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Development of English-Based Electronic Module on Three-Variables Linear Equations System for Mathematics Education Students

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Abstract

Many Mathematics Education students face difficulties in learning systems of linear equations in three variables, particularly when the material is delivered in English. This study aimed to develop an English-based electronic module that meets the criteria of validity, practicality, and effectiveness. Using the ADDIE development model, the product was evaluated by two validators (material expert and media expert) and implemented with 35 students enrolled in the selected topics in school mathematics course. The validation results showed that the module achieved an average validity score of 91.11% for content feasibility and 88.57% for language feasibility, indicating a 'very valid' category. Student responses indicated that the module was practical, with an overall practicality score of 74.17%. Effectiveness testing demonstrated that 77.14% of students met the Minimum Competency Criteria (MCC), placing the module in the effective category. These findings suggest that the English-based electronic module is feasible for use in supporting students' conceptual understanding and strengthening language-based mathematical literacy, particularly in learning systems of linear equations in three variables.

Keywords: electronic module, three variables liniear equation system, english in mathematic

INTRODUCTION

Mathematics education students in the era of globalization not only need a deep understanding of mathematical concepts, but are also required to have linguistic skills, especially in English. This is because most international standard learning resources use

English. Likewise, as prospective mathematics teachers, mathematics education students need to prepare themselves to face global demands in the world of education.

However, understanding mathematics in English poses a particular challenge for students, especially those in countries where English is not the official or primary language (Planas et al., 2025). This challenge is due to students' lack of English language skills, which causes them to experience various difficulties, including difficulty interpreting English terms used in mathematics, interpreting and understanding English teaching concepts, and understanding the meaning of questions in English (Wiyanah & Ningsih, 2023). The structure of English and the specific vocabulary of mathematics in English also pose language challenges for these students (Fatmanissa & Kusnandi, 2017; Planas et al., 2025).

On the other hand, technological developments in education provide opportunities to integrate mathematics content with digital media. One such opportunity is through the use of electronic modules as an effort to increase student engagement. Several studies on electronic modules show that electronic modules can be validated in terms of material and media, practicality, and effectiveness in the learning process (Mahfudhah et al., 2022). Electronic modules can also be used in online learning and are effective in providing independent learning experiences for students (Dio, 2022).

Three-Variables Linear Equation System is a key mathematical concept taught at the secondary level, and it is also covered in university mathematics courses. This topic is significant because it gives conceptual tools for addressing a wide range of real-world situations (Anggraini et al., 2021). However, this material poses a challenge for students due to its abstract nature, the need for precision in constructing mathematical models, and the understanding of matrix representation. This difficulty increases when the material is presented in English. As observed and interviewed with students of the Mathematics Education Study Program indicate that many students continue to struggle with understanding the concept and applying it to a variety of issues. Their challenges rise when the learning materials and problem sets are offered in English. Students struggle to grasp both the information and the problems, especially when tasks on three-variables linear equations system are frequently presented as word problems. They also face challenges in understanding mathematical terminology and symbols when presented in English.

Several previous researchers have developed electronic modules for three-variable linear equation system material. (Ristianti & Widyawati, 2019) developed an electronic module for three-variable linear equation system material based on the scientific method. (Rani & Maarif, 2021) developed an electronic module for three-variable linear equation system material to improve students' mathematical communication. Both of these electronic modules were developed using Indonesian and did not maximize the electronic features that could be used, such as video, audio, and others. (Maghfiroh et al., 2024) developed an electronic teaching module for three-variable linear equation systems to improve students' mathematical problem-solving skills. This electronic module utilizes video features but is still developed in Indonesian.

These electronic modules were developed specifically for high school students, not for prospective teacher students.

Thus, no research has been found that develops English-based electronic modules on the subject of three-variable linear equation systems for mathematics education students, making this research relevant and important to conduct. Therefore, this study aims to develop English-based electronic modules on the subject of three variable linear equation systems for mathematics education students. The development of these electronic teaching modules follows the criteria of validity, practicality, and effectiveness (Nieveen, 2007).

METHODS

This study employed a research and development design using the ADDIE model (Branch, 2009). The model consists of five main stages: (1) Analyze, (2) Design, (3) Develop, (4) Implement, (5) Evaluated. Analyze stage to identify the root causes of the problems. At this stage, the researchers collected information related to the learning process, instructional materials, students' learning difficulties, and their needs in the learning process. Design stage to plan the product to be developed, namely electronic teaching module in English on the topic of three-variable linear equations system. Develop stage to produce the electronic teaching module based on the design. This stage also included expert validation and subsequent revisions to ensure the validity of the materials. Implement stage to apply the developed electronic module in a classroom setting with students, who then provided responses regarding the practicality of the product. Evaluate stage to assess the quality of the product after implementation by analyzing students' responses on its practicality and effectiveness. Revisions were made at this stage if necessary to refine the product.

This research instrument consists of a validation sheet, a student response questionnaire, and a student learning outcome test. Validation was carried out by material and media experts. The material expert assessment sheet consists of 13 statements related to the suitability of content and presentation of material. The media expert assessment sheet consists of 15 statements related to the appropriateness of language and graphics.

Table 1. Material Expert Assessment Indicators

Aspect	Indicators	Item Number	Number of Item
Content Feasibility	Suitability of material to learning objectives	1, 2	2
	Accuracy of material	3, 4, 5	3
	Material relevance	6, 7	2
	Encouraging curiosity	8	1
	Appropriateness of material presented	9	1
Presentatio n Feasibility	Clarity of objectives to be achieved	10	1
	Presentation techniques	11	1
	Presentation support	12, 13	2

Table 2. Media Expert Assessment Indicators

Aspect	Indicator	Item Number	Number of Item
Language Feasibility	Straightforward	1, 2, 3	3
	Communicative	4	1
	Dialogic and interactive	5	1
	Suitability for student development	6	1
	English grammar	7	1
Presentation Feasibility	Cover	8	1
	Design	14, 15	2
	Material description and sample questions	9, 10	2
	Illustration/image/video in electronic module	11, 12,13	3

The student response questionnaire is a practicality assessment questionnaire consisting of 20 statements related to the ease of use and usefulness of the teaching module.

Table 3. Electronic Module Practicality Survey Indicators

No	Aspect	Indicators	Number of Item +	-
1	Ease of use	Language	1, 3	2
		Content/material in electronic module	4, 8, 10, 11	7, 12
		Design	6	5
		Image Suitability	9, 18	
		Access	19	20
2	Usefulness	Problem solving	17	15
		Student attitude	14,16	13

The learning outcome test is used to determine the effectiveness of the teaching module produced.

Table 4. Student Learning Outcome Test Indicators

No	Competency	Indicator	Item Number	Question Type
1	Students are able to construct mathematical models from real-life problems involving a system of three linear equations (Three-Variable Linear Equation System).	Identify information from word problems and determine appropriate variables to construct a three-variable system of linear equations.	1, 2, 3, 4	Essay / Constructed Response
2	Students are able to solve a system of three linear equations using elimination, substitution, or a combination of methods.	Solve the three-variable system of equations based on the mathematical model to obtain the value of each variable.	1, 2, 3, 4	Essay / Constructed Response
3	Students are able to interpret the solution of the system of equations in real-life contexts.	Interpret the calculated results into the correct contextual answer (worker wages, product prices, work rates, production, etc.).	1, 2, 3, 4	Essay / Constructed Response

The test questions used were valid because the calculated r_{xy} value was higher than the table r_{xy} value, the test questions were valid. which is 0.334 as shown in table 5 below.

Table 5. Validity Score of Test

Test Item	r_{xy} Count	Criteria
1	0,432	Valid
2	0,577	Valid
3	0,710	Valid
4	0,406	Valid

The test questions were also reliable with a reliable value using Conbrach's alpha 0.666 including the medium category (Taber, 2018). Table 6 below shows the results of the test of reliability.

Table 6. Results of Reliability Test

Cronbach's Alpha	N of item
0,666	35

The collected data were analyzed to determine the feasibility of the electronic teaching materials in terms of validity, practicality, and effectiveness. Qualitative data in the form of comments and suggestions were analyzed descriptively and used as input for revising the product. Quantitative data were analyzed using feasibility tests and effect size calculations (Yaniawati et al., 2022).

The validity data analysis followed these steps:

1. Assigning scores from experts based on a Likert scale 1-5.
2. Calculating the percentage score using the formula:

$$Va = \frac{Tse}{Tsa} \times 100\%$$

Note:

Va = Percentage value
Tse = Total Score
Tsa = Overall Maximum Score

3. Interpreting the percentage values using the criteria shown in Table 7:

Table 7. Criteria Validity

Interval	Criteria
$80\% < Va \leq 100\%$	Very Valid
$60\% < Va \leq 80\%$	Valid
$40\% < Va \leq 60\%$	Fairly Valid
$20\% < Va \leq 40\%$	Less Valid
$0\% < Va \leq 20\%$	Not Valid

The practicality data analysis followed these steps:

1. Assigning scores from experts and respondents based on a Likert scale 1-5.
2. Calculating the percentage score using the formula:

$$Pr = \frac{Tse}{Tsa} \times 100\%$$

Note:

Pr = Percentage value
Tse = Total Score
Tsa = Overall Maximum Score

3. Interpreting the percentage values using the criteria shown in Table 7:

Table 8. Criteria Practicality

Interval	Criteria
$80\% < Pr \leq 100\%$	Very Practical
$60\% < Pr \leq 80\%$	Practical
$40\% < Pr \leq 60\%$	Fairly Practical
$20\% < Pr \leq 40\%$	Less Practical
$0\% < Pr \leq 20\%$	Not Practical

(Zain et al., 2025).

The effectiveness of electronic modules is determined by the learning outcomes of students after using electronic teaching modules. The effectiveness of electronic module can be fulfilled well if the result of the assessment of students meets the percentage of the Minimum Completeness Criteria (MCC). Test results are analysed using the formula below to determine the level of effectiveness.

$$\boldsymbol{P = \frac{L}{n} \times 100\%}$$

Note :

P = percentage of students who pass classically
L = number of students who pass the MCC
n = number of students

Table 9. Effectiveness Assessment Criteria

Interval	Criteria
$80\% < P \leq 100\%$	Very Effective
$60\% < P \leq 80\%$	Effective
$40\% < P \leq 60\%$	Fairly Effective
$20\% < P \leq 40\%$	Less Effective
$0\% < P \leq 20\%$	Not Effective

(Solo et al., 2023)

RESULTS & DISCUSSION

The outcome of this research is the development of electronic module in English on the topic of three-variables linear equations system that are valid, practical, and effective. The findings from each stage of the development process are presented as follows.

Analysis

At this stage, it was found that students experienced considerable difficulty in understanding the topic of three-variables linear equations system, which often led to errors in subsequent problem-solving steps. A common mistake was the inability to transform real-world problems into appropriate mathematical models. Other errors included misapplication of formulas and inaccurate calculations. These findings are consistent with (Wiyah & Nurjanah, 2021), who identified frequent student errors such as misinterpreting information, creating inappropriate models, performing incorrect calculations, constructing inaccurate systems of equations, and providing insufficient justification for answers. Contributing factors included limited time to process problems, lack of accuracy in computation, forgetting formulas, and weak conceptual understanding. Similarly, (Kasali et al., 2023) reported that students' mistakes in solving problems on three-variable linear equations system stemmed from conceptual, procedural, and technical misunderstandings, with difficulties in problem comprehension, problem representation, and formula application.

The analysis also revealed that lecturers had employed a variety of instructional methods to encourage student autonomy in learning. Students expressed enthusiasm when provided with textbooks in English but admitted to difficulties in comprehension due to limited English proficiency. Many students acknowledged that conceptual errors often arose from mistranslating both the instructional content and the problem set into Indonesian. They particularly struggled with understanding mathematical terminology in English. These challenges are in line with the study of (Wiyanah & Ningsih, 2023), which highlighted English-related learning difficulties among mathematics education students.

Based on these findings, it was concluded that there is a strong need to develop electronic module on three-variables linear equations system in English. Such materials would support students in independent study as well as distance learning.

Design

The developed electronic module was designed to consist of three main sections: the introduction, the core content, and the closing section. The introductory part includes the cover page, preface, table of contents, and instructions for use. The core content presents explanations of three-variable linear equations system, including definitions, principles, and methods for determining solutions. The closing section contains practice problems, references, answer keys for the exercises, and a glossary. The complete structure of the developed materials is illustrated in Figure 1.

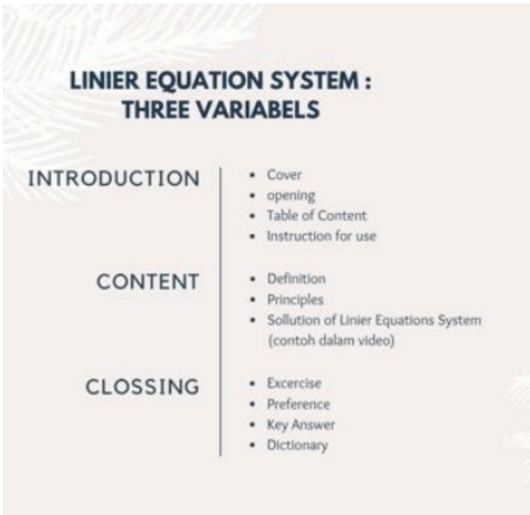


Figure 1. Teaching Material Arrangement

Development

At this stage, electronic module on the topic of three-variables linear equations system were developed in English. The materials were designed using the Canva application. Canva was selected because it offers a wide range of attractive graphic designs and features that enhance creativity in designing instructional media and related materials (Tanjung & Faiza, 2019). The developed teaching materials consist of the following components:

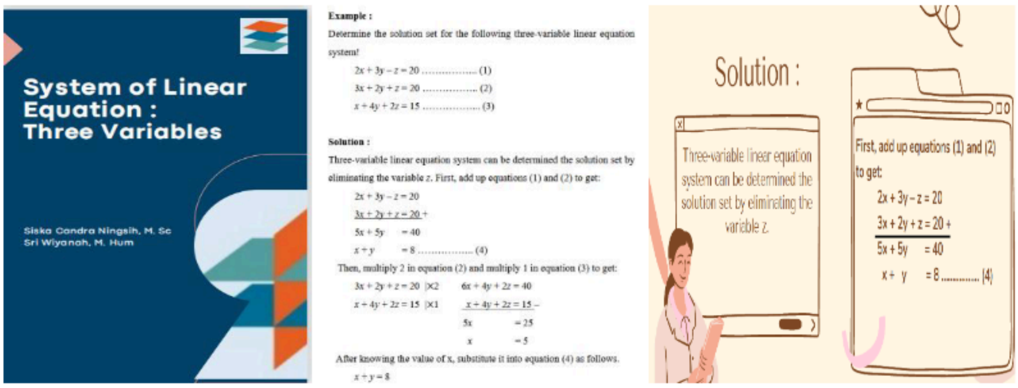
Cover Page

The cover page was designed using templates available in Canva. It includes the title of the material and the author's name. An example of the cover page is shown in Figure 2(a).

Content Section

The content is organized into several parts, including definitions, key principles, and methods for solving systems of three-variable linear equations. This section is supported with worked examples, as illustrated in Figure 2(b). The examples aim to strengthen students' understanding by demonstrating the application of formulas and concepts that have been presented. In line with (Huang, 2017), each example is placed immediately after the corresponding formula to facilitate comprehension.

The worked examples are explained both in written form and through instructional videos. The development of these videos began with preparing a draft in Canva using presentation templates. The draft was then presented and recorded through Canva, and subsequently saved in video format. The finalized videos were uploaded to YouTube, and the corresponding links were embedded in the electronic teaching materials. An example of a video presentation of a worked example is shown in Figure 2(c).



(a) (b) (c)

Figure 2. (a) Cover page; (b) Example question; (c) Video display

Closing Section

The electronic module conclude with a set of practice exercises that students can solve independently. These exercises are accompanied by answer keys, enabling students to conduct self-assessment. In addition, the closing section provides a glossary of formulas that includes key mathematical terms in English.

The completed electronics module was saved in PDF format and then converted into a flipbook using an online platform, allowing the materials to be accessed interactively, page by page, like a printed book. The embedded video links can be directly played and viewed with an internet connection. Figure 3 illustrates the appearance of the electronic module presented in flipbook format.

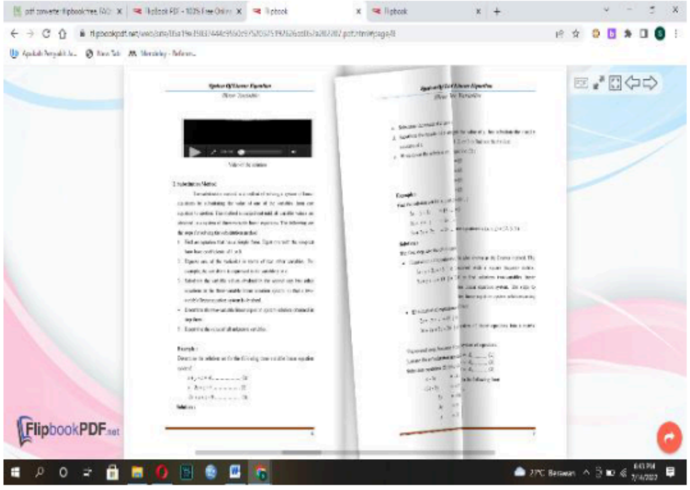


Figure 3. Display of the Electronic Module in the Flipbook Application

The electronic module that had been developed were reviewed and validated by experts, namely a subject matter expert and a media expert. Table 10 and 11 present the results of the expert evaluation of the teaching materials.

Table 10. Results of Material Expert Assessment

Assessment Aspect	Score Each Aspect	Average of Each Aspect	Percentage	Category
Content Feasibility	41	4.56	91.11	Very Valid
Presentation Feasibility	17	4.25	85	Valid

Table 11. Results of Media Expert Assessment

Assessment Aspect	Score Each Aspect	Average of Each Aspect	Percentage	Category
Language Feasibility	31	4.43	88.57	Valid
Graphic Feasibility	27	4.5	90	Very Valid

The content of the materials reflected both completeness and depth relevant to the intended learning objectives. The explanations were structured to support the achievement of these objectives, in line with (Yaniawati et al., 2022), who emphasized that teaching materials should be developed in accordance with instructional goals and targets. The facts, symbols, images, illustrations, and terminology used were accurate, while the illustrations complemented the explanations and the references employed were up-to-date. The concepts were presented systematically, making it easier for students to understand. This aligns with the development by (Wardhana et al., 2021), where instructional materials were supported with guidance to enhance students' skills in formulating and solving problems.

The intended competencies were clearly articulated, and the concepts were sequenced in a logical manner, helping students connect prior knowledge with new concepts. The presentation was further supported with directions for students in solving problems. Worked examples and their solutions were provided in both written form and video format. Such worked examples strengthen students' comprehension of the subject matter (Wardhani et al., 2022).

The language used in the electronic module employed correct sentence structures, communicative style, and was adapted to the developmental level of the students. As highlighted by (Hariyadi & Ramaniyar, 2021), the appropriateness of language is crucial in electronic module for university students. The materials used effective sentences and standardized terminology, with English expressions that adhered to proper grammar conventions. The communicative sentence structures facilitated students' understanding of the conveyed messages, tailored to their intellectual development level.

In terms of graphic feasibility, the electronic teaching materials presented clear titles, explanations, and worked examples. Consistent with (Ariyani et al., 2020), the illustrations were sufficient and appropriately aligned with the concepts. The integration and placement of videos within the materials also supported the clarity of the content.

Implementation

The validated teaching materials were implemented with 35 students of the Mathematics Education Study Program at Universitas PGRI Yogyakarta. The materials were applied in the Selected Topics in School Mathematics course and delivered through distance learning. Electronic module can serve as an important support tool for online learning (Maghfiroh et al., 2024). As noted by (Adedoyin & Soykan, 2020) and (Means & Neisler, 2021), distance learning requires a variety of supporting facilities and infrastructure. (Kusmaryono et al., 2021) further predicted that distance learning will not only complement face-to-face learning but could potentially replace it entirely. After completing the learning activities, students undertook a test to measure their abilities and to evaluate the effectiveness of the developed electronic module. In addition, students completed a questionnaire assessing the practicality of the materials.

Evaluation

At this stage, an analysis was conducted on the practicality and effectiveness of the developed electronic teaching materials following their implementation in the learning process.

Practicality of the Electronic Module

Students who used the electronic module provided feedback regarding their practicality. They reported that the developed materials were practical for use in the learning process, particularly in terms of ease of use and usefulness, as presented in Table 12 below.

Table 12. Practicality of the Electronic Module

Practicality Aspect	Students	
	Practicality Percentage	Practicality Criteria
Ease of Use	75.12%	Practical
Usefulness	73.21%	Practical
Overall Assessment	74.17%	Practical

The results in Table 12 indicate that the developed electronic module were assessed as practical across all evaluated aspects. The highest score was obtained in terms of ease of use (75.12%), suggesting that students found the materials accessible and user-friendly in the learning process. The usefulness aspect also received a high rating (73.21%), reflecting students' perception that the materials contributed to their learning needs. Overall, the electronic module achieved a practicality score of 74.17%, placing them in the practical category. These findings confirm that the electronic module can be effectively applied in instructional settings to support student learning.

Student responses indicated that the electronic module were practical in terms of ease of use. The language and terminology employed in the materials were simple and comprehensible, enabling students to more easily grasp the mathematical concepts. The sequential organization of the content facilitated the connection between prior knowledge and new material. The inclusion of problem-based tasks further supported students' understanding.

The videos developed with Canva, which explained problem-solving processes and were embedded into the flipbook, also provided significant assistance for students. They reported that the videos made the content easier to understand compared to relying solely on written text. This finding is consistent with (Beheshti et al., 2018), who identified numerous benefits of using videos in learning, including enhancing student satisfaction, improving learning outcomes, and boosting motivation. Moreover, accessing the flipbook materials was considered convenient, as no additional software was required on laptops or mobile devices. The flipbook format allowed the materials to be used seamlessly in both online and offline learning environments.

Students further noted that the electronic module presented via flipbook were practical in terms of usefulness. The materials supported students in developing a comprehensive understanding of concepts, thereby making it easier for them to solve various problems, particularly those connected to real-life situations. By integrating Canva and flipbook, the materials not only enhanced mathematics learning but also encouraged students to improve their English language skills. This result aligns with (Sari & Ahmad, 2021), who found that flipbook-based electronic module can reduce student boredom while strengthening conceptual understanding.

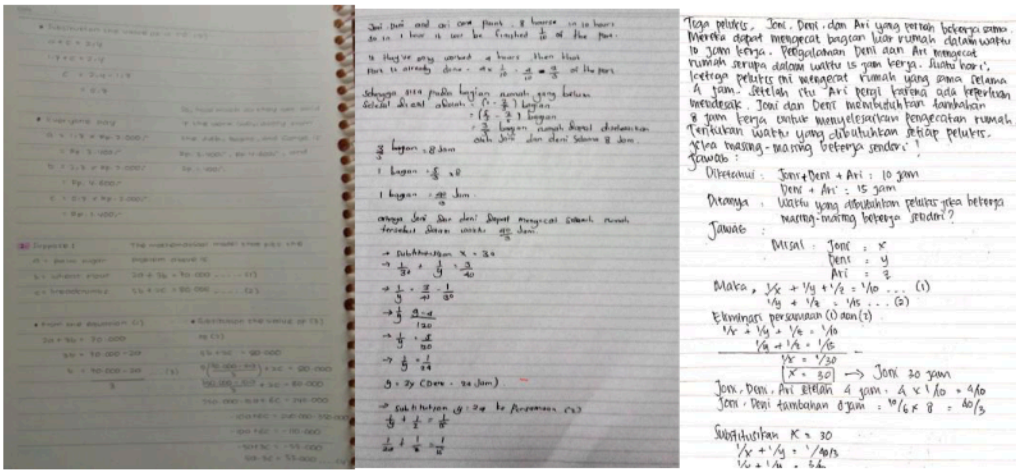
Effectiveness of the Electronic Module

The effectiveness of the electronic module was determined from students' test results after using them in the learning process (Saripudin et al., 2022). The test results showed that 27 out of 35 students who participated in learning using electronic modules obtained test scores above the Minimum Competencies Criteria (MCC). The remaining 8 students obtained test scores below the Minimum Competencies Criteria (MCC). Percentage of students who pass classically is 77. 143%. This result means that the electronic module is effective for use in the learning process.

Table. 13. Effectivity of Electronic Module

Student Grade	Number of Student	Percentage of Completeness	Criteria
Pass than MCC	27	77.143%	Effective
Less than MCC	8		

Based on the students' answers to the test, there are several styles of working. Some students used English to complete the questions. Others mixed languages when working on the questions. Some chose to translate the questions into Indonesian first before completing the questions (see Figure 4).



(a) (b) (c)

Figure 4. Student Test Answers (a) using full English; (b)mixing English and Indonesian; (c)translating the questions.

Students who have used English fluently were able to answer the questions correctly. Similarly, students who translated the questions first and then answered them in Indonesian were able to answer the questions correctly. Meanwhile, students who still mixed languages appeared hesitant in answering the questions and were therefore unable to answer them correctly. This indicates that students who have good English language skills can understand the questions and complete the questions correctly. Conversely, students who are not yet proficient in English cannot understand the questions completely, resulting in errors in completing the questions. This is in line with (Abuqutaish & Al-Zayed, 2020) who stated that proficiency in English among students in countries that use English as a foreign language directly affects their ability to solve problems in mathematics, where students who have good English skills tend to be able to solve mathematical problems better.

One of the strengths of the developed electronic module is that the content is presented in a well-structured manner and uses English with simple, clear sentence structures that are easy for students to understand. In addition, the closing section includes a glossary of mathematical terms in English used throughout the materials. This feature greatly assists students in interpreting the material with confidence, without hesitation about the correct meaning. Knowledge of specific mathematical vocabulary in English is essential for enhancing comprehension (Moleko & Mosimege, 2020).

Another strength lies in the integration of videos accompanying the materials, which provide step-by-step explanations for solving example problems. The inclusion of real-life problems alongside video explanations enriches students' learning experiences (AlAlawi, 2025). Furthermore, the videos help students practice English pronunciation and listening skills while also accommodating diverse learning styles.

The electronic module is versatile and can be used in both face-to-face and distance learning contexts. When presented in the form of a flipbook, the materials allow students to review the content anytime and anywhere without the burden of carrying physical books, since they can be accessed easily from any location. Importantly, the flipbook format is user-friendly and does not require special applications to operate (Prasetya et al., 2022). As (Juliani & Ibrahim, 2023) also noted, flipbooks are portable, practical, and accessible in various learning settings.

CONCLUSION

This developmental research has produced English-based electronic teaching materials on the topic of three-variable linear equations for students in the Mathematics Education Study Program. Based on expert validation results, the e-module meets the criteria of high validity in terms of content, presentation, language feasibility, and visual design. Student response data also indicate that the e-module is practical, particularly regarding ease of use, clarity, and usefulness during learning. In terms of effectiveness, the e-module achieved a classical completeness level of 77.14%, which categorizes it as effective, although the improvement in student achievement was not statistically significant when compared to the minimum competency standard.

Despite this limitation, the findings clearly demonstrate that integrating English into mathematics content through the developed e-module strengthens students' language-based mathematical literacy and supports their conceptual understanding, especially in interpreting terminology, identifying information in word problems, and connecting mathematical representations. Thus, the e-module is feasible for use as a supplementary resource in both face-to-face and distance learning.

This study also has several limitations. The sample size was limited to one class, and the effectiveness measure relied primarily on classical completeness without deeper statistical testing of learning gains. In addition, students varied English proficiency levels influenced their performance, which may have affected the measured outcomes. Future research should involve larger samples, incorporate comparative or experimental designs with statistical analysis, and examine long-term impacts on students' mathematical literacy and language proficiency.

REFERENCES

Abuqutaish, R. H. M., & Al-Zayed, N. (2020). The English Language Level of Proficiency on Mathematical Problem Solving Skill. *Revista de Ciencias Humanas y Sociales*, *36*(27), 435–453.

Adedoyin, O. B., & Soykan, E. (2020). Covid-19 Pandemic and Online Learning: The Challenges and Opportunities. *Interactive Learning Environments*, *31*(2), 1–14. https://doi.org/10.1080/10494820.2020.1813180

AlAlawi, N. R. (2025). Ninth-Grade Students' Difficulties in Solving Systems of Equations With Three Variables in UAE High Schools. *US-China Education Review A*, *15*(03), 212–229. https://doi.org/10.17265/2161-623x/2025.03.007

Anggraini, R. D., Murani Hutapea, N., & Amalina, D. A. (2021). Perangkat Pembelajaran Matematika berbasis Problem Based Learning untuk Materi Sistem Persamaan Linear Tiga Variabel (Sebuah Studi Pengembangan). In *Journal for Research in Mathematics Learning) p* (Vol. 4, Issue 4).

Ariyani, N., Susilaningsih, E., & Mahatmanti, F. W. (2020). The Development of The Chemical Teaching Material Integrated to Nautical Material to Improve Understanding The Hydrocarbon and Petroleum Concept in The Shipping Vocation High School. *Journal of Innovative Science Education*, *9*(1), 94–102. http://journal.unnes.ac.id/sju/index.php/jise

Beheshti, M., Taspolat, A., Kaya, O. S., & Sapanca, H. F. (2018). Characteristics of Instructional Videos. *World Journal on Educational Technology: Current Issues*, *10*(1), 61–69. www.wj-et.eu

Branch, R. M. (2009). Instructional Design: The ADDIE Approach. In *Instructional Design: The ADDIE Approach*. Springer US. https://doi.org/10.1007/978-0-387-09506-6

Dio, R. V. (2022). Utilization of Digital Module for Asynchronous Online Independent Learning in Advanced Mathematics Education. *Mathematics Teaching Research Journal*, *14*(1), 80–98.

Fatmanissa, N., & Kusnandi. (2017). The Linguistic Challenges of Mathematics Word Problems: A Research and Literature Review. *Malaysian Journal of Learning and Instruction (MJLI), Special Issue on Graduate Students Research on Education*, 73–92.

Hariyadi, & Ramaniyar, E. (2021). Penulisan Buku Teks Mahasiswa Bahasa dan Sastra Indonesia IKIP PGRI Pontianak. *Jurnal Pendidikan Bahasa*, *10*(2), 215–230. https://doi.org/10.31571/bahasa.v10i1.2229

Huang, C.-H. (2017). Teachers' Choice and Use of Examples in Teaching Derivatives. *American Journal of Educational Research*, *5*(11), 1152–1157. https://doi.org/10.12691/education-5-11-6

Juliani, R., & Ibrahim, N. (2023). Pengaruh Media Flipbook Terhadap Hasil Belajar Bahasa Indonesia Siswa Kelas IV di Sekolah Dasar. *Elementary School Education Journal*, *7*(1), 19–26. https://doi.org/10.3065

Kasali, B., Yuliani, A., & Nurfauziah, P. (2023). Error Analysis of Senior High School Student's Problem Solving Ability on Three Variables Linear Equation System. *Journal of Innovative Mathematics Learning*, *6*(4), 231–239. https://doi.org/10.22460/jiml.v6i4.p18404

Kusmaryono, I., Jupriyanto, & Kusumaningsih, W. (2021). A Systematic Literature Review on the Effectiveness of Distance Learning: Problems, Opportunities, Challenges, and Predictions. *International Journal of Education*, *14*(1), 62–69. https://doi.org/10.17509/ije.v14i1.29191

Maghfiroh, K., Dwijanto, & Cahyono, A. N. (2024). Development of Mathematics E-Module to Improve Students' Mathematical Problem Solving Skills in Problem

Based Learning Models. *Unnes Journal of Mathematics Education*, *13*(3), 231–240. https://doi.org/10.15294/ujme.v13i3.2112

Mahfudhah, A., Hamidah, D., & Wulan, E. R. (2022). Lectora Inspire Interactive E-Module with a Realistic Approach to Facilitate Understanding of Mathematical Concepts. *Al-Khwarizmi : Jurnal Pendidikan Matematika Dan Ilmu Pengetahuan Alam*, *10*(1), 35–60. https://doi.org/10.24256/jpmipa.v10i1.2127

Means, B., & Neisler, J. (2021). Teaching and Learning in the Time of COVID: The Student Perspective. *Online Learning Journal*, *25*(1), 8–27. https://doi.org/10.24059/olj.v25i1.2496

Moleko, M. M., & Mosimege, M. D. (2020). Teachers' and Learners' Experiences for Guiding Effective Teaching and Learning of Mathematics Word Problems. *Issues in Educational Research*, *30*(4), 1375–1394.

Nieveen, N. (2007). An Introduction to Educational Design Research. Proceedings of Seminar Conducted at the East China Normal University, Shanghai. In T. Plomp & N. Nieveen (Eds.), *Formative Evaluation in Educational Design Research* (pp. 89–102). netzodruk, Enschede. www.slo.nl/organisatie/international/publications

Planas, N., McKinley, J., Smith, K., Ingram, J., Essien, A. A., & Moore, E. (2025). Students' Linguistic Challenges when Learning Mathematics: Voices of Teachers from Seven Countries. *African Journal of Research in Mathematics, Science and Technology Education*, 1–13. https://doi.org/10.1080/18117295.2025.2494292

Prasetya, R., Rusdarti, & Prihandono, D. (2022). Development of E-Modules With Problem-Based Learning (PBL) to Increase Economic Learning Outcomes Article Info. *Journal of Economic Education*, *11*(1), 93–102. http://journal.unnes.ac.id/sju/index.php/jeec

Rani, L., & Maarif, S. (2021). Development E-Module Three Variable Linear Equation System Based On Mathematic Communication. *Journal of Medives : Journal of Mathematics Education IKIP Veteran Semarang*, *5*(2), 377–389. https://doi.org/10.31331/medivesveteran.v5i2.1707

Ristianti, F. D., & Widyawati. (2019). Developing Electronic Mathematics Modul On Three VariablesLinier Equation System Based On Scientific Method. *ADMATHEDUST : Jurnal Ilmiah Mahasiswa Pendidikan Matematika*, *6*(10), 517–522.

Sari, W. N., & Ahmad, M. (2021). Pengembangan Media Pembelajaran Flipbook Digital di Sekolah Dasar. *Edukatif : Jurnal Ilmu Pendidikan*, *3*(5), 2819–2826. https://edukatif.org/index.php/edukatif/article/view/1012

Saripudin, D., Fauzi, W. I., & Nugraha, E. (2022). The development of interactive E-book of local history for senior high school in improving local wisdom and digital literacy. *European Journal of Educational Research*, *11*(1), 17–31. https://doi.org/10.12973/eu-jer.11.1.17

Solo, P. R., Nenohai, J. M. H., & Nubatonis, O. E. (2023). Development of Androids-Based Learning Application Using Articulate Storyline 3. *Hipotenusa: Journal of Mathematics Society*, *5*, 182–196.

Taber, K. S. (2018). The Use of Cronbach's Alpha When Developing and Reporting Research Instruments in Science Education. *Research in Science Education*, *48*(6), 1273–1296. https://doi.org/10.1007/s11165-016-9602-2

Tanjung, R. E., & Faiza, D. (2019). Canva Sebagai Media Pembelajaran Pada Mata Pelajaran Dasar Listrik dan Elektronika. *Jurnal Vokasional Teknik Elektronika Dan Informatika*, *7*(2), 79–85. http://ejournal.unp.ac.id/index.php/voteknika/index

Wardhana, I. P., Agung Sutimin, L., & Susanto. (2021). Development of E-Book Teaching Materials about the Four Days Battle in Surakarta August 7-10, 1949 as a Source of Local History Learning for History Education Students. *Budapest International Research and Critics in Linguistics and Education (BirLE) Journal*, *4*(3), 1090–1103. https://doi.org/10.33258/birle.v4i3.2404

Wardhani, F. P., Fiamanillah, Islamiyah, H. Y., Zulfadilla, I., Pajriansyah, & Mukhlis, M. (2022). Analisis Kelayakan Penyajian Buku Teks Bahasa Indonesia Kelas XI Kurikulum 2013 Edisi Revisi 2017. *Sastra, Bahasa, Dan Pembelajaran Bahasa Dan Sastra*, *1*(1), 156–167.

Wiyah, R. B., & Nurjanah. (2021). Error Analysis in Solving The Linear Equation System of Three Variables Using Polya's Problem-solving steps. *Journal of Physics: Conference Series*, *1882*(1), 1–7. https://doi.org/10.1088/1742-6596/1882/1/012084

Wiyanah, S., & Ningsih, S. C. (2023). Learning Difficulties in Understanding English Materials of Mathematics Education Students. *Proceedings of the 1st UPY International Conference on Education and Social Science (UPINCESS 2022)*, 189–202. https://doi.org/10.2991/978-2-494069-39-8_17

Yaniawati, P., Maat, S. M., Supianti, I. I., & Fisher, D. (2022). Mathematics Mobile Blended Learning Development: Student-Oriented High Order Thinking Skill Learning. *European Journal of Educational Research*, *11*(1), 69–81. https://doi.org/10.12973/EU-JER.11.1.69

Zain, N. K., Masamah, U., Nursirot, M. A. S., & Maulidani, M. (2025). Pengembangan Platform Digital Linktree Berbantuan Wordwall Untuk Memfasilitasi Literasi Digital Pada Pembelajaran Geometri Terintegrasi Al-Quran/Hadist. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *14*(2), 340–351. https://doi.org/10.24127/ajpm.v14i2.8886