

Development of Technology-Based Teaching Materials in Islamic Religious Education Subjects

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Abstract: This study is motivated by the limited use of interactive and technology-based teaching materials in Islamic Religious Education (PAI), which often relies on conventional lecture methods and results in low student engagement and motivation. The objective of this research is to develop and evaluate the feasibility of technology-based teaching materials in the form of an interactive e-module for junior high school students. The study employs a Research and Development (R&D) method using the Four-D model, consisting of the Define, Design, and Develop stages. Data were collected through expert validation involving lecturers and teachers, as well as student response questionnaires using a Likert scale. The results show that the developed teaching materials are highly feasible, with an average score of 4.65 from both media and material experts, categorized as very appropriate. Student responses also indicate positive perceptions, with an average score of 4.25, reflecting high acceptance and usability. The integration of multimedia elements, such as text, images, videos, and interactive features, enhances student engagement and understanding. This study contributes to the development of innovative, flexible, and student-centered learning resources, supporting independent learning and improving the overall quality of Islamic Religious Education in the digital era.

Keywords: Four-D 4d Model; Islamic Education; Technology; Teaching Materials

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INTRODUCTION

The development of the world of education is now starting to be considered, in this modern era, the presence of technology currently requires educators to be ready to face the millennial generation, namely a generation where they are faster than what they are taught regarding the use of technology. One of the uses of technology in education is looking for learning materials that can be easily searched on the internet, so advances in technology and information have changed the way people learn. Technological sophistication provides a big response in playing an important role in educating the nation, so technology must be utilized as fully as possible to achieve better educational goals (Aziz, 2015)

In general, the Islamic Religious Education learning process at junior high school level is delivered using lecture, question and answer and discussion methods. The lecture method is usually called *mauidzah hasanah*, namely by delivering material persuasively to students (Aras & Arhas, 2022). This method is considered very passive for students, because there is no interaction between educators and students, where communication is only one way from the teacher, so students do not get space to express their opinions. Especially in Islamic Cultural History material, direct involvement of students is very important in understanding the explanations given by educators (Yulaika et al., 2020). Apart from that, in presenting the material, the teacher seems to be too oriented towards the material contained in the curriculum, textbooks and is not connected enough to social and technological issues as well as problems that exist in society which are related to the subject matter to be discussed. This condition causes Islamic Religious Education learning to be less meaningful for students, and reduces students' interest and motivation to learn (Subhan & Novianti, 2021).

The integration of technology into education has been widely recognized as an important factor in improving learning experiences and outcomes. Several theories and empirical studies support the effectiveness of technology-based teaching materials, particularly in making the learning process more engaging and effective. One prominent theoretical framework is the Technology Acceptance Model (TAM), developed by Davis (1989). TAM posits that perceived ease of use and perceived usefulness significantly influence user acceptance of technology. When applied to education, these factors indicate that if students find technology-based materials easy to use and beneficial for their learning, they are more likely to utilize these tools, thereby enhancing their educational outcomes.

Another relevant theory is the Constructivist Learning Theory, which emphasizes the importance of active learning where students construct their own understanding and knowledge through experiences. Jonassen et al. (1999) argue that technology can provide interactive and immersive environments that support constructivist learning principles. For example, multimedia elements such as videos, animations, and interactive simulations can help students better grasp complex concepts by providing concrete visual examples.

Empirical evidence also supports the positive impact of technology-based instructional materials. A study by Garrison and Anderson (2003) on e-learning

showed that students engaged with interactive and multimedia-rich content demonstrated better understanding and information retention compared to those using traditional textbooks. This is reinforced by Mayer's Cognitive Theory of Multimedia Learning (2001), which states that multimedia presentations can enhance learning by providing multiple representations of information, thereby catering to different learning styles and improving cognitive processes.

Research specifically focusing on Islamic Education (PAI) also highlights the benefits of integrating technology. A study by Hussain and Suleiman (2019) found that the use of digital resources such as educational applications and online platforms significantly increased student engagement and understanding in Islamic studies. Similarly, Al-Mahdi and El-Far (2018) showed that incorporating videos and interactive quizzes in PAI lessons enhanced student motivation and participation, leading to better academic performance.

The findings from these studies are echoed in this research, which aims to develop and validate technology-based PAI teaching materials. By integrating various digital elements such as text, images, videos, and animations, the developed materials received high ratings from both experts and students, indicating their effectiveness and feasibility. The innovative approach of making these materials accessible via smartphones and other digital devices aligns with the learning preferences of the millennial generation, addressing the need for modern, engaging, and flexible educational resources.

In conclusion, theoretical foundations and empirical evidence strongly support the development and implementation of technology-based instructional materials. These resources not only make learning more interactive and engaging but also cater to the diverse needs and preferences of today's students. The integration of technology into PAI education, as demonstrated in this research, offers a promising solution to the challenges faced by traditional teaching methods, ultimately enhancing the overall quality and effectiveness of the learning experience.

In this study, there are several differences and updates that make it innovative compared to previous research: **Integration of Modern Technology:** This study emphasizes the development of technology-based instructional materials that are not limited to the use of audio-visual media but also integrate various modern digital elements such as text, images, videos, and animations. This differs from previous research that might focus on just one type of media. Thus, the resulting teaching materials are more interactive and engaging for students.

Focus on Millennial Student Needs: This study considers the characteristics of the millennial generation who are more familiar with technology and digital devices. Previous research might not specifically target the needs and learning habits of this generation. By developing teaching materials that can be accessed via smartphones and other digital devices, this study provides more relevant and accessible solutions for today's students.

Self-Directed Learning Approach: This study offers teaching materials that are not only used in classroom learning contexts but also encourage students to learn independently outside school hours. This is a significant update from

traditional learning methods that rely more on direct interaction between teachers and students. With digital teaching materials accessible anytime and anywhere, students have greater flexibility in managing their own learning time.

Connection to Social and Technological Issues: This study also emphasizes the importance of linking learning materials with social and technological issues relevant to students' daily lives. Previous research might focus more on delivering curriculum-based content without connecting it to the evolving social and technological context. Thus, the developed teaching materials become more contextual and meaningful for students.

With these differences and updates, this study is expected to contribute more significantly to improving the quality of Islamic Education at the junior high school level, as well as enhancing students' motivation and interest in learning through the optimal use of technology.

In the continuously evolving digital era, education is undergoing significant transformations with the integration of technology in the learning process. In Indonesia, Islamic Education (PAI) lessons at the Junior High School (SMP) level often still use traditional teaching methods that are less appealing to the millennial generation familiar with technology. This serves as the background for this research to develop interactive and engaging technology-based teaching materials and analyze their feasibility in PAI learning.

RESEARCH METHOD

This study employs the Research and Development (R&D) method to produce and test technology-based teaching materials for Islamic Religious Education (PAI) subjects. The aim is to develop innovative and effective products to support the learning process. The development model used is the 4D model developed by S. Thiagarajan and Dorothy S. Semmel, which consists of four main stages: Define, Design, Develop, and Disseminate. However, due to time and budget constraints, this study is limited to the Develop stage, effectively making it a 3D model: Define, Design, and Develop. The steps and procedures for developing the teaching materials are illustrated in Figure 1.

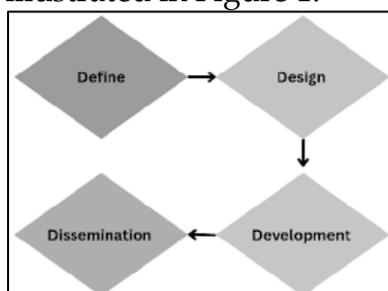


Figure 1. Development Procedure

As shown in Figure 1, the Define stage begins with a needs analysis to identify existing problems and determine the objectives for developing the teaching materials. This stage includes observations and interviews with teachers and students at Islamic Junior High School SMP Darussalam Pondok Labu to identify shortcomings in current PAI teaching methods and the need for

technology-based teaching materials. The output of this stage is a clear understanding of the needs and objectives of the development.

In the Design stage, researchers design technology-based teaching materials that align with the PAI curriculum and students' needs. This design includes creating storyboards, learning scenarios, and developing interactive multimedia content. Additionally, instruments for measuring the feasibility of the teaching materials are designed in this stage, including questionnaires for media experts, material experts, and students. The validation criteria for the questionnaires include aspects of clarity, relevance, engagement, and effectiveness of the teaching materials.

During the Develop stage, the designed teaching materials are created and tested. Initial testing is conducted through a small group trial involving 10 eighth-grade students at SMP Darussalam Pondok Labu. Data is collected through observations, interviews, and validated questionnaires. Data analysis is conducted descriptively to describe the development results and the feasibility of the teaching materials. To ensure transparency and replication of the evaluation process, this article outlines the criteria used for validating the expert and student response questionnaires.

For the media expert validation instrument, researchers analyze the data results based on validation scores obtained from assessments by media expert validators. This assessment determines whether the developed technology-based teaching materials are feasible for use. The expert validation assessment instrument consists of six aspects: material appropriateness, material completeness, material accuracy, material presentation technique, material presentation support, and language aspect. These aspects are assessed using an expert validation sheet via Google Form, utilizing a Likert Scale with five response options: strongly agree, agree, neutral, disagree, and strongly disagree, with a scoring scale of 1-5.

The student response questionnaire assessment is conducted through a small group trial to gauge students' responses to the developed technology-based teaching materials. The small group trial is carried out by having students fill out a student response questionnaire in Google Form with a rating scale of 1 to 5. This limited small group trial involves 10 eighth-grade students at SMP Darussalam Pondok Labu. The student response questionnaire contains 4 indicators with 10 questions.

Quantitative and qualitative data analysis is the technical data analysis carried out in this research. Qualitative data analysis in the form of suggestions and assessments from validators (Creswell, 2023). Suggestions and assessments from validators are used as guidelines for improving this teaching material product so as to create better teaching materials that can be implemented in Islamic Religious Education learning. Meanwhile, quantitative data comes from calculating the scores given in the validation questionnaire and student response questionnaires.

Analysis of data from student response questionnaires is obtained in the same way as analysis of expert assessment instruments. The criticism and suggestions given will be used as material for improving technology-based

teaching materials. This analysis is used to determine the level of suitability of teaching materials developed from validation that has been completed by expert validators.

RESEARCH RESULT AND DISCUSSION

In the product analysis activities carried out, problems were found in the form of limited use of teaching materials to help the learning activities carried out run smoothly. Next, the researcher makes an initial design of the teaching materials that will be developed. After the design of the teaching materials is finished, validation is carried out. This validation activity was carried out by 1 lecturer at Muhammadiyah University, Jakarta. The level of feasibility or validity of the product produced is obtained through a validation questionnaire instrument. The formula used in calculating the validation results is in Table 1. The aim is to obtain data from experts. The data and information obtained from the validators will later be used to determine the validity of the teaching materials. If the material and media do not meet the eligibility criteria, they will be revised according to advice from experts. For material validators, 4 Islamic religious education teachers from school and learning media validators.

At the validation stage of the media expert instrument, the researchers analyze the data results based on the validation values obtained from the assessment by the media expert validator. The assessment is carried out to see whether the technology-based teaching materials developed are suitable for use or not. The expert validation assessment instrument consists of 4 aspects, namely: Appearance (Design) Aspect, User Ease Aspect, Consistency Aspect, and Graphic Aspect (Syamriani et al., 2023). These four aspects will be assessed using an expert validation sheet via Google Form which is made with a Likert Scale with 5 alternative answers, namely strongly agree, agree, disagree, disagree and strongly disagree, with a rating of 1-5. The party carrying out the material validation assessment teaching includes 1 media expert lecturer, namely Mr. Rusjdy as a lecturer at the Islamic Religious Education Department, Muhammadiyah University, Jakarta.

Table 1. Results of Validation of Teaching Materials by Media Experts

No	Rated Aspect	Average Score	Criteria
1	Appearance Aspect (Design)	4,75	Very Decent
2	User Convenience Aspect	4,71	Very Decent
3	Consistency Aspect	4,61	Very Decent
4	Graphical Aspect	4,5	Very Decent
	Overall Rating	4,65	Very Decent

Validation of technology-based teaching material expert instruments is carried out with different instrument aspects between media experts and material experts, both by lecturers and teachers. The assessment of the validation

results of technology-based teaching materials will be used as improvement material so that they become teaching materials that are suitable for use in the learning process. Based on Table 4.3 which contains the average score from the expert validation assessment if converted according to Table 3.4, it can be concluded that technology-based teaching materials are included in the very appropriate criteria with an average score of 4.42. The results of calculating the assessment data from expert validators are contained in Appendix 5 and the assessment format by expert validators via Google Form is presented as follows.

At the validation stage of the media expert instrument, the researchers analyze the data results based on the validation values obtained from the assessment by the media expert validator. The assessment is carried out to see whether the technology-based teaching materials developed are suitable for use or not. The expert validation assessment instrument consists of 6 aspects, namely: material suitability, material completeness, material accuracy, material presentation techniques, material presentation support and language aspects. These six aspects will be assessed using an expert validation sheet via Google Form which was created using a Likert Scale with 5 alternative answers, namely strongly agree, agree, disagree, disagree and strongly disagree, with a rating scale of 1-5.

Table 2. Results of Validation of Teaching Materials by Material Experts

No	Aspects assessed	Average Score	Criteria
1	Material Feasibility Aspect	4,75	Very Decent
2	Aspects of Material Completeness	4,5	Very Decent
3	Aspects of Material Accuracy	4,7	Very Decent
4	Technical Aspects of Presenting Material	4,7	Very Decent
5	Supporting Aspects for Presentation	4,6	Very Decent
6	Language Aspect	4,65	Very Decent
	Overall rating	4,65	Very Decent

Assessment of student response questionnaires is carried out by conducting small group trials to determine student responses to the technology-based teaching materials that have been created. Small group trials were carried out by filling in student response questionnaires on Google Form with a rating scale of 1 to 5. Small group trials were carried out on a limited basis on 10 Class VIII students at Islamic Junior High School Darussalam *Pondok Labu*. The student response questionnaire contains 4 indicators with 10 questions. The following are the results of the analysis of student response questionnaires which are listed in table 5.

Table 3. Student Response Questionnaire Assessment Results

No	Aspects assessed	Average Score	Criteria
1	Views Teaching materials (Design)	4,75	Very Decent
2	Supporting the Presentation of Teaching Materials	4,71	Very Decent
3	Content of Teaching Materials	4,61	Very Decent

4	Use of Language in Teaching Materials	4,5	Very Decent
	Overall Rating	<u>4,65</u>	Very Decent

Based on Table 4.5, the average score of the converted student response questionnaire is in Table 3.4. Based on the results of this conversion, it can be concluded that technology-based teaching materials according to student responses are included in the Very Appropriate criteria with an average score of 4.25. The results of calculating student response questionnaire data are listed in Appendix 5.

Teaching materials are a set of learning facilities or tools that consist of learning materials, methods, limitations and ways of evaluating that are designed systematically and interestingly in order to achieve the expected goals, namely achieving competencies and subcompetencies (Suwito et al., 2023). The existence of teaching materials can help students learn something. All the information obtained from learning sources is then arranged in the form of teaching materials. This then opens up new discourse and vehicles for students because the teaching material presented is something new and interesting. Teaching materials also provide various types of teaching material options (Ordu, 2021). The choice of teaching materials in question is not limited to just one source, but from various learning sources that can be used as a reference in preparing teaching materials, so that it makes it easier for teachers to carry out learning. Teachers as facilitators in learning activities will make it easier because the teaching materials are prepared themselves and delivered in a way varied, and learning activities become more interesting (Tanggoro, 2015).

The development of technology-based teaching materials begins with the stages of initial analysis, student analysis, task analysis, concept analysis and formulation of learning objectives. The product produced in this research is technology-based teaching material in the form of an E-Module on Islamic Religious Education material. Then proceed with designing teaching materials, and making assessments of technology-based teaching materials for expert validators and student response questionnaires. After the teaching materials are designed, the next step is to create technology-based teaching materials which will be assessed by expert validators. Teaching materials with appropriate assessment criteria are obtained after going through a validation process from validators and assessing student responses by means of small group testing. Technology-based teaching materials that have been created based on the results of this research have been proven to be suitable for use in the learning process after being validated by expert validators.

In this stage, there are 5 steps namely; first, Front-end Analysis (Initial-Final Analysis). Activities at this stage are conducting interviews with teachers and students to analyze the problems faced in the learning process at school. Based on the results of the interviews, it was found that the method used by the teacher The learning process uses lecture and discussion methods only and is interspersed with video shows from YouTube. There are no additional technology-based teaching materials such as E-Modules, especially material on the History of the Growth of Science during the Umayyad Era. The low interest

in students' learning is due to students' lack of understanding of historical material and their lack of insight into history.

Meanwhile, interviews with students found that Islamic Religious Education lessons were boring, especially the discussion of history, which was rather difficult to understand and that interest in learning was still lacking, this was what caused students to be less enthusiastic about studying Islamic Religious Education. Second, Learner Analysis (Learner Analysis) based on classroom learning, teachers are used to the lecture method where students only listen and understand what is explained by the teacher. However, occasionally teachers also show learning videos.

There are no additional teaching materials such as E-Modules, especially material on the History of the Growth of Science during the Umayyad Period to support the learning process in class. Therefore, there is a need for additional teaching materials in the form of E-Modules to make students active independently in the learning process because students will discuss with their group of friends. Third, Task Analysis. The activities carried out in task analysis are identifying and compiling the material to be studied systematically. The material that will be used in technology-based teaching materials is the History of the Growth of Knowledge during the Umayyad Era for class VIII Islamic Junior High School students. There are 5 activities in the teaching materials that will be prepared, apart from that in each activity there are 1 or 2 practice questions that students must do to practice students' understanding of the teaching materials. Fourth, Concept Analysis is carried out to examine Core Competencies (KI) and Basic Competencies (KD) according to the curriculum. Fifth, Specifying Instructional Objectives (Formulation of Learning Objectives) Formulation of learning objectives is made to design technology-based teaching materials based on basic competencies that have been determined in concept analysis.

The design stage is the aim of producing an initial design for the teaching material product that will be made. The following 4 stages are carried out, First, Initial Design. This activity is the process of designing teaching materials in accordance with the structure for preparing teaching materials determined by the Ministry of National Education, namely: The title/identity of the teaching materials created is "Technology-based Teaching Materials in the form of E-Modules (Syatriana et al., 2013). Second, the use of learning strategies, at this stage the technology-based teaching materials developed use the E-Module interactive learning model which is designed as teaching material so that students can learn independently. These technology-based teaching materials can improve student understanding and make students more active in learning independently in the learning process (Wilujeng & Putri, 2020). The learning steps consist of Let's Observe, Let's Read, and Let's Practice. Third, regarding the stages of presenting teaching materials, what needs to be paid attention to by researchers is that the teaching materials developed refer to the Islamic Religious Education student book for junior high school class VIII, Ministry of Education and Culture, 2016 Revised Edition, as well as several other sources related to technology-based teaching materials. Making teaching materials using Canva,

Microsoft Word and Power Point applications, and teaching materials in the form of PDF files containing interactive media that can be accessed via QR-Code Scan (Admelia et al., 2022). Fourth, making a technology-based teaching material assessment tool aims to test the validation of whether the teaching material created is suitable for use or not. The form of technology-based teaching material assessment tool is in the form of an assessment questionnaire by expert validators and Islamic Religious Education teachers as well as student response questionnaires.

The development stage aims to be a process for creating teaching material products that produce technology-based teaching materials in the form of E-Modules. This stage consists of 3 stages, First, Making technology-based teaching materials (Mulyadi et al., 2020). Making Technology-based teaching material products starting from preparing E-Modules using Microsoft Word, Power Point and Canva applications. Based on the initial design that has been made, the content of technology-based teaching materials is in accordance with the structure of teaching materials that have been determined by the Ministry of National Education. E-Module teaching materials also contain the front cover, identity of the teaching materials, table of contents, bibliography, and so on (Laratmase et al., 2023). Second, Validation of Teaching Materials. Validation of teaching materials is carried out by expert validators, namely 1 expert lecturer and 4 Islamic Religious Education teachers after the technology-based teaching material product is completed. The assessment of teaching materials is carried out by means of each expert validator being given a validation assessment questionnaire for technology-based teaching materials (Devi & Rusdinal, 2023). which will be filled in by giving grades to each aspect, as well as criticism and/or suggestions for improving technology-based teaching materials. Third, Revision of Teaching Materials. There are several improvements based on criticism and suggestions by expert validators after technology-based teaching materials have been validated (Shofa et al., 2021). The following are several improvements to technology-based teaching materials that have been suggested by expert validators, namely improvements to the front cover image, improvements to the appearance of technology-based teaching materials, corrections to the editor of incorrectly typed sentences, and improvements to the addition of interactive power point media and the addition of video displays.

The results of the media expert assessment can be seen from the average score of 4.65 with very adequate criteria. In the aspect of appearance (Design), an average score of 4.75 was obtained with very decent criteria, this shows that the design appearance of teaching materials is appropriate and can be used in learning Islamic Religious Education. The ease of use aspect obtained an average score of 4.71 with very decent criteria, this shows that the teaching materials are easy to use or apply in learning. The consistency aspect obtained an average score of 4.61 with very adequate criteria, this shows that the use of words, sentences and letters is consistent in writing teaching materials. And finally, the graphic aspect obtained an average score of 4.5 with very decent criteria, this shows that the graphic use of color, image illustrations presented in the teaching materials are appropriate and the colors are not too excessive.

The results of the material expert assessment can be seen from the average score of 4.65 with very adequate criteria. In the aspect of material suitability, an average score of 4.75 was obtained with very appropriate criteria. This result shows that the use of material discussed in technology-based teaching materials as a whole is in accordance with KI and Kd as well as the 2013 curriculum. The material completeness aspect obtained an average score amounting to 4.5 with very appropriate criteria, this result shows that the material included in technology-based teaching materials as a whole is complete, includes interactive media, and contains multiple choice and easy practice questions. In the aspect of material accuracy, the average score was 4.7 with very decent criteria, this shows that the material presented in technology-based teaching materials is overall accurate, including video presentations, power point media, and practice questions. The technical aspect of presenting the material obtained an average score of 4.7 with very decent criteria, indicating that the material presentation technique presented is easy to understand, and is structured systematically. The presentation support aspect received an average score of 4.6 with the assessment criteria being very adequate, this shows that the presentation support in teaching materials is very adequate with presentations such as Barcodes which contain interactive media, learning video power points and interactive quizzes. Increase student interest and make it easier for teachers in the learning process. And finally, the language aspect received an average score of 4.65 with very decent assessment criteria, this shows that the language used in general is clear and in accordance with EYD.

Thus, the technology-based teaching materials created received a good response from students. In terms of the appearance of teaching materials, presentation, content of teaching materials, as well as the language used in teaching materials, these are included in the assessment criteria as being very suitable for use in learning (Awrus et al., 2020). The following are several teaching material products that have gone through a validation process by expert validators and students, presented in Figure 2.



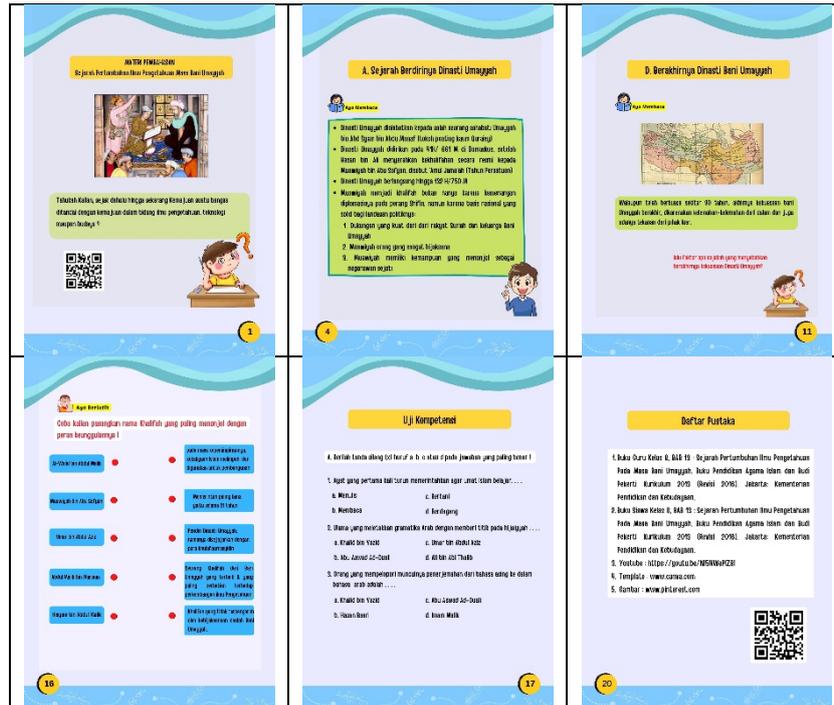


Figure 2. Teaching Material Products

Figure 2 illustrates several examples of technology-based teaching material products that have undergone a validation process by both material experts and students. The figure shows that the developed teaching materials are presented in an integrated and interactive format, combining various digital components such as learning videos, PowerPoint presentations, interactive quizzes, and barcode-based access to additional resources. This integration reflects an effort to align instructional content with contemporary digital learning environments.

Furthermore, the visual appearance of the teaching materials demonstrates a structured and systematic design, making it easier for students to follow the learning flow. The inclusion of multimedia elements not only enhances students' engagement but also supports different learning styles, particularly visual and auditory learners. In addition, the use of interactive features encourages active participation, which is essential in student-centered learning approaches.

The results presented in Figure 2 are consistent with the high validation scores obtained in all assessment aspects, including material suitability, completeness, accuracy, presentation techniques, and language use. This indicates that the developed teaching materials are not only theoretically appropriate but also practically applicable in classroom settings. Therefore, these technology-based teaching materials can be considered effective and feasible to support the learning process, particularly in improving students' understanding and learning outcomes.

CONCLUSION

Based on the results of this research and development, several conclusions can be drawn. First, the development of technology-based teaching materials in Islamic Religious Education was carried out using the Four-D (4-D) model by

Thiagarajan, which includes the stages of define, design, develop, and disseminate. However, this study was limited to the develop stage. The define stage involved analysis of needs, students, tasks, concepts, and learning objectives. The design stage included preparing the initial design, integrating learning models, developing teaching materials, and creating validation instruments. The develop stage involved producing teaching materials using Microsoft Word, PowerPoint, and Canva, followed by validation by one lecturer and four teachers. Revisions were made based on expert suggestions, and the materials were tested on a small group of 10 students.

Second, the validation results indicate that the developed teaching materials are highly feasible for use. Media expert assessment covered aspects such as design, usability, consistency, and graphics, while material expert assessment included material suitability, completeness, accuracy, presentation techniques, supporting elements, and language. In addition, student responses showed that the teaching materials are very appropriate for learning, particularly in terms of design, presentation, content completeness, and discussion aspects. Therefore, the developed technology-based teaching materials are considered effective and suitable for classroom use.

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