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Educational Technology Approach in Developing a Mind Mapping Based E-Module for Fifth Grade Students at SDN 05 Batu Taba

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Abstract: This study developed and evaluated a Mind Mapping-based e-module as an interactive digital teaching material for the hajj subject in fifth-grade Islamic Religious Education. Using the Research and Development (R&D) method with the ADDIE model, the e-module was designed, produced, and tested for feasibility, practicality, and effectiveness. Expert validation indicated that the product met high feasibility standards, while teacher and student feedback confirmed its practicality in classroom use. Implementation results showed that the e-module effectively enhanced students' learning motivation and outcomes, supporting active and enjoyable learning in line with the Merdeka Curriculum principles. The findings suggest that the Mind Mapping-based e-module can serve as an innovative solution for integrating technology in elementary Islamic Religious Education, offering a model for developing engaging and student-centered digital teaching materials.

Keywords: ADDIE model; Digital learning; Educational technology; E-module; Mind mapping

Introduction

In the post-pandemic era, the Indonesian education system faces the challenge of addressing learning loss and declining student motivation. The Ministry of Education, Culture, Research, and Technology (Kemendikbudristek) introduced the Merdeka Curriculum to resolve these issues by promoting active, creative, and technology-integrated learning in line with Education 5.0 values, which emphasize flexible and adaptive approaches that empower students to access knowledge independently (Sinaga et al., 2022). Islamic Religious Education (PAI) is a strategic subject in shaping students to be pious, useful, and of noble character (Abdilla et al., 2019; Nursaadah, 2013), and its delivery must adapt to these educational shifts.

Field observations at SDN 05 Batu Taba show that PAI teachers still rely on narrative-based textbooks with minimal illustrations as their primary teaching materials. This lack of engaging visual resources limits students interest and comprehension, especially for practical topics like Hajj recently incorporated into the Merdeka Curriculum. The issue is reflected in Grade 5 achievement data for the 2023/2024 academic year, where 25% of students scored below the Minimum Competency Criteria (KKM). Teachers also reported difficulties in delivering the Hajj material due to limited teaching resources, despite the availability of technological facilities. This condition contradicts the curriculum's demand for active, innovative, creative, and enjoyable learning processes (Nasution et al., 2023).

Technological advancements provide opportunities for more effective and innovative teaching materials, such as those integrating visuals, audio, and interactive multimedia, which stimulate creativity, increase activity, and improve comprehension (Maharcika et al., 2021). Previous studies confirm that technology-based teaching materials can significantly enhance motivation

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and learning outcomes (Azkiya et al., 2022; Hasanah et al., 2025; Masdi et al., 2022; Rusdi et al., 2025; Susanto et al., 2022). However, no research has specifically developed and tested a Mind Mapping-based e-module for teaching Hajj in elementary-level PAI, particularly at SDN 05 Batu Taba.

Therefore, this study aims to develop and evaluate the feasibility, practicality, and effectiveness of a Mind Mapping-based e-module for Grade 5 Hajj learning. This innovation seeks to address the shortcomings of conventional materials, improve student engagement and understanding, and support teachers in implementing active, enjoyable, and technology-integrated learning aligned with the Merdeka Curriculum (Muspirawati et al., 2021; Pondaag et al., 2021; Syafrin et al., 2023).

Method

This study employs the Research and Development (R&D) method, which aims to produce a product in the form of a Mind Mapping-based e-module and to test the effectiveness of the product in Islamic Religious Education learning at the elementary school level. The R&D method is selected because it allows researchers not only to develop new products but also to conduct systematic validation and evaluation to ensure the product aligns with learning needs and student characteristics (Daniel et al., 2020).

The development model used is the ADDIE model, which consists of five main stages: Analysis, Design, Development, Implementation, and Evaluation (Jundu et al., 2020). This model is chosen for its comprehensive guidance throughout the learning product development process—from initial planning to final evaluation.

In the Analysis stage, the researcher conducted observations of teaching materials used at SDN 05 Batu Taba, interviews with Islamic Religious Education teachers, and an analysis of learning materials, learning objectives flow (ATP), and student characteristics. These activities aimed to identify needs and weaknesses of existing materials so that the developed product could effectively meet learning requirements.

Next, in the Design stage, the e-module was designed using the Canva application, including the creation of the cover, user instructions, learning material menu, identity, content mind maps, material explanations, and student worksheets (LKPD). The design was oriented toward making the product engaging and user-friendly for students.

The Development stage involved product validation by expert validators and product revision based on the feedback received. This validation is essential to ensure the resulting product is valid, effective, and aligned with the expected learning outcomes.

In the Implementation stage, the product was tested in Grade V at SDN 05 Batu Taba. User response data were collected through questionnaires assessing the practicality and effectiveness of the e-module in the learning process. This stage provided a realistic overview of the product's classroom use.

Finally, the Evaluation stage involved product refinement based on the results of field testing and user responses. This evaluation process is a crucial step in enhancing the product's quality to better meet learning objectives and student needs. In addition, the study conducted instrument validity tests concerning content validation, media, student practicality, and effectiveness, using formulas developed by the researcher.

$$Instrument\ validity = \frac{\sum peritem\ score}{maximum\ score} x\ 100\% \quad (1)$$

Based on the percentage results of each statement item, the categorization is as follow.

Table 1. Validation Category (Saputri et al., 2023)

Range percentage (%)	Criteria
1-20	Not valid
21-40	Less valid
41-60	Fairly valid
61-80	Valid
81-100	Highly valid

Then, a practicality test of the Mind Mapping-based e-module was conducted, determined through an analysis of teachers' and students' responses using the following formula.

$$Media\ Practicality = \frac{\sum per\ item\ score}{maximum\ score} x\ 100 \quad (2)$$

Based on the percentage results of each statement item, the categorization is as follows.

Table 2. Practicality Category

Percentage Range (%)	Criteria
0-20	Not practical
21-40	Less practical
41-60	Fairly practical
61-80	practical
81-100	Very practical

Next, an effectiveness test was conducted, evaluated through an analysis of student learning achievement. This involved applying a specific analysis, such as a comparison between pre-test and post-test scores, by conducting a Normalized Gain Test (N-Gain) using the following formula:

$$\text{N} - \text{gain} = \frac{S_{post} - S_{pre}}{S_{max} - S_{min}} \quad (3)$$

The effectiveness criteria derived from the normalized gain score are as follows.

Table 3. Normalized Gain Value Classification

Normalized Gain Score (N)	Criteria
0.70 ≤ n ≤ 1.00	High
0.30 ≤ n ≤ 0.70	Medium
0.00 < P ≤ 0.30	Low

The following is the formula for calculating the mean score.

$$\text{Mean pretest score} = \frac{Total\ pretest\ scores}{Number\ of\ pretest\ participants} \quad (4)$$

$$\text{Mean posttest score} = \frac{Total\ posttest\ scores}{Number\ of\ posttest\ participants} \quad (5)$$

Next, the difference between the pre-test and post-test scores is calculated. The effectiveness of the e-module is assessed through the analysis of students' learning achievement. A student is considered successful if they meet or exceed the value of the Learning Objective Achievement Criteria (KKTP). Overall learning success is measured by a minimum of 75% of students achieving scores that meet the mastery standard.

Result and Discussion

Analyze Stage

This research is a development project of a Mind Mapping-based E-Module aimed at supporting Islamic Religious Education (PAI) learning for Grade V elementary students, with a focus on the Hajj topic. In the analyze stage, observations conducted at SDN 05 Batu Taba revealed that the PAI learning process was less engaging, relying solely on conventional textbooks without adequate and appealing teaching materials. Furthermore, interviews with PAI teachers confirmed the challenges due to the limited availability of teaching resources, which were restricted to printed books, resulting in a lack of interactivity and student interest. An in-depth analysis of the teaching materials highlighted several weaknesses, such as heavy reliance on narrative content with minimal visuals and unappealing design. This is problematic, considering that Hajj, as a practical subject matter, requires sufficient visual media to enhance students' understanding. The analysis of the Learning Objectives Flow (Alur Tujuan Pembelajaran/ATP) indicated that it aligns with the standards of the Indonesian Ministry of Education Regulation No. 16 of 2022. The selected content includes the definition, rules, miqat (starting points), types, and the wisdom behind the Hajj ritual−topics that indeed require more innovative instructional methods than conventional ones. Lastly, the analysis of student characteristics revealed that students are more responsive to visual learning media and enjoy the use of technology such as projectors. The results of the analysis indicate a need for interactive visual teaching materials for Hajj material. Therefore, the use of a Mind Mapping-based E-Module is considered capable of increasing learning effectiveness, providing a more engaging learning experience, and fostering students' creativity, imagination, and motivation. Consequently, the development of a Mind Mapping-based E-Module is deemed an appropriate solution to enhance the teaching and learning of Islamic Religious Education, particularly the Hajj material, for Grade V elementary students.

Design Stage

In the Design stage, a comprehensive plan was developed to design a Mind Mapping-based E-Module aligned with the Hajj material and the learning objectives of the *Kurikulum Merdeka* for Grade V elementary school students. The E-Module was designed using the Indonesian language and fully colored, utilizing the Canva platform. During the design process, special attention was given to layout aspects, color composition, animation choices, font sizes, image and video placements, as well as the visual compatibility with the subject matter—ensuring that the E-Module is not only aesthetically appealing but also supports student comprehension. One of the main focuses was the cover page design, which serves as the product's identity and provides an overview to users before engaging with the learning content. Therefore, the cover was designed to be as attractive and clear as possible, featuring the title, topic, subject, curriculum, target users, and supporting graphic elements to characterize the developed E-Module. In addition to the cover, other important sections include the user guide page, menu, teaching material identity, Hajj content, and a final evaluation or assessments by using students' worksheet (LKPD) with Canva application, followed by creating the questions using the Quizizz application, after which the link was copied and embedded into the design created in Canva, as illustrated in the following image.

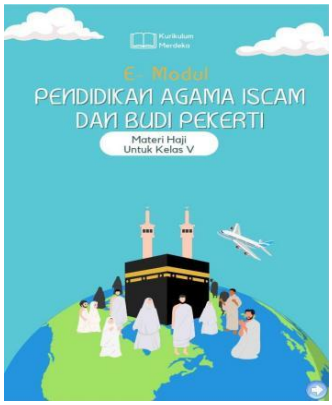

Figure 1. Cover design

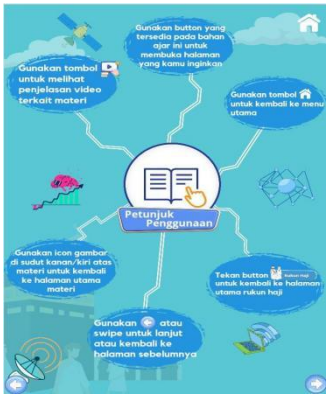

Figure 2. User guide display

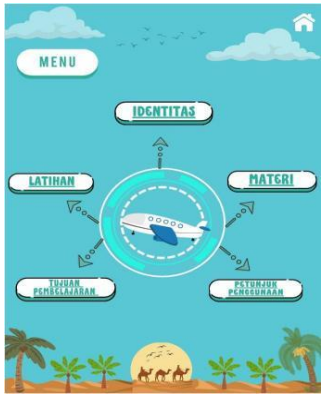

Figure 3. E-module menu display

Figure 4. E-module identity display

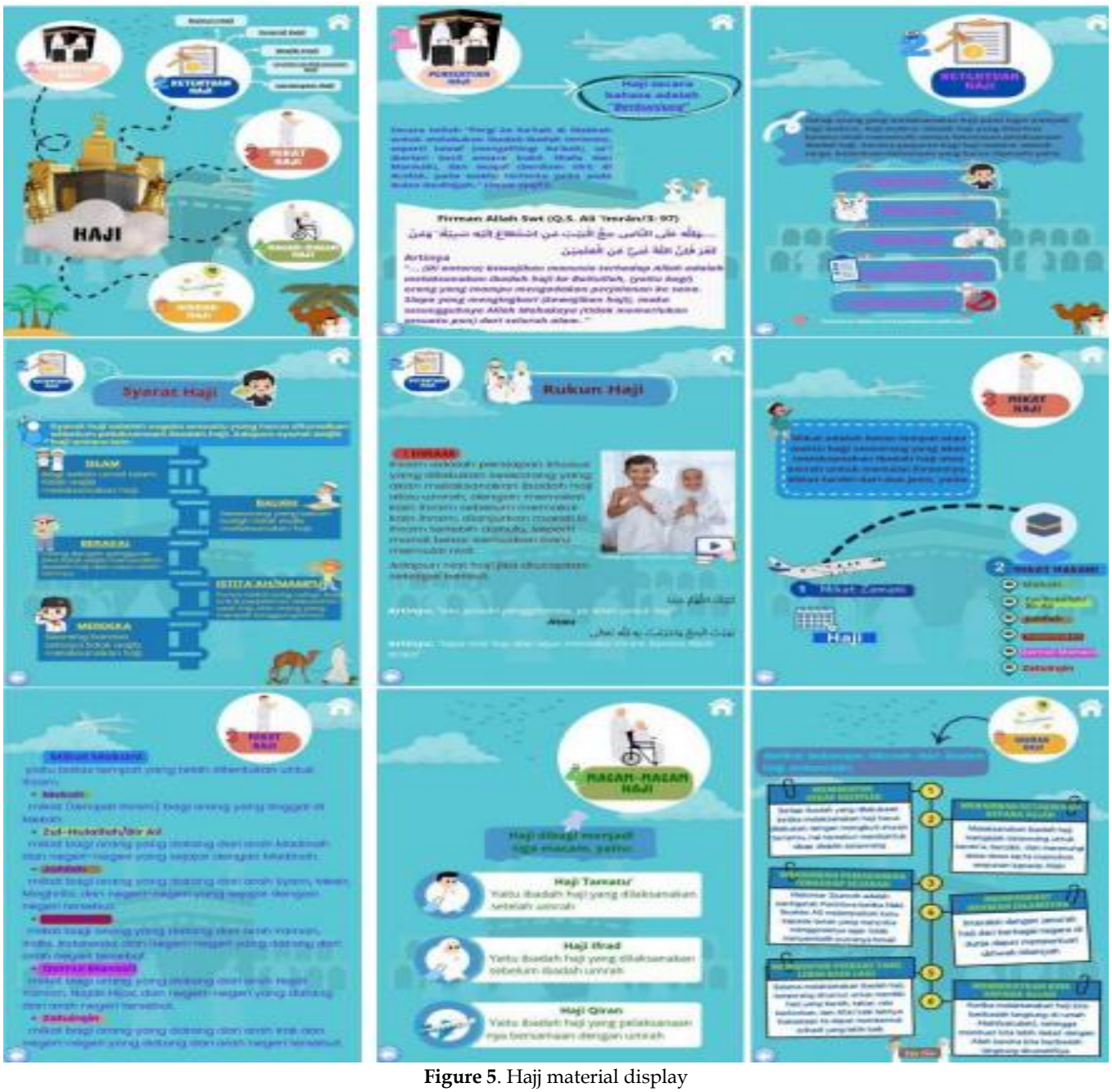

Figure 5. Hajj material display

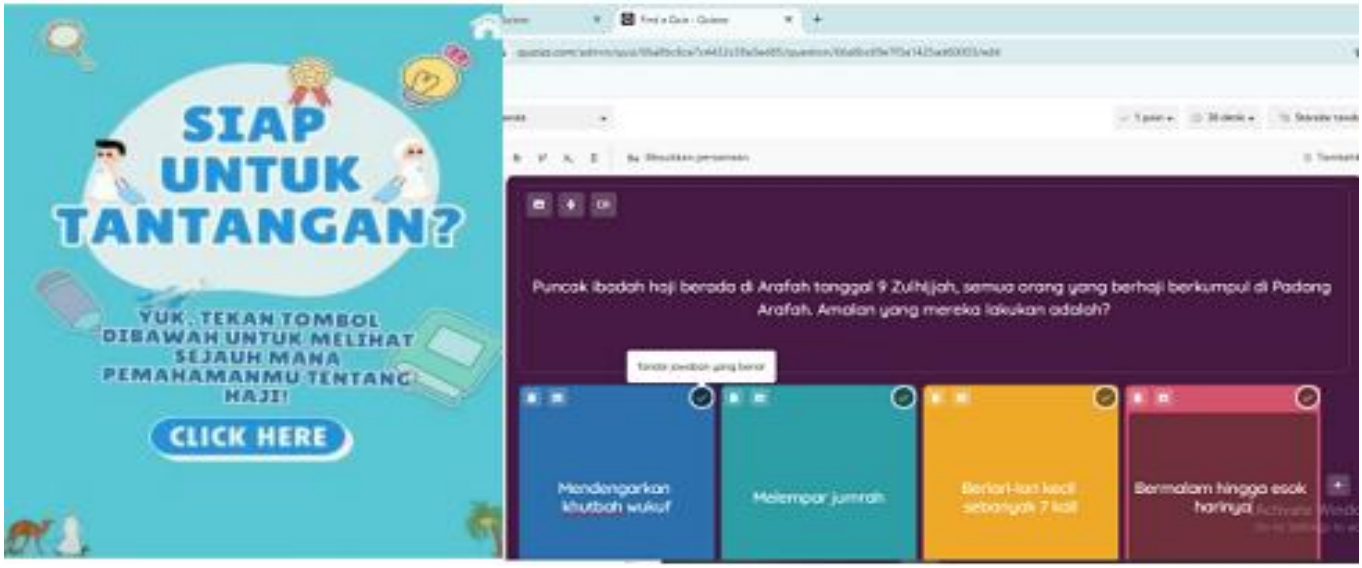

Figure 6. LKPD and questions in quizzes display

Development Stage

The Development stage focused on the validation of the Mind Mapping-based E-Module to ensure that the resulting product is valid, practical, and effective. Validation was carried out by three experts: a media expert, a subject matter expert, and a language expert, using validation instruments that have been proven to be highly valid, with scores exceeding 80%. The media expert validation assessed aspects such as cover design, layout, and content, with an average score of 86%, categorized as highly feasible for use. This indicates that the appearance and structure of the E-Module meet the quality standards for instructional media, assessed by Dr.Rayendra, M.Pd (a Master Educational Technology lecturer at Graduate School, Universitas Negeri Padang). The subject matter expert validation evaluated the relevance and presentation of the material, achieving an average score of 96%, confirming that the learning content in the E-Module is both appropriate and well-presented in accordance with the curriculum and learners' needs, assessed by Dr. Ahmad Rivauzi, MA, a Master Islamic Religious Education lecturer at Universitas Negeri Padang). Meanwhile, the language expert validation reviewed the use of language based on Indonesian grammar rules, its appropriateness for students, terminology usage, and clarity of communication. This evaluation resulted in an average score of 96%, indicating that the language used in the E-Module is communicative, accurate, and easy for students to understand, and it was assessed by Dr. Abdurrahman, M.Pd (a Language Education lecturer at Language and Arts Faculty, Universitas Negeri Padang). These comprehensive validation results confirm that the developed E-Module is feasible and appropriate for use in the learning process. The following is a recap of the validation results from the media, subject matter, and language experts.

Table 4. Validation Results Recap

Assessment aspects	Score average	Category
Media expert	86%	Very feasible
Subject matter expert	95%	Very feasible
Language expert	96%	Very feasible
Average	92%	Very feasible
General assessment of validators		LD (feasible to use)

The data above can be ilustrated in the form of a histogram as follows:

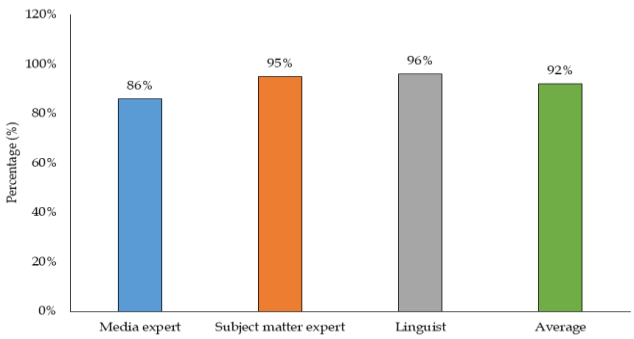

Figure 7. Diagram of validation results recap

Implementation Stage

At the Implementation stage, the Mind Mapping-based E-Module was tested on 28 fifth-grade students at SDN 05 Batu Taba to evaluate its practicality and effectiveness in teaching Islamic Religious Education, specifically the Hajj topic. The practicality assessment was conducted by both the 2 teachers and the 28 students, covering aspects such as presentation, usability, content, and pedagogical impact. The teacher's

assessment showed an average practicality score of 97.05%, categorized as very practical, while the students gave an average score of 92.82%, also falling into the very practical category. This indicates that the E-Module is highly practical to use from the perspective of both user groups.

Table 5. Recapitulation of Practicality Test Results

Indicator	Percentage	Category
Teacher	97.05%	Very Practical
Students	92.82%	Very Practical

The effectiveness of the product was measured by comparing the results of the pre-test and post-test, with an average pre-test score of 49 and a post-test score of 93, and a gain score of 0.86, which falls into the high category (N-gain ≥ 0.7). This significant improvement indicates that the use of the Mind Mapping-based E-Module is effective in enhancing students' understanding of the Hajj material. Overall, the implementation stage proves that the developed learning product is not only highly practical but also effective in improving student learning outcomes in Islamic Religious Education.

Table 6. Recapitulation of Effectiveness Test Results

Description	Pre-test	Post-test
Total	1370	2600
Average	49	93
N-gain		0.86
N-gain Percentage		86.01%
Category		"High" (N-gain) ≥ 0.7

Evaluation Stage

At the Evaluation stage, improvements to the Mind Mapping-based E-Module were made based on suggestions and feedback from a team of experts, including a media expert, a content expert, and a language expert. The media expert recommended adding *Talbiyah* audio and teacher voice recordings on several slides to enhance the atmosphere of the Hajj activities and support students with auditory learning styles, as well as adding color to the text to make it brighter and more engaging. The content expert suggested strengthening the visualization of key materials, while the language expert emphasized the importance of correcting punctuation and adjusting font sizes for better readability. These improvements significantly enhanced the quality of the E-Module's appearance and functionality, as evidenced by the updated cover, the addition of audio elements, and refined text coloring tailored to student needs. Thus, the evaluation results indicate that the revision process was productive and contributed to the development of a valid, practical, and effective learning module, in accordance with the validators' recommendations.

Teaching the topic of Hajj in elementary schools presents new challenges, especially because this material is practical in nature and is a new topic within the Merdeka Curriculum. Teachers face obstacles because conventional methods are less effective without teaching materials that can comprehensively visualize the activities of Hajj. Currently, the available materials are still limited and not sufficiently engaging for students. To address this issue, the use of information technology through the development of a Mind Mapping-based E-Module becomes a relevant solution. As stated by Dayanti et al. (Dayanti et al., 2021), the use of interactive and varied learning media, such as images, videos, and animations, can facilitate students' understanding.

This study uses the ADDIE development model, which consists of five stages: analysis, design, development, implementation, and evaluation. In the analysis stage, observations and interviews were conducted at SDN 05 Batu Taba, where it was found that existing teaching materials were still in the form of narrative text without colored illustrations, making them less interesting and causing low learning interest. This aligns with the findings of V. S. Putri et al. (2024), who emphasize the importance of media variation in enhancing understanding. Islamic Religious Education teachers also stated that Hajj material requires teaching aids that can visually depict the worship activities so that students can understand the stages of Hajj properly. The analysis of the Learning Objective Flow (Alur Tujuan Pembelajaran/ATP) ensured that the developed e-module supports curriculum competencies, as emphasized by Supriadi et al. (2022) regarding the importance of aligning learning materials with the curriculum. In addition, the characteristics of the learners, most of whom have visual and kinesthetic learning styles, support a visually based approach, in line with research by Masdi et al. (2022), who stated that Mind Mapping-based e-modules can improve students' understanding and motivation.

In the design stage, the e-module was drafted with a structure that includes a cover, user guide, main menu, Mind Mapping-based material, material explanations, and student worksheets (LKPD). The material is presented through Mind Mapping branches, complete with bright colors, images, videos, and animations to help students understand the concept of Hajj in a systematic and engaging way—aligned with Buzan's theory that Mind Mapping improves memory and understanding through visualization (Nurrachmawati et al., 2022). Canva was chosen as the development platform due to its accessibility and interactive features, supporting the arrangement of concise material and the addition of interactive evaluations via Quizziz links (Tambunan et al., 2023).

The development stage involved a validation process by four experts (media, content, and language) to ensure the quality and relevance of the module with students' needs and the curriculum. This validation produced a "very valid" score, in line with the guidelines of Masdi et al. (2022), who emphasized the importance of expert evaluation in creating high-quality learning products. The final outcome of this development is a refined E-Module that is ready to be used as an innovative teaching material in Islamic Religious Education learning.

Implementation was carried out in class V of SDN 05 Batu Taba with the aim of assessing the practicality and effectiveness of the E-Module. Field testing showed that this module made it easier for teachers to deliver procedural Hajj material and provided a more interesting and non-monotonous learning experience for students, as evidenced by students' enthusiasm toward the visualizations and concise yet clear explanations. Final evaluation confirmed that the E-Module succeeded in increasing students' understanding and engagement, motivating them to study independently, with an attractive design, ease of use, and suitability to elementary students' characteristics. Teachers also stated that the module facilitated the teaching of complex and practical Hajj content (Masdi et al., 2022). Thus, the development of a Mind Mapping-based E-Module proves to be an effective solution in teaching Hajj material in elementary schools, combining theoretical approaches and information technology to significantly enhance learning quality.

Conclusion

This study concludes that the Mind Mapping-based e-module for Hajj learning in Grade 5 is a feasible, practical, and effective digital teaching material. The developed e-module enhances student motivation and learning outcomes, and supports the implementation of active and enjoyable learning in line with the principles of the Merdeka Curriculum. The findings imply that this e-module can be used as an innovative instructional tool to improve Islamic Religious Education in elementary schools and can serve as a model for technology-based teaching materials development. Based on these results, teachers and schools are encouraged to adopt and integrate similar digital modules across various subjects, while researchers are recommended to further refine and expand this development using emerging technologies.

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Author Contributions
Collecting data, analyzing data, writing original drafts, methodology, data curation, visualization, NA; reveiw writing, SS.

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Conflicts of Interest
The authors declare no conflict of interest.

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