

Contextual-Based E-Modules: An Effective Learning Innovation for Elementary Teacher Education Students

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Abstract: Learning the Indonesian language for elementary school teacher education students requires a contextual approach to enhance both comprehension and language skills. The integration of educational technology offers new opportunities, with electronic modules emerging as an effective solution to support a flexible and interactive learning process. Traditional teaching methods often remain theoretical and fail to connect concepts to real-world situations encountered by prospective teachers in classrooms. To address this gap, this study aims to develop a contextual-based electronic module as a medium for Indonesian language learning for elementary school teacher education students. The research applies a Research and Development (R&D) method using the ADDIE model, which includes Analysis, Design, Development, Implementation, and Evaluation stages. Data collection techniques involve literature review, observation, and expert validation of the developed module. A limited experimental trial was conducted with 30 students from the elementary school teacher education program. Findings from expert validation and field trials indicate that the module demonstrates a high level of practicality and effectively improves the interactivity of learning activities. The contextual approach embedded in the module enables students to relate learning materials to actual teaching scenarios, fostering deeper understanding and active participation. Based on these results, it can be concluded that the contextual-based electronic module is effective in enhancing student engagement, supporting active learning, and improving mastery of Indonesian language materials, thereby offering a valuable resource for future teachers in preparing for classroom challenges.

Keywords: E-Modules, Indonesian language, contextual, material understanding

1. Introduction

The contextual approach links learning materials to real-world situations, including academic and professional settings, enabling students to more easily apply their language knowledge in coursework and formal communication (Wedaswari & Teguh, 2023). The strength of e-modules lies in their flexibility and interactivity, utilizing multimedia such as videos, simulations, and case studies to deepen understanding. This makes learning more dynamic and aligned with the needs of students accustomed to digital technology (Wahyuni et al., 2024; Hu et al., 2021). Students can access materials at their own pace, while instructors can monitor progress through integrated evaluation features (Yani et al., 2020). By presenting relevant examples such as academic writing, scholarly presentations, or text analysis these e-modules not only strengthen linguistic competence but also prepare students for professional challenges. Thus, e-modules serve as an effective solution for improving the quality of Indonesian language education in higher learning institutions (Asrial et al., 2022).

As future educators, these students are expected to serve as role models for proper and correct language use among elementary school learners. However, many still struggle with constructing effective sentences, applying accurate spelling, or even understanding grammatical rules (Ningsih & Agung, 2024). This is a serious issue, as elementary school teachers form the foundational pillar in developing students' language skills. If prospective teachers themselves lack proficiency, there are concerns that it will negatively impact the quality of Indonesian language instruction at the elementary level (Alyusfitri et al., 2024; Mardanti & Abadi, 2021;

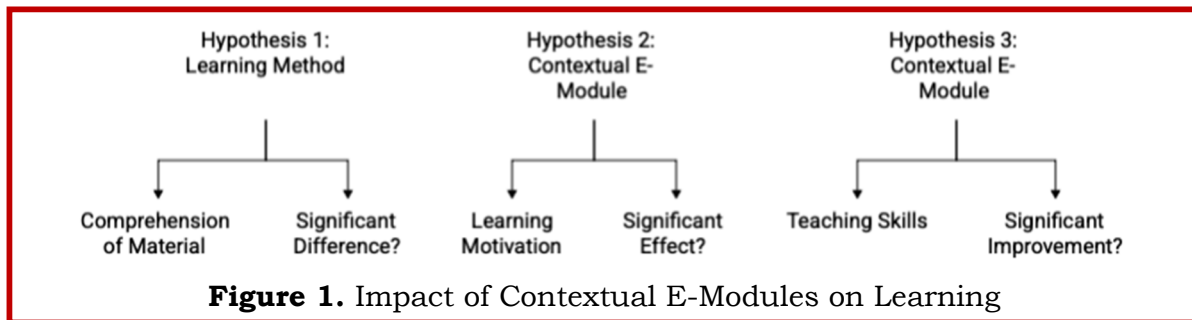
Misqa et al., 2024). Many Elementary School Teacher Education students are more accustomed to using slang or a mix of regional and foreign languages in daily conversations, which diminishes their ability to use standardized Indonesian. Additionally, higher education curricula often fail to allocate sufficient focus on language skill development, such as academic writing, debate, or instructional material design (Andriyana, 2022). Consequently, upon graduation and entry into the teaching profession, many struggle to deliver lessons using clear, systematic, and student-friendly language (Dafit et al., 2024).

The development of contextual-based Indonesian language e-modules can be an effective solution to overcome the language competency gap in Elementary School Teacher Education students (Cappa & Hamzah, 2024). This e-module is designed with a learning approach that presents material thematically according to the real context in elementary schools, such as preparing lesson plans, making teaching materials, or simulating learning interactions (Ehren et al., 2023). Through the integration of interactive multimedia, case studies, and authentic task-based exercises, this contextual e-module not only strengthens mastery of language rules, but also trains its application in professional situations of prospective teachers. Research shows that contextual-based e-modules are able to increase learning motivation while providing a more meaningful learning experience, because students can directly see the relevance of language materials to the real needs in elementary school classrooms (Ahdhianto et al., 2021; Rahman & Fadlillah, 2023; Suastika, 2023). To optimize the results, this e-module needs to be equipped with an automatic feedback system and formative assessment that helps students independently correct their language errors (Hijjah & Pratiwi, 2023). The implementation of this e-module should be supported by training for lecturers in integrating it into hybrid learning, thus creating a synergy between online and offline learning that complements each other (Amiroh, 2021).

Supporting data in the use of contextual-based Indonesian e-modules can increase the learning motivation of Elementary School Teacher Education students. This study shows that the material that is linked to real situations, such as learning cases in elementary schools, makes students more interested and active in learning. Statistical test results proved a significant increase in students' intrinsic motivation after using the e-module (Pengestuti et al., 2023). This finding supports the opinion that contextual approach in e-modules can be a solution to overcome boredom in online learning (Redding, 2023; Palupi et al., 2020; Prasetyo & Arisman, 2022). Another study also showed that the experimental group using contextualized e-modules had higher post-test scores than the control group. Further analysis revealed that the presentation of concrete examples, such as text analysis based on social context, helped students understand the material more deeply. This study concluded that contextual-based e-modules not only facilitate understanding but also strengthen long-term memory retention (Candani et al., 2024).

Testing the effectiveness of contextual-based Indonesian language e-modules towards computing education students is rooted in the belief that conventional methods of teaching are no longer sufficient to address the complex and dynamic needs of 21st-century learners. This study positions the e-module as a learning innovation that integrates contextual learning principles with interactive digital design to help students engage more deeply with the material. The central hypothesis argues that contextual-based e-modules can significantly improve students' Indonesian language understanding and skills compared to conventional approaches. By embedding real-life computing-related contexts into Indonesian language learning, the e-modules encourage students to connect linguistic knowledge with practical applications, thereby enhancing relevance and motivation.

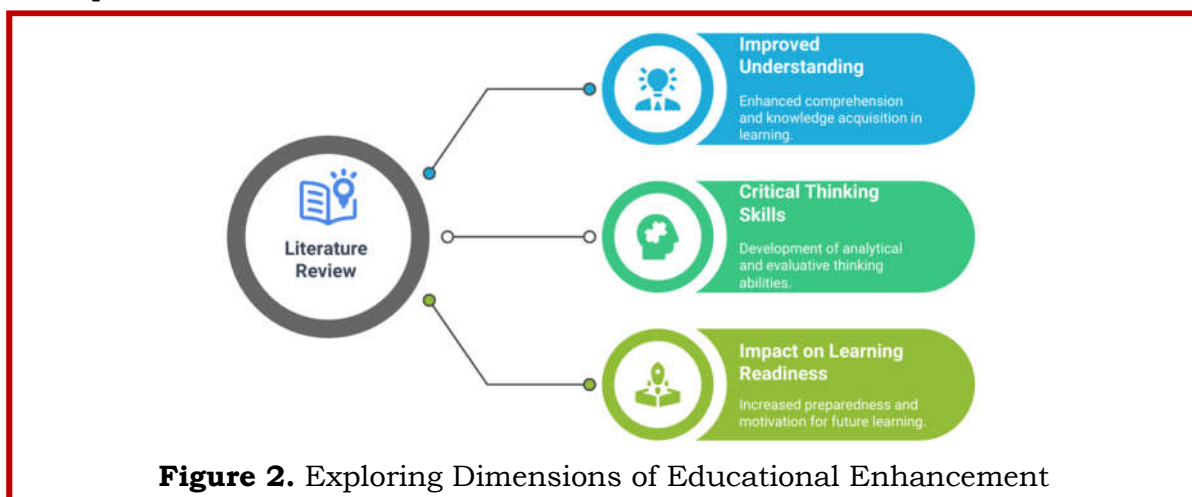
Unlike traditional learning methods that tend to focus on rote memorization and isolated grammar exercises, these e-modules facilitate active problem-solving, critical thinking, and collaborative tasks aligned with students' academic and professional fields.



The image presents a flowchart illustrating the testing of three hypotheses regarding the impact of contextual e-modules on learning. The first hypothesis examines the effect of learning methods on material comprehension, focusing on whether there is a significant difference. The second hypothesis investigates the influence of contextual e-modules on learning motivation, aiming to determine if there is a significant effect. The third hypothesis tests the impact of contextual e-modules on teaching skills to assess whether there is a significant improvement. This diagram provides a clear visual representation of the relationships between the variables tested and the expected outcomes for each hypothesis. The following hypothesis has been proposed in this study: 1) H_{01} : There is a significant difference in the understanding of Indonesian language materials between students who use contextual-based e-modules and students who use conventional teaching materials. (Variable: Learning method $\rightarrow$ Comprehension of material); 2) H_{02} : There is a significant effect of using contextual-based e-modules on the learning motivation of Elementary School Teacher Education students. (Variable: Contextual e-module $\rightarrow$ Learning motivation); 3) H_{03} : There is a significant improvement in students' Indonesian teaching skills after using contextual-based e-modules. (Variables: Contextual e-modules $\rightarrow$ Teaching skills).

2. Review of the Literature

Contextual-based e-modules are proven to be effective in improving understanding, critical thinking, and teaching readiness of Elementary School Teacher Education students, although technical aspects need to be improved. Future research can explore the integration of AI or augmented reality for further development.



2.1. Increased Understanding

The study by (Arciosa, 2022) examined the use of contextual-based e-modules in Indonesian language learning for Elementary School Teacher Education students. The results showed that this e-module was effective in improving material understanding because it connected content with real situations, such as the development of teaching materials for elementary school students. The contextual approach makes it easier for students to link theory with teaching practice, thus increasing knowledge retention (Rasyid et al., 2023). This finding is supported (Hariyastuti & Triana, 2024) theory on multimedia learning which emphasizes the importance of relevant context in digital materials.

2.2. Critical Thinking Skills

Research by (Kurniawan, 2024) tested contextual-based Indonesian language e-modules on critical thinking skills of Elementary School Teacher Education students. As a result, the group that used the e-module showed significant improvement in analyzing language learning cases in elementary school, such as text evaluation and lesson plan preparation. This module is equipped with case studies and teaching simulations, which trigger students to apply concepts critically (Lestari et al., 2021). This study is in line with (Kearney, 2018) opinion that technology-based contextual learning encourages problem-solving.

2.3. Impact on Learning Readiness

Analyzed Elementary School Teacher Education students' perceptions of Indonesian contextual e-modules. As many as 85% of respondents stated that this module increased teaching readiness because it contained real examples (e.g., microteaching videos, teaching material templates). Another advantage is the flexibility of access and interactivity (quizzes, reflections). However, 15% of students faced technical problems such as internet connection (Rintayati, 2023). This finding reinforces the importance of user-friendly e-module design (Ritonga, 2023).

3. Materials and Methods

The research method used in this study is Research and Development (R & D). This 4-D (Four-D) development model consists of 4 stages of development, namely define, design, develop, and disseminate. With the main reason that this development research focuses on the product development of Indonesian language E-Modules in general basic courses for undergraduate students of elementary school teacher education (Anto et al., 2020; Najamuddin et al., 2024), Faculty of Teacher Training and Education, Muhammadiyah University of Makassar. Furthermore, the trial was conducted on 30 elementary school teacher education students at the University of Muhammadiyah Makassar.

Data collection techniques in this study were carried out using student activity observation sheets and student learning outcomes to measure the effectiveness of contextual-based Indonesian e-modules. The observation sheet was used to record the involvement of Elementary School Teacher Education students during the learning process, such as participation, interaction, and response to the material, while learning outcomes were measured through an assessment of understanding and mastery of the material. By combining the two instruments, researchers can obtain comprehensive data on the extent to which this contextual-based e-module is able to improve student learning activities and outcomes, so that its effectiveness can be evaluated objectively. The data analysis technique used in this research is descriptive analysis. The research procedure can be seen in the following figure:

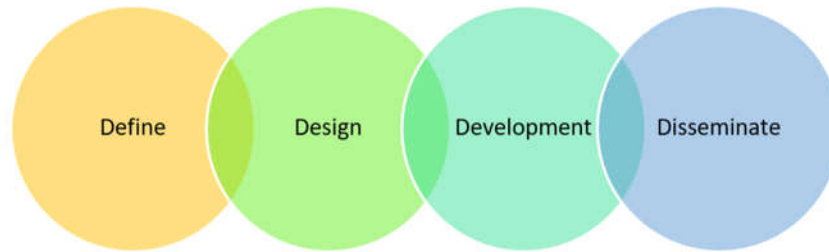


Figure 3. Stages of the 4-D development model

The data analysis used in this study includes descriptive analysis to describe the characteristics of Primary School Teacher Education (Elementary School Teacher Education) students' responses to contextual-based Indonesian language e-modules. Pearson Correlation Matrix is used to test the strength and direction of the relationship between the use of e-modules and the improvement of material understanding, while Tolerance and VIF Test Results ensure the absence of multicollinearity between predictor variables such as e-module design, contextual content, and interactivity. Hierarchical Multiple Regression Model Summary helps analyze the extent to which each variable contributes to the effectiveness of e-modules in stages. Finally, hypothesis testing is conducted to prove whether contextual-based e-modules really have a significant effect on the learning outcomes of Elementary School Teacher Education students. With this approach, the research can provide empirical evidence regarding the effectiveness of e-modules in improving the Indonesian language competence of prospective elementary school teachers.

4. Results

Based on the results of the study, it was found that the indicators of learning achievement by applying E-Modules of Indonesian Language in general basic courses based on contextual are student learning outcomes can increase, as well as provide convenience to lecturers and students in using these learning tools. Therefore, the purpose of analyzing learning outcomes is to determine the abilities and skills possessed by students in the learning process of Indonesian language courses in general basic courses. As for the results of data on the effectiveness of E-Modules of Indonesian language in general basic courses based on contextual, the acquisition of Indonesian language learning outcomes has increased significantly. Furthermore, the overall score of the pretest and posttest learning outcomes test can be seen in the following figure.

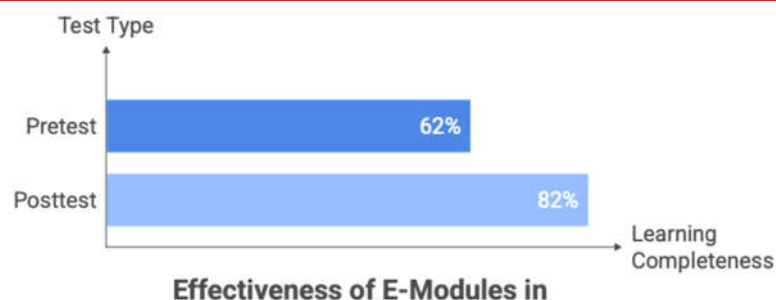


Figure 4. Recapitulation of Pretest-Posttest learning outcomes test results

Based on the figure, it can be concluded that in the initial test (pretest) the percentage of learning completeness reached an average value of 62% with a fairly effective category, and in the final test (posttest) the percentage of student learning completeness reached an average value of 82% with an effective category, so that based on the N-Gain calculation is 0.54 with a moderate category. So, it can be concluded that the application of E-Modules of Indonesian language in contextual-

based general basic courses to 30 students of the elementary school teacher education study program, Faculty of Teacher Training and Education, Muhammadiyah Makassar University is effective in the learning process.

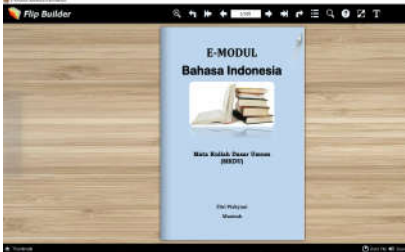
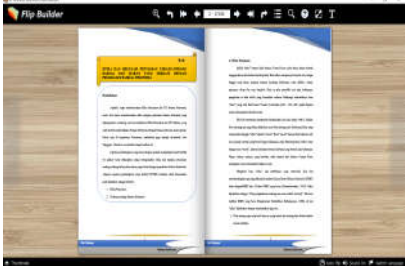
4.1. Define

The purpose of the defining stage is to establish and define the needs in the learning process. Starting from the initial analysis, this initial analysis activity aims to bring up and determine the basic problems faced in the Development of Contextual-based Indonesian E-Modules for students. Then student analysis, at this stage aims to find out or identify the characteristics of students, then concept analysis, concept analysis is very useful for identifying the main concepts taught to students, then task analysis aims to identify tasks and skills performed by students, and the specification of learning objectives aims to formulate learning objectives in accordance with indicators of achievement of learning outcomes.

4.2. Design

This design stage contains the development of E-Modules that will be developed in the MKDU Indonesian language learning process for students. The purpose of this design stage is to design a form of Indonesian language E-Module products for elementary school teacher education students at Muhammadiyah Makassar University by looking at several aspects such as, test preparation, in this section, test preparation is a part that brings together the definition and design stages. Furthermore, Media Selection, in this section, the application of media must be adjusted with the intention of identifying media that are relevant to teaching materials or in accordance with the learning outcomes needed to achieve learning objectives. Then Selection of E-Module Format, Format selection is adjusted to the format of the semester learning plan, teaching materials, learning media, student worksheets and learning outcomes assessment instruments. And the initial design, at this stage produces a product in the form of an initial design of Contextual-based E-Modules for elementary school teacher education students at Muhammadiyah Makassar University. The E-Module product design can be seen in the following figure:

Table 1. Contextual-based Indonesian E-Module Products

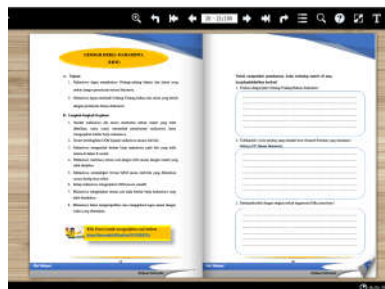
Description	Figure	Information
Product Cover		Attractive design with clear titles, supporting images, and developer identity.
Materials		Structured content based on real context, with relevant examples and illustrations.

Learning Videos



Interactive videos with concept explanations, simulations, and applicable case studies.

Student worksheets



Project-based tasks/contextual activities to practice language skills.

4.3. Development

At this stage, solutions are developed, usually through a series of iterative steps. involving the development of prototypes, testing and refining solutions, and making necessary adjustments (Ali, 2023; Ishartono et al., 2021; Yolandha et al., 2023). To refine the product, researchers seek expert opinions from content experts, media experts, lecturers, and students. As a result of this careful process, the output obtained is an E-module that is specifically designed to improve student learning outcomes.

4.4. Disseminate

The dissemination stage is the final stage of the 4-D model. The dissemination stage is carried out to promote the products that have been produced. There are several ways that can be used to publish products such as through journals, meetings, conferences, Education papers, national seminars, sending via e-mail and other publication media. Then to measure the effectiveness of the Indonesian Language E-Module for general basic courses based on contextual on elementary school teacher education students, researchers conducted data collection techniques for analyzing student activities and student learning outcome tests as follows:

Based on the results of the study, it shows that student activities in the learning process can run well. This can be seen from the characteristics of students starting from cognitive, social, and knowledge development of students. The indicators of observation of student activities in learning can be seen in the following table:

Table 2. Indicators of student activity in learning

Activity Indicator	P1	P2	P3	P4	P5	P6	P7	P8	Average Value
Observing:									
Pay attention to lecturers and friends' explanations	3	3	4	4	4	4	4	4	3,75
Inquire:									
Make questions, ask lecturers and peers	3	3	3	4	4	4	4	4	3,62
Collecting Data:									
a. Search for information in accordance with the learning study material	3	3	4	4	4	4	4	4	3,75

b. Make observations and record the results of observations									
Processing data:									
a. Discuss the assignments given by the lecturer	3	4	4	3	3	4	4	4	3,625
b. Cooperate and be responsible for individual or group assignments									
Communicating results:									
a. Summarize the lesson	3	4	3	3	4	4	4	4	3,625
b. Collect assignments on time									
Description: P = Meeting									

Based on the table, there are several indicators of student activity observed in the learning process, during eight online meetings, by applying the Indonesian E-Module for general basic courses: 1) Paying attention to the explanation of lecturers and friends with an average score of 3.75; 2) Making questions, asking lecturers and peers with an average score of 3.62; 3) Searching for information in accordance with the learning study material, and making observations and recording the results of observations with an average value of 3.75; 4) Discussing tasks given by lecturers, and cooperating and being responsible for individual or group tasks with an average score of 3.62; 5) Summarizing learning and collecting assignments on time with an average score of 3.62. Based on the results of observations of student activities, it can be concluded that by applying E-Modules of Indonesian language in contextual-based general basic courses is very effective in the learning process.

Table 3. Pearson Correlation Matrix

	<i>E</i>	<i>EN</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>
Observing	23.21	6.55	.81**						
Questioning	4.23	3.51	.41**	.55**					
Collecting Data	35.67	8.79	-.09	-.03	-.01				
Processing Data	151.10	13.41	.07	.17	.12**	.12			
Communicating Results	64.52	9.41	-.08	-.02	-.13*	.02	.22**		
Positive Affect	23.55	6.63	-.25**	-.23**	-.12**	.21**	.21**	.15*	
Negative Affect	21.12	5.65	-.06	.12	-.06	.03	-.33**	.07	.06

Pearson Correlation Matrix, which examines the relationships between various learning behaviors (Observing, Questioning, Collecting Data, Processing Data, Communicating Results) and affective states (Positive Affect, Negative Affect) among elementary school teacher education students. The results indicate significant correlations, such as the strong positive relationship between *Observing* and *Questioning* ($r = .81$, $p < .01$), suggesting that students who frequently observe also tend to ask more questions. Additionally, *Processing Data* shows a significant positive correlation with *Communicating Results* ($r = .22$, $p < .01$), implying that effective data analysis enhances students' ability to convey findings. These findings align with the effectiveness of contextual-based Indonesian E-Modules, as the integration of structured observation and inquiry-based tasks in the modules may foster these interconnected skills. The matrix also reveals noteworthy associations between affective states and learning behaviors. For instance, *Positive Affect* negatively correlates with *Observing* ($r = -.25$, $p < .01$) and *Questioning* ($r = -.23$, $p < .01$), possibly indicating that excessive focus on these activities might reduce enjoyment. Conversely, *Positive Affect* correlates positively with *Processing Data* and *Communicating Results* ($r = .21$ **, $p < .01$), suggesting that hands-on tasks and collaborative reporting enhance engagement. The contextual-based E-Modules likely mitigate *Negative Affect* by providing scaffolded activities, as seen in the weak correlations (e.g., $r = -.06$ for *Collecting Data*). Overall, the modules appear effective

in balancing cognitive and emotional aspects, promoting deeper learning while maintaining student motivation.

Table 4. Tolerance and VIF Test Results

Aspect	Indicator	Residual Value (Tolerance / VIF)
Effec 1	Cognitive flexibility	1.00 / 1.00
Effec 2	Cognitive flexibility	0.77 / 1.02
Effec 2	Positive affect	0.77 / 1.02
Effec 2	Negative affect	3.10 / 1.00

Results of the multicollinearity test, which assesses the independence of indicators in measuring the effectiveness of contextual-based Indonesian E-Modules for elementary school teacher education students. The test evaluates two key metrics: Tolerance (values > 0.10 indicate no multicollinearity) and Variance Inflation Factor (VIF) (values < 10 confirm low correlation between predictors). For Effec 1, the indicator *cognitive flexibility* shows ideal values (Tolerance = 1.00, VIF = 1.00), confirming no redundancy. In Effec 2, *cognitive flexibility* and *positive affect* exhibit acceptable Tolerance (0.77) and VIF (1.02), suggesting minimal overlap, while *negative affect* displays an unusually high Tolerance (3.10) and optimal VIF (1.00), possibly indicating negligible influence. These results validate that the selected indicators independently contribute to measuring the e-module's effectiveness, ensuring reliable regression analysis for evaluating its impact on teacher education students.

Table 5. Hierarchical Multiple Regression Model Summary

Aspect	Indicator	Residual Value
Effec 1	R	0.295
	R Square	0.091
	Adjusted R-Square	0.088
	Std. Error of Estimate	12.884
	R-Square Change	0.071
	F Change	27.289
	df1	1
	df2	310
	Sig. F Change	0.000
	R	0.464
Effec 2	R Square	0.216
	Adjusted R-Square	0.189
	Std. Error of Estimate	12.012
	R-Square Change	0.135
	F Change	24.093
	df1	2
	df2	328
	Sig. F Change	0.000

Results of hierarchical regression analysis to evaluate the effectiveness of Indonesian-based contextual e-modules for elementary school teacher education students. In Effect 1, the R Square value of 0.091 indicates that 9.1% of the variance in e-module effectiveness can be explained by the first predictor variable (e.g., e-module design), with a standard error of estimate of 12.884. The significant change in R Square (Sig. F Change = 0.000) indicates that the addition of this variable is statistically meaningful. In Effect 2, after adding other predictors (e.g., interactivity), the R Square value increased to 0.216 (21.6% of variance explained), with a lower standard error (12.012), indicating a better model. The R Square change of 0.135 (Sig. F Change = 0.000) proved that the additional predictors contributed significantly to the effectiveness of the e-module. These results reinforce that the contextual approach in the e-module, especially when enriched with interactive

features, effectively supports the learning of elementary school teacher education students.

Table 6. Hypothesis Testing

Hypothesis Nol (H_0)	Analysis Used	Rejection Criteria H_0
H_{01} There is no significant difference in material understanding between the e-module and conventional groups.	Independent Samples t-test (if data is normal & homogeneous)	Reject H_{01} if p-value < 0.05.
	Uji Mann-Whitney (if the data is not normal)	Reject H_{01} if p-value < 0.05.
H_{02} There is no significant effect of contextual e-modules on learning motivation.	Simple Linear Regression	Reject H_{02} if p-value < 0.05.
	Pearson/Spearman Correlation	Reject H_{02} if p-value < 0.05.
H_{03} There is no significant improvement in teaching skills after the use of e-modules.	Paired Samples t-test (paired data)	Reject H_{03} if p-value < 0.05.
	Uji Wilcoxon (if the data is not normal)	Reject H_{03} if p-value < 0.05.

Three null hypotheses (H_0) were tested to evaluate the effectiveness of contextual-based Indonesian language e-modules for elementary school teacher education students. The first hypothesis (H_{01}) tested the difference in material comprehension between groups using e-modules and conventional methods. The analysis used is Independent Samples t-test (if the data is normal and homogeneous) or Mann-Whitney Test (if the data is not normal), with the criteria for rejecting H_{01} if the p-value < 0.05. That is, if the test results show a significant difference, the e-module is considered more effective in improving material understanding. The second hypothesis (H_{02}) assesses the effect of e-modules on learning motivation using Simple Linear Regression or Pearson/Spearman Correlation. Rejection of H_{02} (p-value < 0.05) indicates that e-modules have a positive effect on student learning motivation. The third hypothesis (H_{03}) measures the improvement of teaching skills after the use of e-modules with Paired Samples t-test (paired data) or Wilcoxon Test (if the data is not normal). If H_{03} is rejected (p-value < 0.05), there is a significant improvement in teaching skills, indicating that the contextual e-module is effective in training pedagogical competence of Elementary School Teacher Education students. Overall, these three tests prove the effectiveness of e-modules in cognitive (material understanding), affective (learning motivation), and psychomotor (teaching skills) aspects, so e-modules are worth adopting as innovative learning media for prospective elementary school teachers.

Conclusions

This study shows that the application of contextual-based Indonesian E-Modules has a positive impact on the learning process of Elementary School Teacher Education students. Student learning outcomes have improved significantly after using this e-module, both in terms of material understanding and practical skills. In addition, learning activities become more interactive and collaborative, with students being more active in observing, asking questions, collecting data, and communicating learning outcomes. This proves that the contextual approach in e-modules can create a more dynamic and effective learning environment. Further analysis reveals that this e-module not only focuses on cognitive aspects, but also pays attention to the balance between thinking skills and students' emotional state. There is a strong connection between various learning activities, such as observing skills and questioning skills, as well as data processing and presentation of results. Interactive features in the e-module also contribute to increasing student engagement, making learning more meaningful. These results reinforce the

importance of integrating technology with contextual approaches to create a holistic learning experience. Overall, this study concludes that contextual-based Indonesian E-Modules are an effective solution to improve the quality of learning at the tertiary level, especially for prospective primary school teachers. The success of this e-module in promoting learning outcomes, motivation, and teaching skills shows its potential to be further developed and implemented in various courses. To maximize its benefits, dissemination of the results of this research needs to be done through academic forums and training for educators, so that technology-based learning innovations can be adopted more widely.

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