



Needs Analysis and Initial English Proficiency of Mathematics Education Students: A Preliminary Study for Developing a Maluku Local Wisdom- Integrated Digital Module

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Article Info	Abstract
Received: 2026-06-23 Revised: 2026-06-29 Accepted: 2026-09-21 Keywords: <i>Digital Module;</i> <i>English Proficiency;</i> <i>Maluku Local Wisdom;</i> <i>Mathematics Education;</i> <i>Needs Analysis</i> DOI: 10.24256/ideas.v14i2. 11405 Corresponding Author: Nurfadila Hasani nurfadilahasani23@gmail.com Universitas Muhammadiyah Maluku	<i>This preliminary study investigated the baseline English proficiency and learning needs of Mathematics Education students at Universitas Muhammadiyah Maluku as the empirical foundation for developing a Maluku local wisdom-integrated digital English module. Using a descriptive quantitative design within the Analysis stage of a Research and Development framework, two expert-validated instruments were administered to 15 second-semester students: an English proficiency test and a 60-item Likert-scale needs analysis questionnaire supplemented by open-ended questions; both instruments yielded high content validity (Aiken's $V > 0.90$). Proficiency results revealed that 73.33% of students fell into the low category, with Grammar as the weakest component (31.13%) a finding that contrasts with students' own perception of vocabulary as their primary difficulty, indicating a metacognitive gap with direct implications for module design. The needs analysis yielded an overall mean of 4.08 (High category), reflecting strong motivation toward English for mathematics teaching and scientific communication, along with strong enthusiasm for integrating Maluku ethnomathematics, traditional weaving patterns, the Baileo traditional house, and the Pela Gandong kinship system as content through which mathematical concepts and English language form can be acquired simultaneously. These findings converge on five empirically derived design priorities for the subsequent development phase: contextualized grammar instruction, discipline-specific vocabulary development, differentiated reading tasks, scientific communication training, and Maluku ethnomathematics as a cognitive-linguistic scaffold. These findings provide an empirically grounded foundation for developing a scaffolded, culturally contextualized ESP digital module, and offer, to the best of the authors' knowledge, one of the first instrument-validated needs profiles for Mathematics Education students in eastern Indonesia, a replicable needs-assessment template applicable to other underrepresented regional and disciplinary contexts.</i>

1. Introduction

English proficiency is an essential competency for university students, and particularly so for those in Mathematics Education programs. Beyond providing access to international literature and enabling scientific publication, English functions as the primary medium through which mathematical knowledge is produced, circulated, and updated globally (Kawakibi & Indrawan, 2024; Devaki, 2024). For pre-service mathematics teachers, this linguistic demand is doubly consequential: they must not only comprehend discipline-specific English for their own academic development, but also develop the pedagogical language competence needed to guide their future students through an increasingly English-mediated mathematics curriculum.

Despite its importance, English proficiency remains persistently low among Mathematics Education students in Indonesia, arising from a convergence of structural and contextual factors. Research consistently identifies limited disciplinary teaching resources, methods insufficiently aligned with students' field of study, and the absence of contextual English modules as the principal drivers of this gap (Maharani & Yunita, 2023). These challenges are compounded in geographically dispersed regions such as Maluku, where access to quality English learning resources is comparatively restricted and materials tailored to the specific literacy needs of non-language students remain scarce (Setiadi & Piyakun, 2018; Zainuddin & Delavari, 2024). The result is a student population that is simultaneously expected to operate in English-medium academic environments and substantially underprepared to do so.

A growing body of ESP and educational research proposes the integration of local culture as a principled response to this gap, one that goes beyond motivation enhancement to offer substantive cognitive and disciplinary benefits for Mathematics Education students in particular. Culturally responsive materials have been shown to strengthen learner motivation and cultural identity (Azahary & Fatimah, 2024; Alakrash et al., 2021), but their value for mathematics-teacher education students runs deeper: local cultural contexts such as traditional weaving, architecture, and kinship systems encode mathematical structures, geometric transformations, spatial reasoning, relational logic that can serve as a cognitive bridge between students' prior cultural knowledge and formal mathematical-English concepts (Prahmana & D'Ambrosio, 2020; Batiibwe, 2024). In this sense, ethnomathematics integration does not merely make English learning more engaging; it creates a discipline-specific scaffold in which mathematical meaning and English language form are acquired simultaneously through culturally familiar content.

This pedagogical alignment is particularly consequential for pre-service mathematics teachers, who must learn not only to comprehend mathematical English, but to use it as a medium of instruction, a demand that generic ESP materials, absent a mathematical-cultural grounding, are ill-equipped to address. Consistent with this argument, recent development studies confirm the feasibility of the approach: an English for Mathematics textbook infused with local wisdom was found to enhance both student engagement and the cultural relevance of mathematical-English instruction (Siregar et al., 2025), while a Maluku-based digital English textbook strengthened students' contextual understanding of English curriculum content (Jabar et al., 2024). Ethnomathematics research further confirms that Maluku's own cultural heritage, the geometry of the Baileo traditional house, the proportional logic of weaving patterns, the relational structures of the Pela Gandong kinship system, constitutes a rich and largely untapped source of discipline-relevant learning material (Murtiani & Dewi, 2022; Utami et al., 2021).

Despite these advances, a critical gap remains. No study to date has integrated all three elements essential to the present context: (a) a digital English module specifically designed for the English for Mathematics needs of Mathematics Education students, (b) grounded in

an empirical, instrument-validated proficiency and needs diagnosis of that specific student population, and (c) rooted in Maluku local wisdom as a discipline-specific pedagogical scaffold. The Maluku-based digital textbook by Jabar et al. (2024) was developed for general English curriculum purposes rather than for Mathematics Education students, while the local-wisdom English-for-Math textbook by Siregar et al. (2025) was not grounded in an empirical needs-analysis instrument validated for a mathematics-teacher-education population in eastern Indonesia. A digital English module that is simultaneously discipline-specific, empirically need-based, and anchored in Maluku ethnomathematics has therefore not yet been developed.

The present study addresses this gap through the preliminary phase of a Research and Development project aimed at producing a Maluku local wisdom-integrated digital English module for Mathematics Education students that is valid, practical, and effective. This article reports specifically on the Analysis stage, comprising an empirical diagnosis of students' initial English proficiency and a structured needs analysis, which together serve as the foundation for the module's design. The novelty of this study is twofold.

Theoretically, it advances ESP scholarship by demonstrating how ethnomathematics can function not merely as a cultural backdrop but as a discipline-specific linguistic scaffold, an integration model that has not been empirically operationalized in the ESP-for-mathematics literature, particularly within an eastern Indonesian context. Practically, it produces, to the best of the authors' knowledge, one of the first instrument-validated needs profile for a Maluku Mathematics Education student population, providing a replicable methodological template for needs-responsive ESP module development in other underrepresented regional and disciplinary contexts.

2. Method

The Study Design

This study employed a preliminary study design within the framework of the Research and Development (R&D) model by Borg and Gall (1983). The preliminary study constitutes the first of the ten stages of the R&D model and is intended to gather factual information as the basis for product development. The preliminary study was carried out in April 2026.

This article reports the Analysis stage, the foundational phase in which learners' current competencies and instructional needs are empirically diagnosed prior to any design or development activity. The findings generated at this stage will directly inform the Design and Development stages of the Local Wisdom-Based Digital English Module in Phase 2 of the broader project.

Within the Analysis stage, this study adopted a descriptive quantitative research design to investigate the current state of English proficiency and learning needs of Mathematics Education students, without introducing experimental manipulation (Creswell & Creswell, 2018). Empirical baseline data drawn from both an English proficiency test and a structured needs analysis questionnaire serve as the foundation for all subsequent design and development decisions in Phase 2.

Subject of the Research

The research subjects comprised the entire population of second-semester Mathematics Education students in the 2025 cohort at Universitas Muhammadiyah Maluku, totaling 15 students, all of whom were enrolled in an English course at the time of the study. Given that the total population consisted of only 15 students, a total sampling technique was applied, in which all members of the population were included as research subjects. This approach was considered appropriate given that early-semester students constitute the primary target group for the module being developed, and the limited population size

made full inclusion both feasible and methodologically sound. The students came from various regencies across Maluku, and 80% of them had never taken an English course outside the formal school environment.

Data Collection Techniques and Instruments Development

Two types of instruments were used. The first was an English proficiency pre-test consisting of 40 multiple-choice items covering three aspects: Reading (15 items), Grammar (15 items), and Vocabulary (10 items). The second was a needs analysis questionnaire based on a 1–5 Likert scale, consisting of 60 structured statement items and 5 open-ended questions. The questionnaire covered aspects such as learning goals and motivation, preferred learning methods, obstacles in learning English, the need for English within the context of mathematics, and the relevance of Maluku local wisdom to learning.

Before the instruments were used, they were first validated by two expert validators to ensure their content validity, namely one validator who was an English language expert and one validator who was a mathematics expert. The content validity of the instruments was verified through expert judgment by these two validators. The results of the Aiken's V calculation showed values ranging from 0.833–1.000 with an average V value of 0.964 for the pre-test instrument, and 0.667–1.00 with an average V value of 0.905 for the needs analysis questionnaire. Based on the Aiken's V interpretation criteria, all items across both instruments (100%) obtained V values above the minimum threshold of 0.60, and were therefore declared valid. With average V values above 0.80 for each instrument, both the English language proficiency test instrument and the questionnaire instrument can be categorized as having very high content validity. Thus, both instruments are appropriate for use as data collection tools in this study.

Data Analysis

Pre-test data were analyzed using quantitative descriptive statistics, including the mean, highest score, lowest score, and proficiency categorization. Proficiency was categorized into three levels: High (≥ 28 or $\geq 70\%$), Moderate (20-27 or 50%-69%), and Low (< 20 or $< 50\%$). Questionnaire data were analyzed using Likert-scale means, interpreted as follows: Very High (≥ 4.50), High (4.00-4.49), Moderate (3.50-3.99), and Low (< 3.50). Data from the open-ended questions were analyzed using thematic analysis following the six-phase procedure of Braun and Clarke (2006): (1) familiarization with the data, (2) generation of initial codes, (3) searching for themes, (4) reviewing themes against the coded data, (5) defining and naming themes, and (6) producing the report. All responses were coded in the original language (Indonesian) and subsequently translated for reporting.

3. Result

Overall English Proficiency

The pre-test was administered to determine the initial English proficiency of Mathematics Education students across three aspects. The results of the descriptive statistical analysis are presented in Table 1.

Table 1. Descriptive Statistics of English Proficiency Test Results (N = 15)

Aspect	Max Score	Mean	Percentage	Highest	Lowest
Reading	15	8.80	58.67%	14	1
Grammar	15	4.67	31.13%	9	2
Vocabulary	10	4.20	42.00%	8	2
Overall Total	40	17.67	44.17%	30	10

As shown in Table 1, students' overall mean score was 17.67 out of 40 (44.17%). Grammar had the lowest mean score, 4.67 out of 15 (31.13%), followed by Vocabulary with a mean of 4.20 out of 10 (42.00%), while Reading showed relatively better performance with a mean of 8.80 out of 15 (58.67%). The overall categorization of students' initial proficiency is presented in Table 2.

Table 2. Distribution of English Proficiency Categories (n = 15)

Category	Score Range	Interpretation	Number of Students	Percentage
High	≥28	≥70%	1	6.67%
Moderate	20-27	50%-69%	3	20.00%
Low	<20	<50%	11	73.33%

As shown in Table 2, 11 students (73.33%) fell into the low category, 3 students (20.00%) into the moderate category, and only 1 student (6.67%) into the high category. The highest score achieved was 30 out of 40 (75%), and the lowest score was 10 out of 40 (25%).

Need Analysis Result

The needs analysis was conducted using a questionnaire completed by the same 15 students. The Mean scores for each section are presented in Table 3.

Table 3 Mean Score per Section of the Needs Analysis. (n = 15)

Code	Aspect / Section	Mean	Category
B.1	Goals and Motivation for Learning English	3.99	Moderate
B.2	Preferred Learning Methods and Strategies	4.33	High
B.3	Obstacles in Learning English	3.54	Moderate
C	English for Teaching Mathematics	4.22	High
D	English for Academic Mathematics	3.97	Moderate
E	Mathematical Vocabulary	4.21	High
F	Mathematical Scientific Presentation and Communication	4.44	High
G.1	Relevance of Maluku Ethnomathematics to Learning	4.16	High
G.2	Content on Maluku's Nature and Geography	4.08	High
G.3	Content on Maluku Traditions and Customs	3.95	Moderate
G.4	Format and Activities of the Maluku Culture-Integrated Module	3.97	Moderate
	Overall Mean	4.08	High

As shown in Table 3, the overall mean score of the needs analysis was 4.08 (High category). The item with the highest score was the need for direct feedback from lecturers (M=4.67), followed by enthusiasm for the use of mathematics learning media (M=4.60), and interest in applying mathematics within Maluku culture (M=4.53, with 93% agreement). The main obstacle identified was a lack of confidence in explaining mathematical concepts in English (M=3.93, with 87% agreement), followed by difficulty understanding mathematical vocabulary and terminology (reported by 73% of respondents).

The open-ended questionnaire comprised five questions (H.1-H.5) analyzed using thematic analysis following the six-phase procedure of Braun and Clarke (2006). All responses were coded in the original language (Indonesian) and subsequently translated for reporting. The thematic findings for each question are presented below.

Table 4. H1-Most Needed English Skills

Theme	N	%
Reading for academic purposes (accessing journals, textbooks, references)	13	86.7
Speaking and oral academic communication	3	20.0
Academic writing (papers, seminars)	3	20.0
Mathematical vocabulary and terminology	2	13.3

Reading emerged as the overwhelmingly dominant skill need, cited by 13 of 15 students (86.7%), all of whom framed it in terms of accessing international mathematical literature. As NL. stated: “Most textbooks, journals, formulas, theorems, and recent references are published in English.” Speaking and academic writing were each cited by three respondents (20.0%), primarily in relation to future professional demands as mathematics teachers.

Table 5. H2-Main Difficulties in Using English for Mathematics

Theme	N	%
Discipline-specific mathematical vocabulary and terminology	11	73.3
Grammar and complex scientific sentence construction	3	20.0
Lack of confidence in oral explanation of mathematical concepts	3	20.0
Cognitive overload (dual-language processing burden)	2	13.3

Discipline-specific vocabulary was the most frequently cited difficulty (n=11; 73.3%). Students described mathematical English as resistant to literal translation, requiring contextual comprehension of domain-specific meanings. NL. noted: “Mathematics has standard terms whose meanings are very specific and cannot be translated literally.” Grammar difficulties and low oral confidence were each reported by three respondents (20.0%), while cognitive overload from simultaneous mathematical and linguistic processing was noted by two (13.3%).

Table 6. H3-Most Relevant Maluku Cultural Topics

Cultural topic	Mathematical connection	N	%
Traditional weaving patterns (tikar, bakul)	Geometry, patterns, transformation	9	60.0
Baileo traditional house and architecture	Spatial geometry, plane shapes	8	53.3
Pela Gandong kinship system	Relations, functions, sets	4	26.7
Traditional navigation and boat-making	Measurement, trigonometry, vectors	2	13.3
Traditional songs and other cultural elements	Language & cultural context	1	6.7

Traditional weaving patterns were the most widely selected cultural topic (n=9; 60.0%), followed by the Baileo traditional house (n=8; 53.3%). Respondents did not merely select topics by cultural familiarity; they actively articulated mathematical connections. SSH. observed: “The geometric patterns in Maluku weaving, carvings, and the Baileo, as well as the traditional navigation of fishermen, clearly contain mathematical concepts and are close to everyday life.”

Table 7. H4-Ideal Module Design

Theme	N	%
Plain and accessible yet scientific language	11	73.3
Visual aids and cultural illustrations (photos, images)	10	66.7
Culturally contextualized exercises (Maluku-based examples)	10	66.7
Scaffolded and graded activities (easy to difficult)	7	46.7
Bilingual Indonesian-English glossary of mathematical terms	5	33.3
Bilingual instructions and multimedia integration (video links)	3	20.0

Plain language (73.3%), visual aids (66.7%), and Maluku-contextualized exercises (66.7%) were the three most requested design features. Nearly half of respondents (46.7%) specified scaffolded progression. Notably, SSH. proposed a complete unit structure: “Regular structure: introduction to Maluku cultural context, mathematical concept, simple English; bilingual glossary; varied four-skill exercises; illustrations and video links.”

Table 8. H5-Suggestions for Module Developers

Theme	N	%
More Maluku cultural examples connected to mathematics	8	53.3
Interactive and visually rich content	7	46.7
Graded language difficulty appropriate to students' proficiency	5	33.3
Practical activities, project tasks, answer keys, and self-study guides	2	13.3
Pronunciation guide for English mathematical terms	1	6.7
No specific suggestions	2	13.3

More Maluku cultural examples was the most common suggestion (n=8; 53.3%), followed by interactive content (n=7; 46.7%) and graded language difficulty (n=5; 33.3%). OH. emphasized: “Include photos and authentic Maluku cultural illustrations; add practical exercises; provide a pronunciation guide for English terms; and arrange content progressively from easy to difficult.”

Across the five questions, six overarching cross-question themes emerge: (1) reading as the dominant academic skill need; (2) mathematical vocabulary as the primary difficulty; (3) strong preference for Maluku ethnomathematics integration; (4) demand for plain-language content with visual and cultural support; (5) need for scaffolded and graded exercises; and (6) desire for interactive and self-directed digital features. These six themes directly inform the content, structure, and design principles of the digital module under development.

Recommendations for Digital Module Development

Based on the findings from the pre-test and the needs analysis, a recommended structure for the digital module was developed, comprising five units organized around themes of Maluku local wisdom, as presented in Table 9.

Table 9. Proposed Structure of the Digital Module Units

Unit	Maluku Cultural Theme	Skill Focus	Mathematical Concept
1	Traditional Weaving & Geometric Patterns	Reading + Mathematical Vocabulary	Patterns, geometry, transformation
2	Baileo Traditional House & Architecture	Academic Writing + Grammar	Spatial geometry, plane shapes
3	Traditional Navigation of Maluku Fishermen	Reading + Vocabulary	Measurement, trigonometry, vectors
4	The Pela Gandong System	Speaking + Presentation	Relations, functions, sets
5	Traditional Games (Gasing, Boi)	Listening + Speaking	Statistics, probability, patterns

4. Discussion

Students' Initial English Proficiency

The pre-test results (see Table 1 and Table 2) reveal a concerning overall proficiency level, with nearly three-quarters of students (73.33%) falling below the minimum competency threshold. The pattern of weakness is particularly notable: Grammar emerged as the most severely underdeveloped component, with students scoring markedly lower than on Vocabulary or Reading, suggesting that fundamental difficulties with English

grammatical structures rather than exposure or lexical knowledge alone underlie students' general language challenges.

This finding is consistent with Maharani and Yunita (2023), who identified the low English proficiency of Mathematics Education students as a consequence of limited relevant teaching materials and insufficiently contextual teaching methods. This is further supported by Pratiwi and Sunardi (2024), who found that non-language students face significant difficulties in achieving adequate English skills, particularly in grammatical structure and academic vocabulary. The very high heterogeneity in students' abilities, reflected in the gap between the highest score (75%) and the lowest score (25%), confirms the need for a scaffolding approach within the module so that it can accommodate all levels of proficiency.

This wide proficiency gap of 50 percentage points between the highest (75%) and lowest (25%) scores further underscores the inadequacy of a uniform instructional approach for this cohort. The module must therefore incorporate differentiated tasks. For instance, tiered reading texts with varying levels of linguistic complexity, so that both low and moderate proficiency students can access the content meaningfully. A gradual scaffolding structure, beginning with supported comprehension tasks before progressing to independent production activities, is essential to ensure that no student is left behind while still providing sufficient challenge for those with relatively stronger foundations.

Analysis of English Learning Needs

The needs analysis results (see Table 3) stand in sharp contrast to the proficiency data: despite objectively low proficiency, students demonstrated strong motivation and a clear sense of professional purpose regarding English. The highest sub-section scores were consistently clustered around career-oriented and communication-focused needs, reflecting a student cohort that is aware of what English demands of them as future mathematics teachers, even if their current skill levels have not yet caught up with those aspirations.

This condition is consistent with the findings of Sintadewi et al. (2020), who identified limited vocabulary and insufficient exposure to English as the most dominant factors contributing to learning difficulties. The module being developed therefore needs to place greater emphasis on strengthening Grammar and Mathematical Vocabulary, presenting content within contexts that are familiar to students through the integration of Maluku local wisdom.

A particularly noteworthy finding is the discrepancy between students' perceived difficulties and their objectively measured weaknesses. While 73% of respondents identified vocabulary as their primary obstacle, the proficiency test data reveal that Grammar was in fact the weakest component (31.13%), performing significantly lower than Vocabulary (42.00%).

This gap between perceived needs and objective needs suggests a limited metacognitive awareness of grammatical weaknesses, likely because grammar errors are less immediately apparent in receptive tasks such as reading and listening. This finding carries important pedagogical implications: the module must address both dimensions simultaneously by incorporating an academic word list (AWL) component to respond to students' perceived vocabulary needs, while embedding grammar instruction implicitly through meaning-focused, text-based activities. This embedded grammar approach is preferable to explicit deductive instruction, which has been shown to heighten foreign language anxiety, particularly among students who are already aware of their linguistic limitations.

The very high enthusiasm for integrating Maluku local wisdom, particularly traditional weaving, the Baileo traditional house, and the Pela Gandong system, confirms the relevance of the approach proposed in this study. This finding supports the argument of Azhary and Fatimah (2024) that integrating local culture into English learning can enhance students' motivation and the relevance of the materials, while also strengthening learners' cultural identity. This is further reinforced by Alakrash et al. (2021), who demonstrated that local culture-based teaching materials significantly increase learners' engagement and comprehension.

The thematic analysis of the open-ended questionnaire responses provides qualitative depth to the quantitative findings above and yields six overarching themes with direct implications for module design. The first theme, reading as the dominant academic skill need emerged from 86.7% of respondents, who consistently framed their English need as access to mathematical literature: journals, international textbooks, theorems, and formulas published exclusively in English. This finding aligns with the English for Specific Purposes (ESP) literature, which positions reading as the primary skill need for non-language disciplinary students, a priority confirmed in recent comparative needs analyses of ESP learners in technical and scientific fields (Kočović Pajević & Josijević, 2025), and confirms that the module must foreground academic reading with discipline-specific texts rather than general-English passages.

The second theme, mathematical vocabulary as the primary difficulty, reinforces the quantitative proficiency data from a student perspective. With 73.3% of respondents identifying discipline-specific vocabulary as their greatest obstacle, students described mathematics as a domain in which standard terms carry highly specialized meanings that resist literal translation. This perceived difficulty, convergent with the objective pre-test vocabulary score of 42.00%, suggests that vocabulary instruction must be embedded throughout the module via a dedicated Mathematical Academic Word List (MAWL), bilingual glossaries per unit, and repeated encounters with key terms in contextualized exercises.

The third theme, strong student preference for Maluku ethnomathematics integration, further validates the local wisdom approach adopted in this study. Students did not merely express general cultural interest; they actively articulated conceptual links between specific cultural elements and mathematical topics. Traditional weaving was associated with geometric patterns and transformation; the Baileo traditional house with spatial geometry and plane shapes; the Pela Gandong kinship system with relations, functions, and sets; and traditional navigation with measurement, trigonometry, and vectors. These student-generated mappings confirm that ethnomathematics integration is not a superficial cultural decoration but a pedagogically coherent strategy that leverages students' prior cultural knowledge as a cognitive scaffold for mathematical and linguistic learning. This is evidenced in empirical studies demonstrating how cultural artifacts serve as productive entry points into formal mathematical reasoning (Prahmana & D'Ambrosio, 2020; Batiibwe, 2024).

The fourth and fifth themes demand for accessible plain-language content with visual support, and need for scaffolded and culturally grounded exercises, converge on a coherent pedagogical model. With 73.3% requesting plain language, 66.7% requesting visual and cultural illustrations, and 66.7% requesting culturally contextualized exercises, students articulated a preference for a module that reduces cognitive load through visual mediation while maintaining cultural relevance as the primary motivational vehicle. The scaffolding preference (46.7%) further specifies a desired progression: cultural context introduction, guided comprehension, scaffolded production, independent output. This student-preferred sequence mirrors the Input-to-Output scaffolding model proposed by Gibbons (2014), in

which academic language development is structured through a high-challenge, high-support progression from shared cultural context to independent linguistic production. Notably, one student explicitly proposed a three-part unit structure of 'Maluku cultural context, mathematical concept, English language,' which constitutes an organic, student-generated articulation of culturally responsive ESP pedagogy.

The sixth theme desire for interactive and self-directed digital features adds a technological dimension to the module's design requirements. Students requested project-based activities with self-study guides and answer keys (13.3%), and a pronunciation guide for mathematical terms (6.7%), indicating awareness of the limitations of purely text-based, instructor-dependent learning.

These suggestions align with the affordances of digital modules in promoting learner autonomy. Susanti et al. (2023) found that digital learning environments that incorporate gradual guidance and self-assessment tools significantly support independent learning among EFL students, while Rahman et al. (2022) demonstrated that context-based digital modules with interactive components enhance learner engagement and meet students' real field needs. Taken together, the six themes from the open-ended analysis provide a coherent, student-validated framework for the module's content selection, unit structure, visual design, exercise typology, and digital functionality.

Implications for Digital Module Development

Based on the findings from the pre-test and the needs analysis, the digital module being developed needs to accommodate the following considerations. First, a gradual scaffolding approach is essential given the high heterogeneity of students' proficiency levels. Second, the module's content must integrate mathematical terminology in English through Maluku cultural contexts that are familiar to students. Third, each unit of the module needs to be equipped with a bilingual glossary, exercises covering the four language skills (Listening, Speaking, Reading, and Writing), and local culture-based project activities.

This recommendation is in line with the findings of Rahman et al. (2022), who emphasized the importance of developing digital modules based on a needs analysis and the specific context of learners, so that the resulting module is genuinely relevant and responsive to students' real needs in the field.

This study has several limitations that should be considered when interpreting the findings. First, the relatively small number of participants (15 students) drawn from a single class in the Mathematics Education Study Program at Universitas Muhammadiyah Maluku limits the generalizability of the findings to broader Mathematics Education contexts. Furthermore, as an exploratory preliminary study, the results should be regarded as an initial portrayal of students' English learning needs and proficiency levels rather than a basis for universal generalization. Nevertheless, the findings provide a relevant and contextually grounded empirical foundation for the subsequent development of a Maluku local wisdom-integrated digital English module.

5. Conclusion

This preliminary study reveals two main findings. First, the English proficiency of UM MALUKU's Mathematics Education students is generally still in the low category, with a mean score of 17.67 out of 40 (44.17%). The most widespread weaknesses occur in Grammar (31.13%) and Vocabulary (42.00%), with 73.33% of students falling into the low category, indicating the urgent need for structured and contextual learning intervention.

Second, the needs analysis shows an overall mean of 4.08 (High category), indicating students' strong motivation and awareness of the importance of English in academic and professional contexts. Enthusiasm for integrating Maluku local wisdom is very high,

particularly regarding the topics of traditional weaving, the Baileo traditional house, and Pela Gandong, owing to their direct connection with the mathematical concepts being studied.

These preliminary findings provide a strong foundation for designing a Maluku local wisdom-integrated digital English module using a scaffolding approach, complete with a bilingual glossary, authentic Maluku cultural illustrations, contextual exercises, and tutorial videos. Development of the module will follow Borg and Gall's R&D model, encompassing the stages of draft design, development, expert validation, limited-scale trials, large-scale trials, effectiveness testing, and product dissemination.

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