, register, and use (Teng, 2025; T. Wang & Zhang, 2025). From this perspective, vocabulary is a cognitive resource that supports comprehension and a communicative resource that enables learners to participate in spoken and written interaction. Learners with limited lexical knowledge often struggle to understand texts, follow classroom instruction, express ideas, and participate in communication (Seroja Br Ginting & Fithriani, 2021).

Vocabulary learning also involves receptive and productive dimensions. Receptive vocabulary refers to the ability to recognize and understand words during reading or listening, whereas productive vocabulary refers to the ability to use words accurately in speaking or writing (Jessica Ruth Melvira Simanungkalit & Katemba, 2023). These dimensions develop at different rates and require repeated exposure, attention to frequency, and meaningful use. High-frequency words need to be encountered often, while productive use requires learners to move from recognition to controlled and contextualized practice. Therefore, vocabulary instruction should provide exposure, pronunciation support, examples of use, and opportunities to connect words with communicative purposes (Siregar & Henni, 2023).

For the present study, these theoretical distinctions justify the design of materials that include vocabulary items, pronunciation guidance, contextual examples, and phrase-based use. The digital book was therefore designed to support both receptive learning, through visual and translation support, and early productive learning, through practical expressions and topic-based organization.

2.2. The Role of Phrases in Language Learning

The term phrases in this study refers to multi-word lexical units that carry functional meaning in communication, including common chunks, collocations, routine expressions, and selected idiomatic expressions (Contreras Kallens & Christiansen, 2022; Pulido, 2024). It does not refer only to grammatical phrase categories such as noun phrases or prepositional phrases. In vocabulary learning, these phrase-based units are important because learners rarely communicate through isolated words alone. They need expressions that can be used directly in classroom talk, daily interaction, and context-sensitive communication.

Phrase learning is closely related to fluency and natural language use. Formulaic or chunk-based expressions help learners produce language more quickly because they reduce the processing load required to build every utterance word by word (Gheitasi & Enever, 2022; J. Wang & Halenko, 2022; Yu, 2022). For basic-level learners, phrases such as greetings, classroom expressions, daily routines, and culturally relevant expressions can bridge lexical knowledge and discourse use. Therefore, integrating vocabulary and phrases in one learning resource is pedagogically useful because it links word meaning with practical expression (Huang et al., 2022).

This definition also clarifies the scope of the product. The digital book does not attempt to teach every type of phrase in English grammar. Instead, it focuses on phrase-based vocabulary support that is relevant to

basic learners, including daily expressions, Islamic-context expressions, selected idioms, and common lexical combinations.

2.3. Students' Needs in Learning Vocabulary and Phrases

Needs analysis is a key stage in material development because it connects learners' actual conditions with instructional decisions. In this study, needs were understood through target needs and learning needs (Hutchinson & Waters, 1987). Target needs refer to what learners need to do with English, including necessities, lacks, and wants. Learning needs refer to the conditions and supports required to help learners learn, such as preferred media, presentation style, learning strategies, and classroom constraints.

This distinction is important because a needs analysis should not function merely as a descriptive survey. Objective needs, such as students' basic proficiency level, limited vocabulary use, and pronunciation difficulties, need to be read together with subjective needs, such as students' preferences for pictures, translation, and digital access. When both dimensions are considered, material development can avoid producing attractive but pedagogically weak resources. A needs-based digital book should therefore translate learners' lacks, goals, preferences, and context into specific design features (Suwandi, 2023; Tomlinson, 2023).

Previous material-development studies often report students' needs as percentages, but the stronger contribution of needs analysis lies in its role as a bridge between data and design. In the present study, each dominant need was connected with a product implication: pronunciation problems led to phonetic guidance, visual preferences led to image-supported vocabulary, and contextual Islamic preferences led to daily Islamic vocabulary and phrases.

2.4. Digital Books as Learning Materials

A digital book is a learning resource presented in electronic form and accessed through devices such as smartphones, tablets, or computers (Abuloum et al., 2019; Vonti et al., 2023). In EFL settings, digital books may improve access, portability, and independent study because students can review materials inside and outside the classroom. For vocabulary and phrase learning, a digital book can integrate words, phrases, images, translations, phonetic guidance, and thematic organization within one resource (Acar, 2022).

Nevertheless, digital materials are not automatically effective. Their value depends on their pedagogical design, usability, and fit with learners' technological access (Lu et al., 2025). Poorly organized digital materials may cause cognitive overload when too many visual elements, colors, or features compete for attention. Smartphones may also become sources of distraction when learning tasks are not clearly structured. In addition, unequal access to devices or unstable internet connection can limit the use of digital learning resources.

For this reason, the present study treats the digital book as a designed instructional resource rather than a technological solution in itself. Its visual and mobile features are justified only when they support meaning,

pronunciation, review, and learner engagement. This balanced view is important because students' familiarity with smartphones does not necessarily mean that they can use digital materials effectively without clear structure and teacher guidance.

2.5. Visual and Practical Design in Digital Learning Materials

The effectiveness of a digital learning resource depends not only on its content but also on the way content is presented. Visual elements such as images, colors, layout, and typography can support vocabulary learning by helping learners connect forms with meanings (Listanto et al., 2025). However, visual design should serve an instructional function. Pictures, translations, and phonetic symbols are useful when they reduce ambiguity, support memory, and guide pronunciation rather than merely decorating the page.

A practical digital book should therefore balance attractiveness and clarity. Excessive colors, dense information, or unrelated images may overload learners and reduce attention to target vocabulary. In this study, design decisions were linked to students' needs and expert feedback so that the product remained visually engaging while still readable, organized, and appropriate for basic-level learners.

2.6. Material Development Through the 4D Model

The development of educational materials requires a systematic model so that the final product is aligned with learner needs, instructional goals, and evaluation results. The present study used the 4D model proposed by Thiagarajan, Semmel, and Semmel (1974), consisting of define, design, develop, and disseminate stages. Compared with broader models such as Borg and Gall, the 4D model is more concise and manageable for a product-oriented study that aims to develop and validate instructional material within a limited school context.

The model was also selected because its sequence corresponds to the logic of needs-based material development. The define stage allows the researcher to identify learners' necessities, lacks, wants, and learning preferences. The design stage translates these findings into learning objectives, units, layout, and features. The develop stage enables expert validation and product revision. The disseminate stage introduces the revised product to the target users for limited use and perception analysis.

However, using the 4D model does not automatically make a product effective. Its strength depends on how carefully each stage is implemented and how explicitly data from one stage informs the next stage. The model is useful for organizing development and validation, but it does not replace the need for experimental research if the aim is to measure learning gains. Therefore, in this study, the 4D model was used to support systematic development, not to claim instructional effectiveness.

For a digital book on vocabulary and phrases, the 4D model is relevant because it links needs analysis, design decisions, expert feedback, and user responses. It enables the researcher to move from empirical data about learners' difficulties and preferences to a concrete product that

includes vocabulary, phrase expressions, visual support, translation, and pronunciation guidance (Hariyanto et al., 2022; Hasanah et al., 2022).

The literature reviewed above indicates that vocabulary development, phrase-based learning, needs analysis, digital materials, and the 4D model are interconnected in ELT material development. Vocabulary learning requires attention not only to word meaning but also to pronunciation, collocation, frequency, exposure, and contextual use. Phrase-based learning extends this view by showing that learners need common chunks, collocations, routine expressions, and selected idiomatic expressions to move from word recognition to more fluent and natural communication. Therefore, digital vocabulary materials should not merely present word lists in electronic form, but should help learners connect lexical knowledge with communicative use.

Previous studies have demonstrated the relevance of digital books and systematic development models in English learning materials. However, many of them focus mainly on digital format, product feasibility, or general vocabulary content. The present study extends this direction by positioning needs analysis as a design bridge that connects learners' target needs, learning needs, objective needs, and subjective needs with concrete product features. In this sense, the study contributes to ELT material development by integrating vocabulary, phrase-based expressions, visual and pronunciation support, Islamic-context content, and mobile-accessible design through the 4D model. The product is therefore evaluated as a needs-based instructional resource in terms of validity and limited practicality, not as evidence of learning effectiveness.

METHOD

This study employed a research and development (R&D) design by adapting the 4D model proposed by Thiagarajan, Semmel, and Semmel (1974). The study was conducted at Madrasah Aliyah Negeri (MAN) Palopo, South Sulawesi, Indonesia. Data collection for the development process took place from July to August 2024, while the product try-out and limited dissemination were conducted after expert-based revision. Research permission was obtained from the school and relevant authorities before data collection.

The participants in the needs-analysis stage were 36 tenth-grade students of MAN Palopo. Qualitative information was obtained through observation and interviews with the English teacher and selected students. Product validation involved three experts representing design and layout, language, and material/content. After the expert review, the revised product was tried out with target users to gather student and teacher perceptions regarding clarity, attractiveness, relevance, and ease of use.

The instruments consisted of observation notes, interview guides, a needs-analysis questionnaire, expert validation sheets, and perception questionnaires. The needs-analysis questionnaire was organized around target needs, learning needs, objective needs, and subjective needs. It covered students' learning goals, current difficulties, vocabulary and phrase preferences, memorization strategies, desired digital-book features, visual

preferences, and contextual vocabulary needs. Before distribution, the questionnaire was checked by an instrument validator in terms of content, scope, and language clarity, producing an average score of 4.7.

The needs-analysis questionnaire was developed based on the constructs of target needs, learning needs, objective needs, and subjective needs. The items were used to identify students' learning goals, current vocabulary and phrase difficulties, memorization strategies, preferred digital-book features, visual preferences, and contextual Islamic vocabulary needs. The validation process examined the relevance of each item to the research objectives, the clarity of wording, and the suitability of the instrument for tenth-grade EFL learners.

The 4D stages were implemented as follows. In the define stage, observation, questionnaires, and interviews were used to identify students' necessities, lacks, wants, learning preferences, and contextual constraints. In the design stage, the findings were converted into a blueprint specifying units, learning objectives, vocabulary categories, phrase-based expressions, pictures, translation, color use, and phonetic symbols. In the develop stage, the prototype was validated by experts and revised according to comments on language appropriateness, Islamic vocabulary, color use, and visual organization. In the disseminate stage, the final product was introduced to students at MAN Palopo for limited use and perception analysis.

Each stage of the 4D model was connected to a specific data function. Observation and interviews were used to contextualize students' learning problems, questionnaire data were used to identify dominant needs and preferences, expert validation was used to examine product feasibility, and user perception data were used to examine limited practicality. Therefore, the model was used not only as a procedural sequence, but also as a framework for linking empirical needs, design decisions, expert-based revision, and limited user evaluation.

Quantitative data from the needs-analysis questionnaire were tabulated, converted into percentages, and interpreted to identify dominant patterns of students' needs and preferences. The percentage results were not treated as learning outcomes, but as indicators for making product-design decisions. Qualitative data from observation and interviews were reduced, grouped into relevant themes, and used to explain the quantitative findings. Expert validation and user perception data were calculated using mean scores and percentages of the maximum possible score. The results were then interpreted by comparing the numerical scores with expert comments and user feedback, so that feasibility and practicality were determined from both quantitative and qualitative evidence.

To avoid overclaiming, the scoring results were interpreted cautiously. Scores of 80% or above were categorized as very good or feasible for limited use, 60%–79% as good with revision, 40%–59% as fair with substantial revision, and below 40% as poor. These categories were adapted from percentage-based feasibility criteria commonly used in educational product validation, in which percentage scores indicate the degree of product feasibility and practicality (Riduwan, 2015). However, the interpretation was not based on numerical scores alone. High scores were

examined together with experts' qualitative suggestions because a product may be considered feasible while still requiring revision in language appropriateness, content coverage, visual organization, or usability. For this reason, the scoring results were used to support claims of feasibility and limited practicality, not instructional effectiveness.

RESULTS

4.1. Needs Analysis

The define stage indicated that students' target needs were strongly communicative. Half of the respondents (50.0%) stated that their main goal was to communicate in good and correct English, while 38.9% wanted to improve their overall English ability. This pattern shows that vocabulary was needed not as isolated knowledge but as a resource for communication. Students also reported technology-related learning habits: 47.2% improved vocabulary through social media and 33.3% through English courses, whereas only 19.4% relied on dictionaries. These findings suggested that the product needed to connect practical language use with students' existing digital habits.

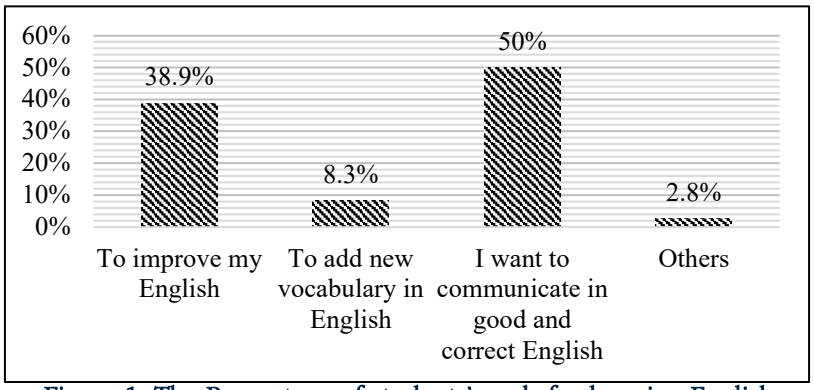

Figure 1. The Percentage of students' goals for learning English

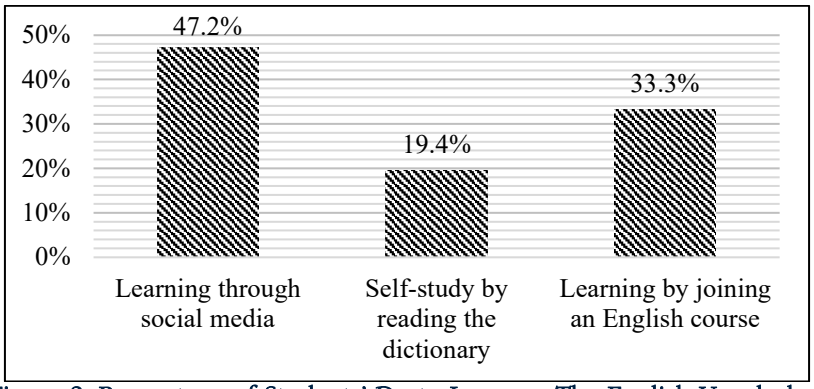

Figure 2. Percentage of Students' Do to Improve The English Vocabulary

The objective needs also showed clear lacks. Most students (77.8%) described their English ability as basic, while 22.2% placed themselves at the intermediate level. Pronunciation was the dominant difficulty (63.9%), followed by meaning and context (13.9%) and spelling (8.3%). In terms of

content, 77.8% preferred vocabulary as the main focus, while phrases and conversation each received 11.1%. This combination of data means that vocabulary should remain the core content, but phrase-based expressions should be included to help students move from word recognition to practical use.

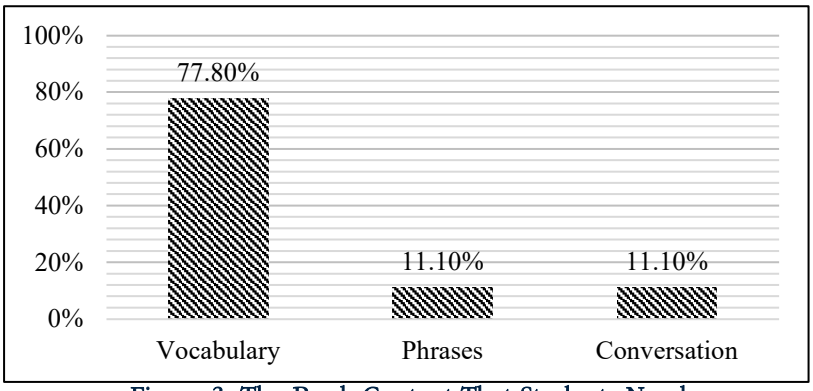

Figure 3. The Book Content That Students Need

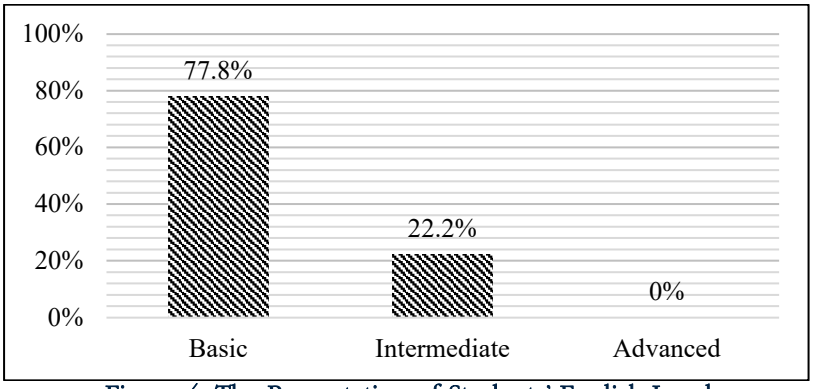

Figure 4. The Presentation of Students' English Level

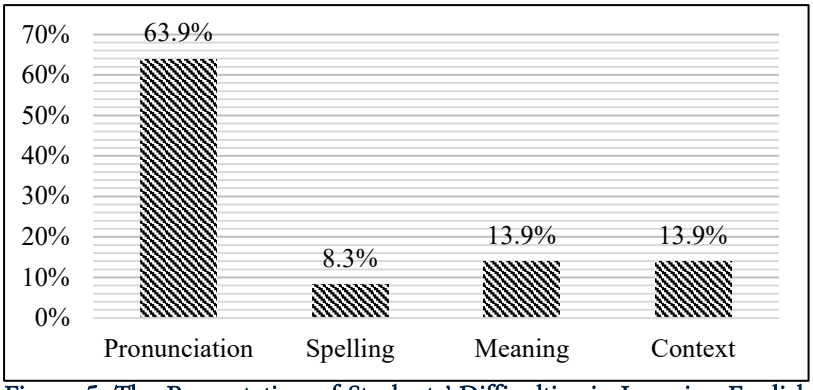

Figure 5. The Presentation of Students' Difficulties in Learning English

Students' learning needs and subjective preferences were also specific. Most respondents preferred visually supported vocabulary with pictures and translation (61.1%) rather than tabular word lists (38.9%). They

also wanted supportive features such as pictures and videos (55.6%), local-language translation (19.4%), cultural explanation (13.9%), and interactive quizzes (11.1%). These results indicate that students valued visual and meaning-supporting features more than decorative or assessment-based features. Therefore, the product design prioritized visual clarity, translation, pronunciation support, and mobile accessibility.

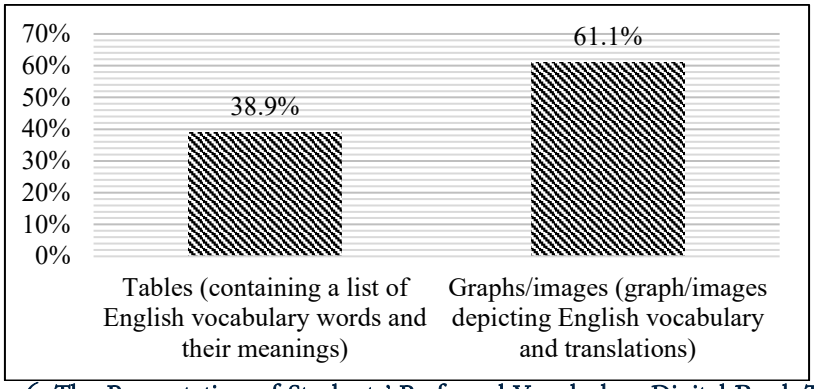

Figure 6. The Presentation of Students' Preferred Vocabulary Digital Book Types

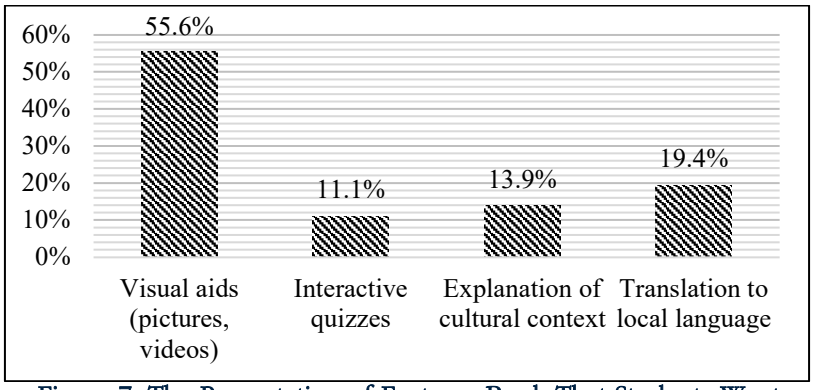

Figure 7. The Presentation of Features Book That Students Want

Contextual relevance was another important finding. English was used mostly for academic purposes (66.7%), while fewer students used it in social media (19.4%) or informal conversation (13.9%). Students also showed a strong preference for daily conversational vocabulary in Islamic contexts (75%), exceeding their preferences for worship activities (11.1%), the pillars of Islam (8.3%), or broader Islamic culture (5.6%). This pattern indicates a need for English materials that are relevant to students' school life, religious environment, and everyday communication rather than materials containing only general or abstract vocabulary.

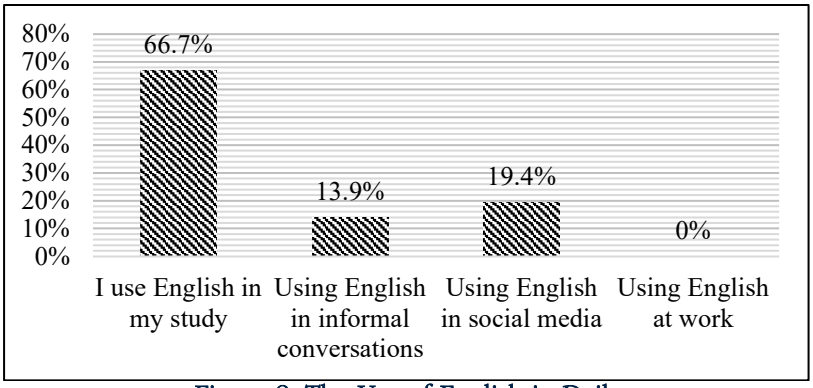

Figure 8. The Use of English in Daily

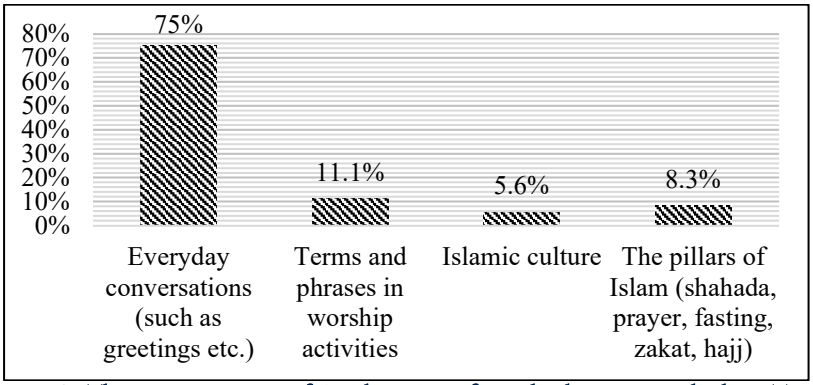

Figure 9. The Presentation of Students' Preferred Islamic Vocabulary Types

Table 1. Summary of the main needs-analysis findings

Dimension	Indicator	Main finding	Design implication
Target needs: necessities	Purpose for learning English	50.0% wanted to communicate in good and correct English; 38.9% wanted to improve overall English ability.	Prioritize functional communication and usable vocabulary rather than isolated word memorization.
Objective needs: lacks	Current level and major difficulty	77.8% identified themselves as basic users; pronunciation was the main difficulty (63.9%).	Provide simple input, pronunciation guidance, phonetic symbols, and contextual examples.
Subjective needs: wants	Most needed book content	77.8% preferred vocabulary as the main content; phrases and conversation each received 11.1%.	Keep vocabulary as the core content while integrating phrases to support practical use.
Learning needs	Visual and design choices	61.1% preferred vocabulary with pictures and translation rather than tables that containing a list of English vocabulary words and their meaning.	Use image-supported vocabulary, translation, and organized pages to reduce comprehension difficulty.

Learning support	Desired features	55.6% wanted pictures and videos; 19.4% wanted local-language translation; 13.9% wanted cultural explanation.	Include multimodal ans meaning-support features, while keeping the design simple to avoid overload.
Contextual relevance	Islamic vocabulary preference	75.0% preferred daily conversational Islamic vocabulary over narrower religious terminology.	Include daily Islamic and school-related vocabulary can use in familiar contexts.

4.2. Design and Development of the Digital Book

Based on the define-stage findings, the product was designed as a digital book entitled "Vocabulary and Phrases for Students." The design did not simply compile word lists; it translated students' target and learning needs into learning features. The product combined vocabulary, common phrase-based expressions, pictures, translations, phonetic symbols, and visually organized pages. The initial blueprint included thematic units on Islamic vocabulary, daily vocabulary, word change, reduplication, idioms, slang, daily phrases, and abbreviations.

The selection of content reflected both communicative and contextual needs. Vocabulary remained the main focus because it was the strongest student preference, but phrases were retained to support natural expression and discourse use. Islamic and daily-life vocabulary were included because students preferred language that could be used in school and religiously familiar contexts. Phonetic symbols were added because pronunciation emerged as the dominant difficulty.

The develop stage resulted in several revisions. The language expert recommended correcting unsuitable slang items and changing parts of the table of contents into clear English. The material expert suggested adding Islamic vocabulary and avoiding red font because it could create negative visual associations. The design and layout expert emphasized consistency in spacing, visual organization, and readability. These revisions show that expert validation functioned not only as approval but also as a mechanism for improving pedagogical and visual quality.

The resulting product was designed for flexible use inside and outside the classroom. Its major components included topic-based vocabulary lists, phrase expressions, visual illustrations, color cues, translations, and phonetic symbols. The book was intended to support independent learning as well as teacher-guided instruction. Because many students preferred digital access, the product was prepared in a format that could be opened through common personal devices.

Table 2. Main features of the developed digital book

Feature	Description	Instructional function
Topical units	The product contained units such as Islamic vocabulary, daily vocabulary, daily phrases, idioms, slang,	To provide context-based vocabulary exposure and phrase-based language use.

	abbreviations, and other lexical enrichment topics.	
Visual support	Pages used pictures, illustrations, and a full-color layout based on student preferences and expert feedback.	To strengthen comprehension, memory, and learner interest without overloading the page.
Meaning support	Vocabulary items were accompanied by translation and contextual organization.	To reduce confusion for basic-level learners and support independent review.
Pronunciation support	Selected entries included phonetic symbols and pronunciation guidance.	To address the dominant pronunciation difficulty reported in the needs analysis.
Phrase-based support	The book included routine expressions, daily phrases, selected idioms, and common lexical combination.	To help students move from word recognition to practical communicative use.
Revision focus	Revisions added Islamic vocabulary, removed unsuitable slang, improved wording, and refined color choices and layout.	To improve learner suitability, clarity, and overall usability.

4.3. Expert Validation and User Perception.

Expert validation indicated that the product was feasible, although the results should be read together with the revision notes. The design expert gave a mean score of 4.42 (88%), the language expert 4.00 (80%), and the material expert 4.30 (86%). These scores suggest that the digital book met the basic criteria of design clarity, language suitability, and content relevance. However, the experts' qualitative feedback showed that several aspects still required refinement, particularly slang appropriateness, English wording in the contents page, Islamic vocabulary coverage, color choice, and layout consistency. Therefore, the high scores were interpreted as feasibility with revision rather than as evidence of learning effectiveness.

User responses supported the limited practicality of the product. Student perception data produced a mean score of 4.60 (90%), showing that students considered the product interesting, relevant, visually attractive, and accessible through smartphones and tablets. Teacher perception reached a mean score of 5.00 (100%), indicating strong perceived usefulness for classroom support. These perception scores should be understood as users' judgments of clarity, attractiveness, and usability, not as measurement of learning gains.

The validation process also involved potential limitations. Since expert judgment and user perception are evaluative rather than experimental measures, the results may be influenced by evaluator expectations, the novelty of the product, and the limited number of participants. For that reason, the study uses the terms feasible, valid, and practical for limited use, and avoids claiming that the product improves vocabulary achievement.

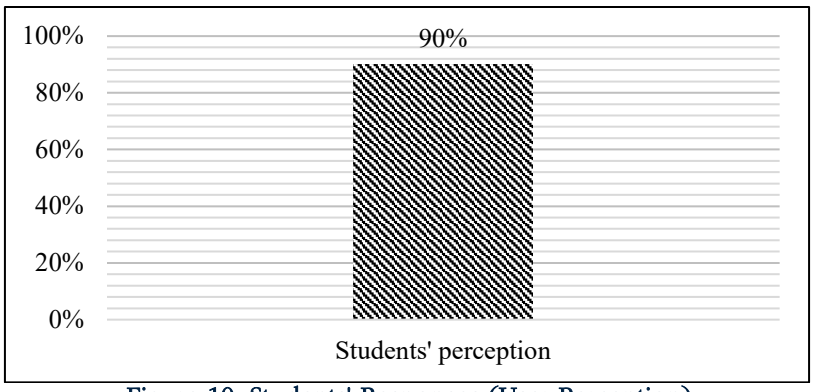

Figure 10. Students' Responses (User Perception)

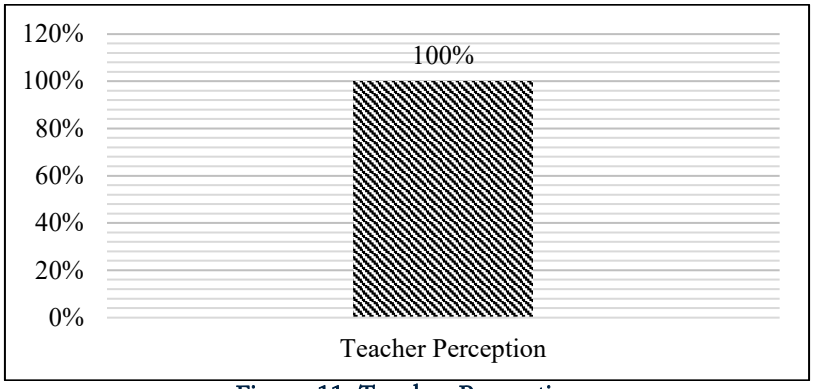

Figure 11. Teacher Perception

Table 3. Validation and perception results

Evaluator	Focus	Mean score	Percentage	Interpretation
Design expert	Design and layout quality	4.42	88%	Very good / feasible
Language expert	Language clarity and suitability	4.00	80%	Good to very good / feasible with revision
Material expert	Content relevance and instructional adequacy	4.30	86%	Very good / feasible with minor revision
Students	Perception of practicality and attractiveness	4.60	90%	Very good / practical for limited use
Teacher	Perception of instructional practicality	5.00	100%	Very good / practical for limited use

Overall, the results show a clear chain from needs analysis to product design and validation. Students' communicative goals, pronunciation difficulties, visual preferences, digital habits, and contextual Islamic vocabulary needs were reflected in the book's features. The numerical scores supported the feasibility of the final product, while the expert

comments provided the basis for revision and helped prevent the validation process from becoming merely procedural.

DISCUSSION

The findings show that students' needs were not limited to knowing more English words. They needed vocabulary as a communicative resource, pronunciation support, visual scaffolding, and phrases that could help them use English in context. This confirms the distinction between vocabulary knowledge and vocabulary use: students may recognize words, but communication requires them to pronounce, combine, and apply lexical items appropriately (T. Wang & Zhang, 2025). The dominance of pronunciation difficulty also indicates that vocabulary materials for basic-level learners should include form-meaning-use connections rather than translation alone.

The inclusion of phrases is pedagogically important because it links vocabulary learning with fluency and discourse use (Gheitasi & Enever, 2022; J. Wang & Halenko, 2022). The product treats phrases as functional multi-word units, including common chunks, collocations, routine expressions, and selected idiomatic expressions. This design choice responds to the reviewers' concern that phrase learning must be conceptually clear. In the MAN Palopo context, phrase-based learning may help learners move from isolated vocabulary recognition toward more natural classroom and daily communication, especially when expressions are connected to familiar Islamic and school contexts.

The study also demonstrates how needs analysis can work as a design bridge (Hutchinson & Waters, 1987; Tomlinson, 2023). The data were not used merely to describe students' preferences; they were translated into product decisions. Students' basic proficiency and pronunciation difficulties led to simple lexical input and phonetic symbols. Their preference for pictures and translation led to visual and bilingual support. Their tendency to use smartphones led to a mobile-accessible format. Their preference for daily Islamic conversational vocabulary led to the inclusion of context-sensitive content. In this way, the product design was empirically linked to target needs, learning needs, objective needs, and subjective needs.

At the same time, the findings need to be interpreted critically. Digital materials may increase accessibility and engagement, but they may also create distraction, usability problems, or cognitive overload when the design is not controlled (Darmayanti et al., 2022; Xodabande & Hashemi, 2023). The expert revisions related to color, layout, and inappropriate slang illustrate this point. A digital book is pedagogically valuable only when its visual and technological features support learning rather than simply making the product look attractive. This is why expert judgment remains important in R&D-based material development.

The validation and perception scores were high, but they do not establish instructional effectiveness. They show that experts and users considered the product feasible, relevant, and practical for limited use. Several factors may have contributed to the high scores, including the product's close alignment with students' stated preferences, the novelty of

a digital book in the local context, and possible positive-response bias from students and teachers during a limited try-out. The variation in expert comments also shows that the product still required revision even when the numerical scores were favorable.

Therefore, the main contribution of this study lies in the systematic development of a contextual digital book rather than in proving learning gains. Compared with previous development studies that focused mainly on digital format, textbook feasibility, or general vocabulary materials (Ma'arif & Claudia, 2021; Syam & Furwana, 2022), this study clarifies how vocabulary and phrase learning can be combined in a needs-based product for a senior madrasah context. Future studies should test the product through experimental or quasi-experimental designs, longer implementation, and broader samples to examine its effects on vocabulary size, phrase use, pronunciation, and speaking confidence.

CONCLUSION

This study produced a digital book for English vocabulary and phrases for tenth-grade students at MAN Palopo through the 4D development model. Empirically, the needs analysis showed that students required practical communication-oriented vocabulary, pronunciation support, pictures, translation, mobile access, and daily Islamic-context vocabulary. These findings indicate a gap between available materials and students' target and learning needs.

In response to these findings, the product was designed with thematic vocabulary, phrase-based expressions, visual support, translation, phonetic symbols, and context-sensitive content. The design process shows that needs analysis can inform concrete decisions in ELT material development, especially when objective data about learners' lacks are combined with subjective data about their preferences and learning habits.

Expert validation and user responses indicated that the digital book was feasible and practical for limited classroom use. Design, language, and material experts gave positive evaluations, while students and the teacher perceived the product as relevant, clear, visually attractive, and easy to access. These results support the appropriateness of the product as a supplementary learning material, not as proof that it improves vocabulary achievement.

The practical implication is that English teachers in similar madrasah contexts may use needs-based digital materials to support vocabulary and phrase learning, particularly when learners require visual scaffolding and pronunciation guidance. The theoretical implication is that vocabulary and phrase learning should be treated as connected components of lexical competence and communicative use.

The study is limited to product development, expert validation, and small-scale user perception. It did not employ pre-test and post-test procedures, control groups, or long-term classroom implementation. Consequently, claims about instructional effectiveness or improvement in students' vocabulary mastery cannot be made from this study.

Future research should examine the digital book through experimental or quasi-experimental designs involving larger samples and

longer periods of use. Further studies may also compare digital and printed versions, examine students' actual interaction with the digital book, and investigate its impact on vocabulary retention, phrase production, pronunciation, and speaking performance.

AUTHOR CONTRIBUTION STATEMENT

H conceived the study, designed the research framework, collected and analyzed the data, and drafted the manuscript. W contributed to data analysis, manuscript development, and revision. DZ collected and analyzed the data, contributed to literature review, data organization, and manuscript revision. All authors reviewed and approved the final version of the manuscript.

AI DISCLOSURE STATEMENT

During the preparation of this manuscript, ChatGPT by OpenAI and QuillBot were used for grammar checking and language refinement purposes only. Mendeley was used as a reference management tool to assist in organizing citations and references. All outputs generated by these tools were critically reviewed, revised, and verified by the authors. The authors take full responsibility for the final content of the manuscript.

COMPETING INTERESTS STATEMENT

The authors declare no competing interests.

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