



Development of E-Module Teaching Materials with a Scientific Approach: A Buddhist Learning on Educational Technology

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ABSTRACT

The purpose of this research is to develop teaching materials in the form of interactive e-modules with a scientific approach to Buddhist material and cultural diversity in Indonesia. This research and development is carried out because the learning process in schools is still conventional, namely the lecture method, and is fixated on the guidebook, and the use of media has not been carried out optimally. The delivery of each material requires a more attractive display and other supporting sources so that it is easy for students to understand. Along with technology development in the learning process, media can be used in learning materials, such as e-module teaching material products. So that students are expected to more easily understand the material and learning becomes more effective and efficient. The method used in this study is research and development or research and development (R and D) level 3. The steps used are several steps, namely researching and developing existing products. The subject of this research is students. The data collection technique uses observation sheets for product validation, the one-group pretest-posttest method, and analysis techniques using paired samples test. The overall assessment results given by the validators of material experts, media, and Buddhist teachers received an average score of 4.31 with a percentage of 86% in the very decent category.

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Introduction

The development of information and communication technology in the digital era has brought significant changes in various aspects of life, including in the world of



education. Digital transformation in learning has become necessary to improve the quality and effectiveness of the teaching and learning process (Hasanah et al., 2023).

The use of technology in learning is not only a demand of the times but also a solution to create more interactive, efficient, and exciting learning for students. Learning Buddhist Education as one of the compulsory subjects in schools also needs to adapt to this technological development. Based on initial observations, several problems were found in learning Buddhist Education. The learning process is still dominated by conventional methods in the form of lectures and is highly dependent on textbooks. The use of learning media is still minimal and has not utilized the potential of technology optimally. This condition impacts students' low interest and understanding of learning materials (Ramadhani, 2023).

Buddhist material and cultural diversity in Indonesia is one of the essential subjects that requires an in-depth understanding from students (Candra et al., 2023). This material is not enough to be delivered only through lecture and textbook methods but requires more interesting visualization and interaction to facilitate students' understanding (Musaad & Suparman, 2023). Developing technology-based teaching materials in the form of e-modules with a scientific approach is one of the solutions that can be applied. E-modules as digital teaching materials have several advantages over conventional teaching materials (Karima et al., 2022). In addition to being more practical and accessible, e-modules can be equipped with various multimedia content such as images, audio, video, and animation that can improve student understanding. The scientific approach in the e-module also encourages students to think critically, analytically, and systematically through observing, questioning, trying, reasoning, and communicating.

Developing e-modules with a scientific approach is expected to solve existing learning problems. Through e-modules, students can learn independently more engagingly and interactively (Pratama et al., 2020). Teachers can also more easily deliver learning materials with the help of technology integrated into e-modules. Based on this background, this research aims to develop e-module teaching materials for students with a scientific approach to Buddhist subjects, Buddhist materials, and cultural diversity in Indonesia. This development will produce valid, practical, and effective teaching materials to improve student understanding and learning outcomes. In addition, this study also aims to determine the feasibility of e-modules developed based on the assessment of material experts, media experts, and education practitioners, as well as to test their effectiveness in improving student learning outcomes.

The results of this research are expected to contribute positively to developing digital teaching materials for Buddhist education subjects and provide a model for developing technology-based teaching materials that can be adapted for other subjects. The development of this e-module is also in line with efforts to modernize education and improve the quality of learning in the digital era.

Method

This research uses a research and development (R&D) method with a development model consisting of several stages: needs identification, product design, validation, and product testing (Sugiyono, 2021b). The subjects of the study were seven students in grade VIII. Data was collected through observation, interviews, and one-group pretest-posttest methods. Data analysis was carried out using the "paired samples test" test to determine the effect of using e-modules on student learning outcomes.

This research process follows a series of systematic stages visualized in Chart 1. This diagram presents a graphical representation of the methodological flow taken, providing a clear and structured framework for the implementation of the study.

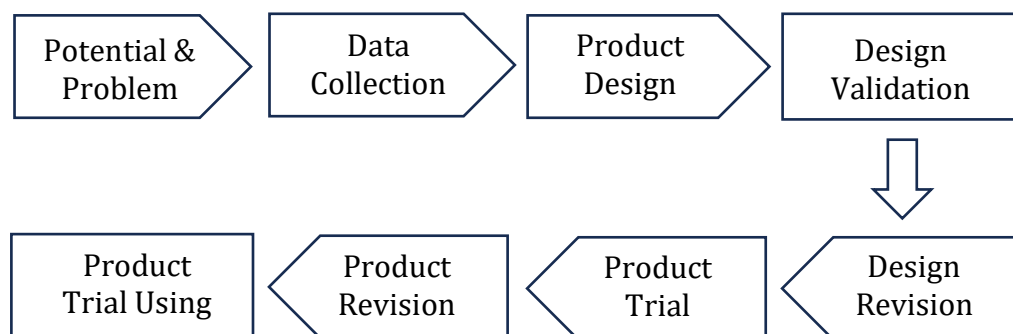


Figure 1. Steps to Use Research and Development Methods
(Sumber: Sugiyono 2021)

Data Collection Instruments. Data was obtained through research instruments in the form of observations and interviews. Observation is a biological and psychological process related to human behavior, work processes, and natural phenomena, especially if the number of observed respondents is not too large (Sugiyono, 2021). Then, the interview is a data collection method where the researcher collects information by asking the interviewee questions (Sugiyono, 2021). This data collection technique is used to identify problems at the preliminary study stage in Junior High School. The research stage uses an instrument in the form of a questionnaire as a measurement tool. This evaluative instrument aims to measure the quality of the media developed by involving assessments from validators consisting of learning media experts, material experts, Buddhist education teachers, and researchers as internal evaluators in the learning media development process.

In measuring the feasibility level of the android-based mobile application "CATRA" with a gamification approach, this study adopts measurement using the Likert Scale. According to Riduwan (2008: 12) in research (Susanto et al., 2023), The Likert scale is a measurement instrument used to quantify the attitudes, opinions, and perceptions of individuals or groups towards certain social phenomena (Situmorang et al., 2020). This instrument uses an assessment gradation with five categories, namely: very feasible (score 5), decent (score 4), moderately feasible



(score 3), less feasible (score 2), and not viable (score 1), which indicates a gradation of answers from very positive to very negative (Sumartini et al., 2020). The data analysis technique used to manage data from the results of validator analysis and trials in developing android-based learning media 'CATRA,' with a gamification approach using descriptive analysis of percentages using a Likert scale.

Findings

The procedure for collecting data and information in the research includes observations, interviews, and theoretical studies from various sources. The first step taken by the researcher is observation. Observation is a data collection technique involving objects, subjects, and other aspects relevant to the research. During the observation process, the researcher obtained data on learning conditions, the number of students, the curriculum used in schools, and the learning process. In addition, the researcher conducted interviews with Buddhist education teachers at state junior high schools. The results of interviews with Buddhist education teachers at State Junior High Schools show that learning has used learning media, but it has not been fully integrated into the learning process. The methods used include lectures, discussions, assignments, and others.

Based on the preliminary study, which includes teacher interviews and observations of Buddhist learning activities at SMPN, the answers to the interviews with Buddhist education teachers and the observation results are used as the primary sources in analyzing the findings on the aspects that are the focus of the preliminary study. The results of the analysis of the findings are a reference for the next step, namely, the development of interactive learning materials. The media application in this study includes implementing media validation tests carried out by testing learning media experts, Buddhist Education material experts, and Buddhist Teacher validation. After product validation tests by the three experts, product revisions are carried out to identify the product's shortcomings.

Results of the validation test of media experts, material experts, and validation of Buddhist education teachers. Based on the results of the validation of media experts, the researcher has obtained data on the assessment of the design of the learning media product that has been devoured. The evaluation results from media experts are calculated based on the question items in the observation questionnaire on product validation.

Table 1. Recapitulation of the Results of Material Expert Validation

No.	Indicator	Score	X
1.	Norm	31	4,43
2.	Procedures	16	4,00
3.	E-module	9	4,5
4.	Content Relevance	32	4,57
Sum			88
Average			4,38

Source: 2024 research data processing results

Based on Table 1 regarding the recapitulation of validation by material experts, it can be seen that the average score of 4.38 includes the aspect of rules: 4.43, the Aspect of governance: 4.00, the Aspect of e-module: 4.5, the Aspect of relevance of content: 4.57 and the percentage is included in the feasible category. Based on a validation review by Buddhist education learning material experts, it was found that comments and notes regarding this interactive media were made; comments by material experts revealed that: "The colors in the e-book are adjusted, the words must vary." Based on comments and suggestions from experts in Buddhist education subjects, the following revisions were made to the media.

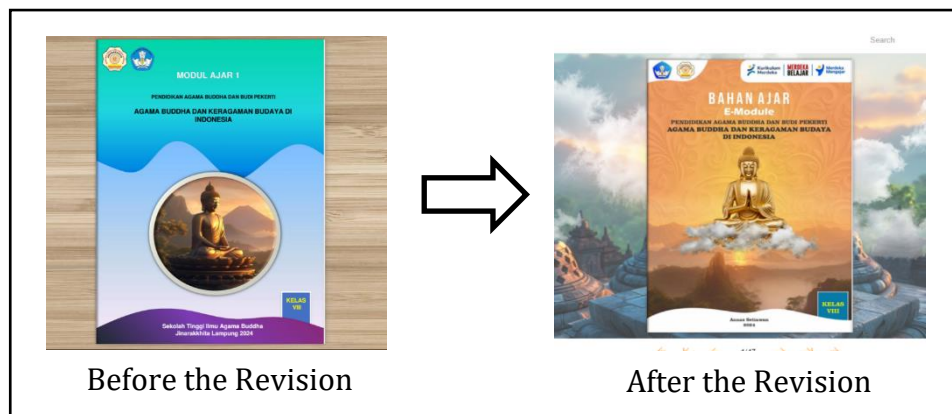


Figure 2. Display Change Scheme

The revision is carried out in the context of changes in conveying competency standards, essential competencies, indicators, and learning objectives. The next revision will change the appearance of the material to include attractive nuances. Furthermore, based on the results of the validation of media experts, the researcher has obtained data on the assessment of media concepts in the learning materials that have been created. The results of the recapitulation of the validation results by media experts are based on indicators, indicators that are analyzed, and the results described in the table below.

Table 2. Recapitulation of the Results of Material Expert Validation

No.	Indicator	Score	X
1.	Norm	69	4,6
2.	Procedures	13	4,33
3.	E-module	36	4,5
4.	Content Relevance	52	4,42
Sum			171
Average			4,46

Source: 2024 research data processing results

Based on Table 2 regarding the recapitulation of validation by material experts, it can be seen that the average score of 4.46 includes the aspect of rules: 4.6, the Aspect of governance: 4.33, the Aspect of e-module: 4.5, the Aspect of the relevance of

content: 4.42 and the percentage is included in the category of feasible. Based on a validation review by a media expert on Buddhist education learning materials, it was found that comments and notes regarding this interactive media and comments from material experts revealed that: "Add logos, etc., color consistency, provide ease of access to learning media." Based on comments and suggestions from experts in Buddhist education subjects, revisions were made to the media as follows.

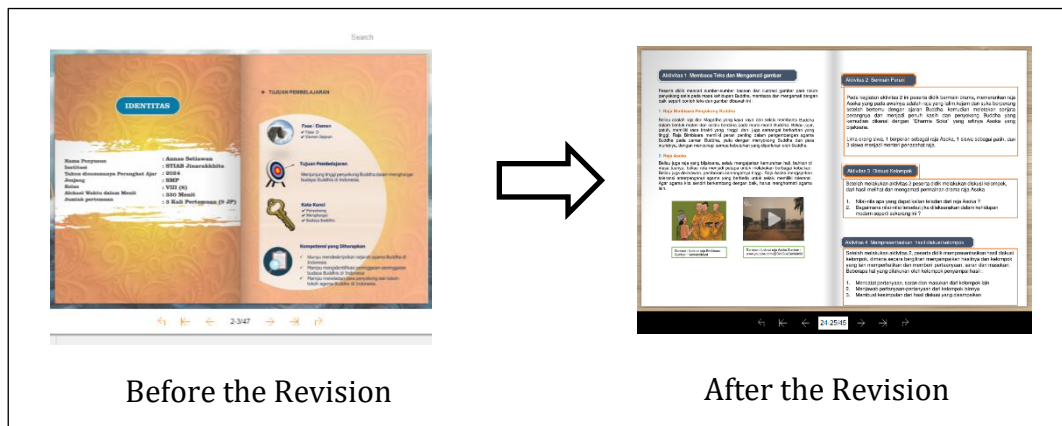


Figure 3. Display Change Scheme

The revision is carried out in the context of changes in conveying media, features, user satisfaction, and ease of access. The next revision will change the appearance of the material to include attractive nuances. Furthermore, based on the results of the validation of Buddhist teachers, researchers have obtained data on the assessment of the concept of learning materials that have been created. The results of the validation recapitulation by Buddhist teachers are based on indicators, the combination of indicators analyzed, and the results described in the table below.

Table 3. Recapitulation of the Results of Validation of Buddhist Teachers

No.	Indicator	Score	X
1.	Norm	67	4,47
2.	Procedures	11	3,67
3.	E-module	34	4,25
4.	Content Relevance	48	4
Sum			160
Average			4,10

Source: 2024 research data processing results

Based on Table 4.15 regarding the recapitulation of validation by Buddhist teachers, it can be seen that the average score of 4.10 includes the aspect of rules: 4.47, the Aspect of governance: 3.67, the Aspect of e-module 4.25, the Aspect of relevance of content: 4.10 and the percentage is included in the category of feasible. Based on a validation review by Buddhist education teachers, it was found that comments and notes on this interactive media were given, and comments provided by material experts revealed that: "create a supporting source that is not in the printed book."

Based on comments and suggestions from Buddhist education teachers, the following revisions were made to the media.

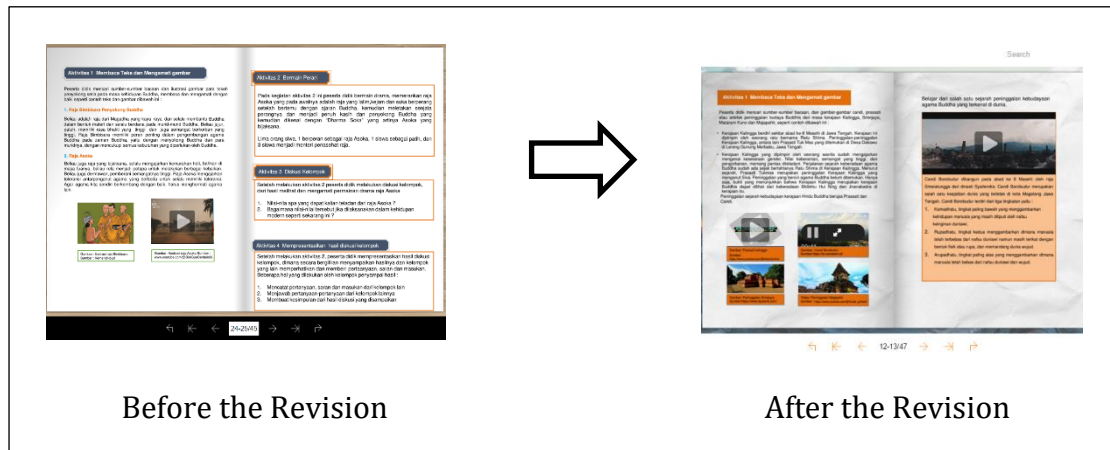


Figure 4. Display Change Scheme

The revision is carried out in the context of changes in conveying media, features, user satisfaction, and ease of access. The next revision was made to change the appearance of the material with interesting nuances.

Product Trial Results

The test design will be carried out on seven students in grade VIII. The data from the trial results will be used as a foothold in revising the e-module teaching material product and is the final result in the development of e-module teaching materials. The results of the product trial are described below.

Table 4. Before and After Product Usage Values

No.	Before	After
1.	40	85
2.	50	90
3.	45	80
4.	35	75
5.	30	85
6.	40	88
7.	25	70
Sum	265	573
Average	37,9	81,9
Min	25	70
Max	50	90

Source: 2024 Researcher Data

Based on table 4 explains the results of the first product test of 7 students who got a score before using the media got a total score of 265 with an average score of



37.9. Students with sequence number 2 obtained the most miniature score of 25. The most significant score was a score of 50, and then the researcher applied e-module teaching materials to Buddhist learning to increase student scores. The e-module applied to 7th-grade students does not distinguish between genders. The score obtained after using the media received a total of 573, with an average of 81.9, and the most miniature score obtained by students was 70, with the most significant score of 90. The difference in the number of scores obtained is $573 - 256 = 317$. The researcher used the Paired Sample T Test to determine the significant difference between the values obtained before and after using the media. Determining a Hypothesis.

H_o : There is no difference between the average grades before using the medium and an average score after using the e-module.

H_a : There is a difference between the average score before using the media and the average score after using the e-module.

The test uses a double-sided test with a significance level of $\alpha = 5\%$. In this case, the significance level means that the researcher risks making the wrong decision to reject the correct hypothesis by as much as 5% (importance of 5% or 0.05 is the standard measure often used in research). The results are shown in the table below.

Table 5. Paired Samples Statistic

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Before	37,86	7	8,591	3,247
	After	81,86	7	7,244	2,738

Source: SPSS for Windows data processing

According to Table 6, data processing results in the Paired Samples Statistics table show the standard deviation results before and after using the 8,591 dan 7,244 by the number of samples seven average 37,86 and 81,86. Next, the correlation table is described.

Table 6. Paired Samples Correlations

		Pair 1
		Before-After
Paired Differences	Mean	-44,000
	Std. Deviation	6,481
	Std. Error Mean	2,449
	95% Confidence Interval of the Difference	-49,994
		-38,006
		Lower
		Upper
T		-17,963
Df		6
Sig. (2-tailed)		,000

Source: Data processing SPSS for Windows



Based on Table 7, the results of data processing before and after the use of media were described as a correlation value of 0.677 with a significance of 0.095, so it can be said between the two variables: The result of 0.677 means less significance with a significance level of 0.05 greater than 0.095 in the table.

Table 7. Paired Samples Correlations

Paired Samples Correlations				
		N	Correlation	Sig.
Pair 1	Before & After	7	,677	,095

Source: SPSS for Windows data processing

Table 7 presents the results of the t-value test; from the table above, the t-value is -17.963. The t-distribution table is sought at $\alpha = 5\%$ (2-sided test) with degrees of freedom (df) $n-1$ or $7-1 = 6$. By 2-sided testing (significance = 0.05), the results were obtained for the t table 1,943. Testing criteria:

Ho accepted if $-t_{table} \leq t_{count} \leq t_{table}$

Ho rejected if $-t_{count} < -t_{table}$ or $t_{count} > t_{table}$

Based on probability:

Ho accepted if the P value $> 0,05$

Ho rejected if the P value $< 0,05$

Furthermore, to compare the t calculation with the t table and probability according to the test criteria with the value $-t_{count} < -t_{table}$ ($-17,963 < -1,943$) and P value ($0,00 < 0,05$) then, Ho was rejected, and Ha was accepted. Therefore, from the test results based on the criteria that have been made with the comparison value $-t_{count} < -t_{table}$ ($-17,963 < -1,943$) and P value ($0,00 < 0,05$), then it can be concluded that there is a difference between the average score before using the media and the average score after using the press. The results of product validation tests by learning media experts and Buddhist education subject matter experts have been carried out. The results of the recapitulation of the validation results by media experts based on five indicators. This validation is intended to anticipate errors in users (learners). Material experts provide assessments on learning aspects and material content, while media experts provide assessments on display aspects and programming aspects.

Table 8. Recapitulation of Validation Results

No	Aspects	Media Expert			Material Expert			Religious Teacher			Total		
		Score	Mean	KT	Score	Mean	KT	Score	Mean	KT	ST	MT	KT
1	Norm	69	4,6	SL	31	4,43	SL	67	4,47	SL	167	4,4	SL
2	Procedures	13	4,33	SL	16	4	L	11	3,67	L	40	4	L
3	E-module	36	4,5	SL	9	4,5	S	34	4,25	SL	79	4,42	SL
4	Content Relevance	53	4,43	SL	32	4,57	SL	48	4	L	133	4,33	SL
		171	4,47	SL	88	4,38	SL	160	4,10	L	419	4,31	SL

Source: Researcher Data Processing in 2024



Discussion

The results of the product validation test obtained the results for the validation test by material experts, who got an average score of 4.38 with a total score of 88 and a percentage of 88%. Meanwhile, the media expert test gave an average score of 4.47, with a total score of 171 and a rate of 89%. Furthermore, the review of Buddhist teachers gave an average score of 4.10 with a total score of 160 and a percentage of 82%, and the three validation tests were then totaled to get a comprehensive picture of the two internal tests that had been carried out. The results of the second test obtained a total score of 419 with an average answer score of 4.31 with a percentage of 86%; then, the media passed the validation test with an average assessment that the media is classified as very feasible. An overview of the results of the analysis of indicators with the product validation test obtained results with four aspects that were analyzed with an average result of 86% test presentation included in the high category with the following description. The feasibility aspect of the rules in the internal test of the product is included in the very feasible category with a percentage of 90%, so the teaching materials developed are said to have a very feasible category in the feasibility of the rules aspect with a total score of 167 and an average of 4.5. So, there is an indication that the conformity of the content of the teaching materials with the Basic Competencies (KD) and Learning Objectives is appropriate. The correctness of the material concept described in the teaching materials is also applicable when viewed scientifically. The presentation of the material in the teaching materials has been described in detail. The topics discussed in the learning materials are correct, and the material described has been broken down. The scope of the material is comprehensive, and the teaching materials thoroughly discuss the content depicted. The suitability of the difficulty level and abstraction of material concepts following the cognitive development of junior high school students in grade VII. The relevance of material examples following the conditions in the surrounding environment. The clarity of the examples given. The clarity of the examples given. The accuracy of the material and examples is appropriate to develop learning independence. Accuracy of materials and examples to develop learning independence. The evaluation given is following the material and learning objectives. Return the answers to the questions given correctly. The accuracy of the example story with the material is appropriate, and the content of the material's cognitive, psychomotor, and affective aspects follows the content of the teaching materials.

The feasibility of the governance aspect in the internal test of the product is included in the feasible category with a percentage of 80%. So, the jar material developed has a suitable category in the feasibility of the governance aspect, with a total score of 40 and an average of 4. So, there are indications that users are satisfied with the performance and results obtained from using teaching materials. User needs are fulfilled by following expectations so students can learn effectively and efficiently. In addition, the material presented in the teaching materials is suitable for the topic and learning needs of users, both teachers and students. The feasibility of the e-module aspect in the internal test of the product is included in the excellent category with a percentage of 88%, so the teaching materials developed can be said to have a



very feasible category in the feasibility of the e-module aspect with a total score of 79 and an average of 4.42. So, there is an indication that teaching materials will be easily accessible to users at any time so that their learning time will not be hindered.

The e-module teaching materials also provide effective performance in supporting user goals. Teaching materials provide the necessary materials to achieve the purpose of use in the learning process so that learning that was previously boring with these teaching materials can be supported. The achievement of learning goals. It can be used efficiently to minimize the cost of learning and teaching—using teaching materials results in achieving optimal results following the desired goals. Offer effective material delivery solutions for users. It can maintain the privacy and security of user data well so that users will be satisfied when using this lesson board because they do not feel worried about their privacy data. Teaching materials also provide exciting features and motivate users to learn. The feasibility of the content relevance aspect in the internal product test is included in the excellent category

with a percentage of 87%, so the teaching materials developed can be said to have a very feasible category in the feasibility of the content relevance aspect with a total score of 133 and an average of 4.33. This is so that there is an indication of clear and concise material coverage, and the questions given also follow the topic and are suitable for students' cognition. The flow of the material described is easily understood through appropriate language and terms and can encourage students' curiosity. The design and consistency of the teaching materials can also support learning so that learning is exciting and the expected learning goals can be achieved. Preparing materials and designs can also help students understand the material quickly. The type and size of the text in this e-module teaching material can also help students read the material clearly and appropriately. So, when viewed from the perspective of the overall relevance of the content in the category, it is very feasible to apply it to Buddhist education in 7th grade at the junior high school level.

Conclusion

The conclusion of this study shows the procedure for developing e-modules on Buddhism and Cultural Diversity in Indonesia for 7th-grade students following the research and development with the level 3 method. The following are the stages used: 1) Needs Analysis: Determine the potential problems in the learning process in the classroom, including the lack of interactive and exciting learning media for students. 2) Product Design: Structuring content based on the curriculum, including core and foundational competencies, indicators, and specific learning objectives. At this stage, the storyboard has several parts: cover, identity, learning objectives, learning activities, materials, and evaluations. The content of the e-module involves text, images, audio, video, and evaluation questions to test students' understanding. 3) Product Development: E-modules are developed using software such as Microsoft Word 2021 and Flip PDF Professional to create interactive displays. The development includes selecting attractive visual designs and presenting materials



adapted to the characteristics of grade VIII students. 4) Product Validation: Engage material experts, media experts, and teachers to ensure the e-module meets the eligibility criteria. This validation includes assessing the content, rules, governance, and relevance to the curriculum. 5) Product Trial: Conducted in schools with a one-group pretest-posttest model. Students use e-modules to learn, and the results are compared before and after use to measure the improvement of learning comprehension and effectiveness. 6) Revision and Refinement: Based on input from trials and validations, revisions are made to improve the quality and ease of use of the e-module before it is widely implemented in the classroom. These steps ensure that the e-module is developed with the need for practical and interactive learning in mind, following Buddhist material and cultural diversity in Indonesia. The e-module on the material "Buddhism and Cultural Diversity in Indonesia" for grade VIII is considered very feasible to develop and use. Based on the validation results involving material experts, media experts, and teachers, this e-module received an average score of 4.31, equivalent to a percentage of 86% in the very feasible category. The e-module on the material "Buddhism and Cultural Diversity in Indonesia" for grade VIII can be developed and used. Based on the validation results involving material experts, media experts, and teachers, this e-module received an average score of 4.31, equivalent to a percentage of 86% in the very feasible category. These assessments are based on various aspects, including the suitability of the content with the curriculum, the clarity of the material, and the interactivity of the modules that help facilitate student understanding. In addition, the trial's results using the pretest-posttest model showed a significant improvement in student understanding, where the average post-test score (81.9) was higher than the pre-test score (37.9). With this achievement, the e-module is considered effective in improving learning outcomes and is very feasible to be used as an interactive learning medium on Buddhism and Cultural Diversity materials.

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