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Evaluating interactive e-module for contextual teaching and learning linear equation in one variable

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ABSTRACT

This research is motivated by the lack of teaching materials used in the mathematics learning process. On the other hand, students still struggle to solve story problems related to contextual issues. Therefore, this research aims to develop a product in the form of an interactive E-Module based on Contextual Teaching and Learning (CTL) for 7th-grade students and to evaluate the validity and practicality of the product. This type of research is developmental research using the ADDIE research model (Analyze, Design, Development, Implementation, & Evaluation). The results of the research show that the assessment of the interactive E-Module obtained an average score of 3.68 by subject matter experts with a category of very valid and an average of 3.6 by media experts with a category of very valid. Meanwhile, for student responses, it obtained a percentage of 90.72% in the small-scale trial with very practical criteria and a percentage of 85.95% with very practical criteria in the large-scale trial. Based on these results, it can be concluded that the interactive e-module based on CTL is strongly valid and very practical, making it suitable for use in learning.

Introduction

This research is motivated by the advancement of time, where the quality of education must always be improved. Education plays a crucial role in creating a resilient, skilled, creative, and educated generation as it contributes to the nation's future (Hidayatulloh, 2016). Education serves as a means for the progress and development of a nation, as the nation's progress and well-being can be measured by its education level (Istikomah & Purwoko, 2020).

Technology has rapidly advanced, especially in the field of information and communication, including smartphones (Agustina et al., 2017). Smartphones have become easy-to-use communication tools equipped with various features to facilitate accessing information in daily life, and the majority of individuals own them (Khuzaini & Sulistyo, 2020). Currently, the majority of individuals use Android-based smartphones. It is well-known that smartphones are widely utilized in the learning process, making learning effective and enjoyable. One of the uses of smartphones is in the field of mathematics learning (Istikhoirini, 2021), such as in the form of learning media. Learning media aims to create a fun and engaging learning atmosphere that can boost students'

enthusiasm, making it easier to achieve learning goals (Mustaqim, 2016). Various learning media, whether in print or electronic form, can be used by students to support learning (Winarsih, 2022). However, despite the many choices of learning media available, they should still be tailored to the predetermined learning goals (Sumiharsono & Hasanah, 2017).

Based on an interview on October 6, 2022, with one of the mathematics teachers at SMP Negeri 1 Jetis, information was obtained that the learning media used in the mathematics learning process is the mathematics book published by MGMP Mathematics Kabupaten Bantul as the main teaching material. Additionally, video learning materials are often used, extracted from YouTube and shared by teachers with students through WhatsApp groups for each class. However, according to the teacher, the use of videos in the learning process is less effective because not all videos align with students' preferences, with some being too lengthy and difficult to understand. From this description, it is evident that smartphones have not been maximally utilized in the mathematics learning process.

Furthermore, the interview revealed the need for teaching materials that can support mathematics learning. The current learning resources are not varied, and the teaching method used is lecturing, which leads to a predominantly one-way learning approach. Students feel bored and tend to be passive in the learning process. Therefore, an interactive E-Module will be developed, containing materials, instructional videos, sample questions, exercises, quizzes, and an attractive design. Flip PDF Professional is one of the easy and practical software tools for creating interactive E-Modules for those who are not familiar with programming languages (Saputra et al., 2022).

In addition to interviews, the researcher also distributed pre-research questionnaires to 30 seventh-grade students in class D through direct completion of observation sheets that had been distributed. Information regarding the variety of learning resources used by students is presented in Figure 1.

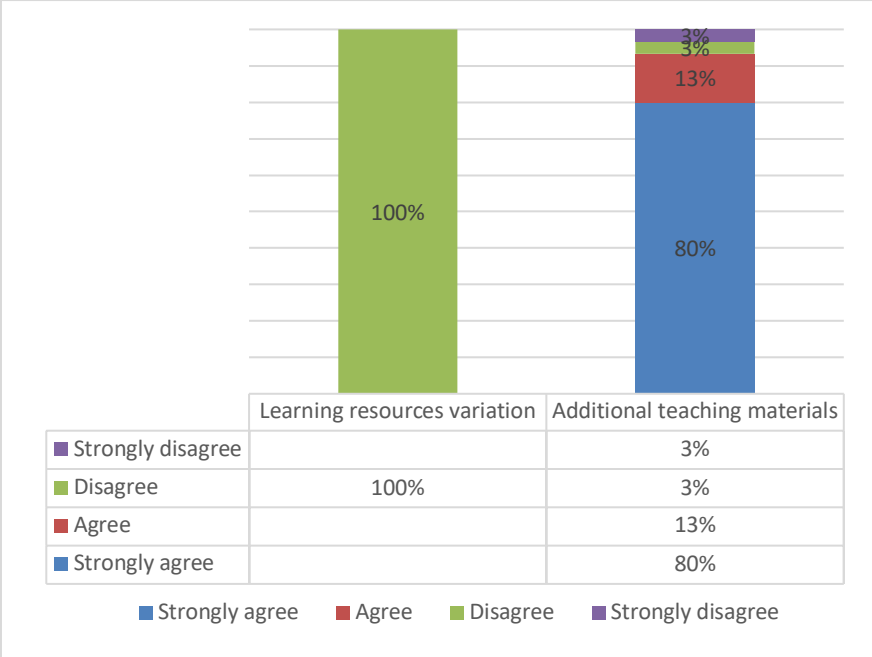

Figure 1. Survey results regarding learning resources variation

From Figure 1, it can be inferred that 100% of the students disagree that the current learning resources are varied, and 80% of the students strongly agree that additional teaching materials are needed. This is supported by the results of an interview with one of the mathematics teachers who expressed the need for teaching materials that can support mathematics learning. Therefore, in this

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study, an innovative teaching material will be developed, namely an e-module.

It was also mentioned in the interview that students' understanding of the concept of a single-variable linear equation (PLSV) is still low, with students struggling to simplify story problems into coherent mathematical sentences. Students also face challenges in solving contextual problems related to PLSV materials. To enhance conceptual understanding, students can be encouraged to learn from problems close to their daily environment. In the learning process, students should play an active role, actively seek and combine information, allowing them to construct the concepts they have learned. A suitable approach for this is the contextual approach or Contextual Teaching and Learning (CTL). According to Hasibuan (2014:2), CTL is a learning concept that emphasizes the relationship between the material learned and the real-life situations of students, encouraging them to connect their knowledge with everyday problems. Therefore, this research will develop an interactive e-module based on CTL for the topic of single-variable linear equations. Particularly, this paper tried to present the evaluation of the developed e-module in the level of validity and practicality.

Method

In this research, the Research and Development (R&D) method is employed. The development model used in this research is the ADDIE model (Analysis, Design, Development, Implementation, Evaluation). The study is conducted at SMPN 1 Jetis with 30 participants from class VIID as the research subjects. The instruments used in this research include interview sheets, validation sheets, and response questionnaire sheets. The validation sheet is utilized to assess the validity of the developed e-module. Meanwhile, the student response questionnaire is conducted to understand the students' feedback on the developed e-module.

Results and discussion

Analysis of e-module validity

The results of the assessment of the e-module by subject matter experts and media experts, as well as the responses from student questionnaires, are then analyzed as follows:

Analysis of subject matter expert validation data

The results at this stage are obtained by analyzing the data from the assessment of two subject matter experts on the e-module, consisting of five aspects and 28 statement items. The following is the subject matter expert validation data (Table 1).

Table 1. Validation results from content expert

Evaluation Aspect	Validator		Total Score	Average
	I	II		
Content Validity	41	37	78	3,54
Language Validity	15	16	31	3,875
Presentation Validity	27	25	52	3,71
Contextual Teaching and Learning (CTL)	11	11	22	3,67
Critical Thinking Skills	11	12	23	3,83
Total Score	105	101		
Average	3,75	3,61		
Average Total Score by Validators	3,68			
Criteria	Strongly valid			

Overall, the highest score among the five assessment aspects is in the language validity aspect with an average score of 3.875. Meanwhile, the lowest score is in the content validity aspect with an average score of 3.54. Furthermore, based on the calculation and evaluation by subject matter experts on the E-Module, the average total score by validators is 3.68. Considering the validity interpretation guidelines in Table 1, it can be observed that this average falls into the category of very valid ($3 \leq \bar{x} \leq 4$).

Analysis of media expert validation data

The results at this stage are obtained by analyzing the data from the assessment of two media experts on the E-Module, consisting of two aspects and 15 statement items (Table 2).

Table 2. Validation results from media expert

Evaluation Aspect	Validator		Total Score	Average
	I	II		
Overall Appearance	32	40	72	3,6
Media Effects on Learning Strategies	16	20	36	3,6
Total Score	48	60		
Average	3,2	4		
Average Total Score by Validators	3,6			
Criteria	Strongly valid			

Overall, both assessment aspects have the same average, which is 3.6. Furthermore, based on the calculation results from the media expert assessment of the E-Module application, the average total score by validators is 3.6. Considering the validity interpretation guidelines in Table 2, it can be observed that this average falls into the category of very valid ($3 \leq \bar{x} \leq 4$).

Based on the results of the validity analysis of the E-Module obtained from the assessments by subject matter experts and media experts, it can be concluded that the interactive E-Module based on Contextual Teaching and Learning (CTL) on the topic of single-variable linear equations is declared highly valid for use in learning.

Analysis of e-module practicality

The results at this stage are obtained by analyzing the data from the questionnaire responses of students regarding the practicality of the E-Module, consisting of four aspects and 21 questions.

Results of the small-scale trial

The data obtained through the trial with five students from class VII D regarding their responses to the E-Module are as follows (Table 3).

Overall, the highest score among the four assessment aspects is in the overall appearance aspect with a percentage of 93.57%. Meanwhile, the lowest score is in the content presentation aspect with a percentage of 87.5%. Furthermore, based on the calculation of student responses to the practicality of the e-module, the average percentage obtained is 90.72%. Considering the practicality interpretation guidelines in Table 3, it can be observed that this percentage falls into the category of very practical ($75\% \leq RS \leq 100\%$).

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Table 3. Small scale testing results

Evaluation Aspect	Student Assessment Score					Score Total	Percentage
	1	2	3	4	5		
Overall Appearance	27	24	26	26	28	131	93,57%
Content Presentation	14	14	14	14	14	70	87,5%
Benefits	25	26	25	24	25	125	89,29%
Suitability of CTL with Critical Thinking Skills	11	12	10	11	11	55	91,67%
Total Score	77	76	75	75	78		
Percentage Value	91,67%	90,48%	89,29%	89,29%	92,86%		
Average Percentage			90,72%				
Criteria			Very practical				

Results of the large-scale testing

The data obtained through the trial involving 30 students from class VII D regarding their responses to the E-Module are as follows (Table 4).

Table 4. Large scale testing results

Total Score of Assessment for All Students in Each Aspect				Total Score	Percentage
Overall Appearance	Content Presentation	Benefits	Suitability of CTL with Critical Thinking Skills		
732	402	719	313	2166	85,95%

Overall, it can be concluded that the highest rating from students is given to the statement "The appearance of the E-Module is attractive" with a score of 111 out of 120 points (92.5%). Meanwhile, the lowest score is 96 out of 120 points (80%), which is related to the statement "Examples of problems in the E-Module related to everyday life." Based on the results of the calculation of 30 questionnaires from students in class VII D, a total score of 2166 with a percentage of 85.95% is obtained. Considering the practicality interpretation guidelines in Table 9, it can be observed that this percentage falls into the category of very practical (75% ≤ RS ≤ 100%).

Based on the practicality analysis of the E-Module obtained from the small and large-scale trials, it can be concluded that the interactive E-Module based on Contextual Teaching and Learning (CTL) on the topic of single-variable linear equations is considered very practical for use in learning. Therefore, overall, the interactive E-Module based on Contextual Teaching and Learning (CTL) on the topic of single-variable linear equations is highly valid and very practical for use in the implementation of learning.

Conclusion

The result of this research is an interactive E-Module based on Contextual Teaching and Learning (CTL) on the topic of Single-Variable Linear Equations in the form of an Android application. This product was developed using the ADDIE development model (Analysis, Design, Development, Implementation, and Evaluation). Based on the research conducted, the conclusions obtained are as follows:

1. The interactive e-module based on Contextual Teaching and Learning (CTL) on the topic of linear equation in one variable is declared very valid after obtaining an average total validator

score of 3.68 by content experts and 3.6 by media experts.

2. The interactive e-module based on Contextual Teaching and Learning (CTL) on the topic of linear equation in one variable is declared very practical after obtaining a percentage of 90.72% in the small-scale trial and 85.95% in the large-scale trial.

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