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DEVELOPMENT OF AN INTERACTIVE PJBL-BASED E-MODULE FOR ISLAMIC RELIGIOUS EDUCATION AT THE JUNIOR HIGH SCHOOL LEVEL

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Abstract

This study aims to develop an interactive e-module based on Project-Based Learning (PjBL) for Islamic Religious Education at the junior high school level. The study was motivated by the limited use of engaging learning media, which resulted in low student participation. This research addresses the gap by integrating PjBL syntax into a digital e-module to support meaningful and active learning, particularly in social media ethics content. This study employed a Research and Development (R&D) method using the ADDIE model, consisting of Analysis, Design, Development, Implementation, and Evaluation stages. The participants were 33 students (n = 33). Data were collected through observation, interviews, documentation, expert validation questionnaires, practicality questionnaires, and learning outcome tests. The effectiveness was analyzed using the Paired Sample T-Test and N-Gain score. The results showed that the e-module was highly valid (93.75%). Practicality tests indicated very practical results, with scores of 96% from teachers and 95.35% from students. The implementation of learning reached 96%, categorized as very well implemented. The effectiveness test revealed a significant difference between pretest and posttest results (Sig. < 0.05), with an N-Gain score of 79.44% (effective category). In conclusion, the developed interactive e-module based on PjBL is valid, practical, and effective for improving students' learning outcomes.

Keywords: Research and Development; ADDIE Model; Interactive E-Module; Islamic Religious Education; Junior High School; Project-Based Learning

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INTRODUCTION | مقدمة

Islamic Religious Education and Character Education at the junior high school level plays an important role in shaping students' understanding and attitudes in their daily lives. However, in practice, the learning process is still often dominated by the use of less engaging and monotonous teaching materials, which results in students being less actively involved in learning activities. This condition is supported by preliminary observations conducted in one class, which indicated that only about 40–50% of students actively participated during the learning process, particularly in activities requiring discussion and interaction. This finding is in line with Sartika et al. (2024), who state that teacher-centered and less varied learning can reduce student engagement and participation. In many cases, learning has not yet integrated a project-based approach and is still dominated by the use of textbooks, note-taking activities, and assignment-based tasks, leading to student boredom and low participation. Therefore, there is a need for innovative teaching materials that are more interactive, engaging, and capable of encouraging active student involvement.

Various studies have shown that the use of innovative learning models can enhance student engagement in the learning process. One approach considered effective is Project-Based Learning (PjBL), which emphasizes active student involvement through meaningful and contextual project activities (Nadila et al., 2025; Sintia et al., 2025). In its implementation, students are not only recipients of knowledge but are also directly involved in planning, executing, and evaluating learning projects (Amaliya & Kubro, 2025; Farras et al., 2026). Furthermore, PjBL encourages active participation in a more collaborative and meaningful learning environment (Khotimah & Suryanto, 2025; Yusri & Jubaidah, 2025), while also providing authentic and relevant learning experiences (Arfika et al., 2025; Wati & Sugesti, 2025).

However, previous studies on PjBL-based e-module development have primarily focused on general subjects and have not specifically addressed Islamic Religious Education, particularly in the context of digital ethics such as ghibah and tabayyun. In addition, most studies tend to emphasize product development without deeply integrating PjBL syntax into digital learning media to support structured project activities. This indicates a gap in the development of interactive e-modules that explicitly embed PjBL stages within the learning process in Islamic Religious Education. Therefore, this study aims to fill this gap by developing an interactive e-module based on Project-Based Learning (PjBL) that is specifically designed to support student engagement in project-based activities related to digital ethics.

Based on the identified problems and research gap, this study is guided by the following research questions:
(1) How valid is the interactive PjBL-based e-module for Islamic Religious Education?
(2) How practical is the developed e-module when used by teachers and students?
(3) How effective is the e-module in improving student engagement and learning outcomes?

Accordingly, this study aims to develop an interactive e-module based on Project-Based Learning (PjBL) for Islamic Religious Education and to determine its validity, practicality, and effectiveness in supporting student engagement, particularly in project-based learning activities.

METHOD | منهج

This study employed a Research and Development (R&D) method using the ADDIE model proposed by Branch (2009), which consists of five stages: analysis, design, development, implementation, and evaluation. This model was used to develop an interactive E-Module based on Project-Based Learning (PjBL) in Islamic Religious Education and Character Education learning.

The subjects of this study were 33 students of class VIII.8 at SMP Negeri 25 Padang. The subjects were selected purposively based on the research needs, namely a class that had not yet used E-Module-based learning materials and had not optimally implemented the Project-Based Learning (PjBL) model in the learning process.

To evaluate the effectiveness of the developed product, this study employed a one-group pretest–posttest design. This design was chosen due to practical constraints, such as limited access to parallel classes for comparison and the primary focus of the study on product development rather than experimental comparison. Therefore, the effectiveness analysis was conducted by comparing students' learning outcomes before and after the implementation of the E-Module. This study also considered ethical aspects of research involving human participants. Prior to data collection, permission was obtained from the school, and participants were informed about the purpose of the study. Students participated voluntarily, and their data were kept confidential and used solely for research purposes.

Branch (2009) describes the ADDIE model as a systematic and structured instructional design.

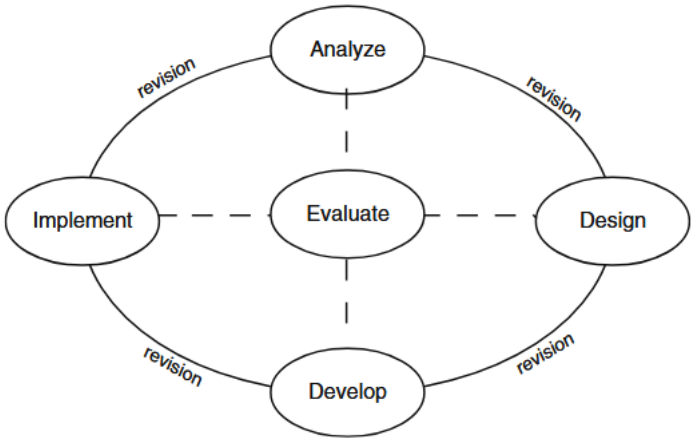


Figure 1. The ADDIE Concept

The ADDIE model is described by Branch as a systematic and structured instructional design. Based on this explanation, the stages of the ADDIE model applied in this study are presented in Table 1.

Table 1. ADDIE Model Stages

Stage	Concept	General Procedures	Description
Analysis	Identifying the causes of learning problems and determining initial needs	(1) Needs analysis, (2) Determining learning objectives, (3) Analyzing student characteristics, (4) Analyzing learning resources, (5) Initial development planning	Summary of needs analysis
Design	Determining learning objectives and strategies to be used	(1) Task analysis, (2) Formulating learning objectives, (3) Developing assessment instruments, (4) Designing learning strategies	Initial product design
Development	Developing and validating learning products	(1) Material development, (2) Media development, (3) Preparing user guidelines, (4) Expert validation, (5) Product revision	E-Module product
Implementation	Applying the product in the learning process	(1) Conducting learning using the E-Module, (2) Involving students and teachers in the learning process	Implementation strategy
Evaluation	Assessing the quality of the product and learning process	(1) Determining evaluation criteria, (2) Using evaluation instruments, (3) Analyzing results, (4) Final revision	Evaluation results

Based on Table 1, each stage in the ADDIE model plays an important role in the development of the E-Module. The *analysis* stage focuses on identifying learning needs, the *design* stage produces the initial product design, the *development* stage develops and validates the E-Module, the *implementation* stage applies the product in the learning process, and the *evaluation* stage aims to assess the effectiveness and quality of the developed product.

At the *analysis* stage, a needs analysis was conducted through observation, interviews, and documentation to identify problems in learning and student characteristics. This stage also includes curriculum analysis, learning objectives, and learning resources used. The *design* stage aims to develop the initial design of the E-Module. Activities at this stage include formulating learning objectives, designing learning materials, developing assessment instruments, selecting media, and designing the layout and structure of the PjBL-based E-Module.

Furthermore, the *development* stage was carried out by developing the E-Module based on the design that had been prepared. The resulting product was then validated by experts covering

aspects of content, media, and language. In addition, a practicality test was conducted through teacher and student response questionnaires to determine ease of use, attractiveness, and usefulness of the E-Module.

The *implementation* stage was carried out by applying the E-Module in the learning process in class VIII.8 of SMP Negeri 25 Padang. At this stage, learning was conducted using the *Project Based Learning* (PjBL) model, and the implementation of learning was observed using observation sheets until students completed and presented their project results. The final stage, *evaluation*, was conducted to assess the quality and effectiveness of the developed E-Module. The evaluation was based on the results of validity, practicality, learning implementation, and student learning outcomes.

Based on the ADDIE stages in Table 1, each stage in this study requires instruments to systematically collect data. The research instruments were adjusted to the needs of each stage of the E-Module development. The instruments used in this study are presented in Table 2.

Table 2. Research Instruments at Each Stage

Stage	Instruments
Analysis	Observation guidelines, interview guidelines, documentation
Design	Curriculum analysis sheets, learning objectives, and E-Module design
Development	Expert validation sheets, teacher practicality questionnaire, student practicality questionnaire
Implementation	Learning implementation observation sheet
Evaluation	Learning outcome tests (pretest and posttest), N-Gain calculation sheet

The instruments used in this study produced both qualitative and quantitative data. Qualitative data were obtained through observation, interviews, and documentation, while quantitative data were obtained from expert validation results, practicality questionnaires, and student learning outcome tests. The quantitative data were analyzed using percentage techniques and categorized based on certain criteria. The criteria for validity and practicality are presented in Table 3.

Table 3. Validity and Practicality Criteria

Percentage (%)	Criteria
81 – 100	Very valid / very practical
61 – 80	Valid / practical
41 – 60	Fairly valid / fairly practical
21 – 40	Less valid / less practical
0 – 20	Invalid / not practical

Source: Yamin et al. (2025)

These criteria were used to determine the level of feasibility and practicality of the developed E-Module based on expert validation results as well as teacher and student responses.

To assess the effectiveness of the developed E-Module, an evaluation was conducted through student learning outcome tests using a *pretest-posttest* design. The *pretest* was administered before students used the E-Module to determine their initial ability, while the *posttest* was administered after the learning process to determine learning outcomes after treatment. Furthermore, a *Paired Sample T-Test* was conducted to determine whether there was a significant difference between pretest and posttest results.

In addition, the improvement in learning outcomes was analyzed using the N-Gain score to determine the effectiveness level of the E-Module in improving student learning outcomes. The N-Gain value was calculated and then converted into percentage form. The criteria for interpreting N-Gain scores are presented in Table 4.

Table 4. N-Gain Effectiveness Criteria

N-Gain (%)	Interpretation
< 40	Ineffective
40 – 55	Less effective
56 – 75	Moderately effective
> 76	Effective

Source: Wahab et al. (2021)

Thus, the analysis of *pretest*, *posttest*, *Paired Sample T-Test*, and N-Gain was used sequentially to determine the improvement and effectiveness level of the E-Module in the learning process.

RESULT | نتائج

The following section presents the results of each stage in the development of the Interactive E-Module based on Project Based Learning (PjBL) in Islamic Religious Education and Character Education at SMP Negeri 25 Padang.

1. Results of the Analysis Stage

The analysis stage in this study aimed to identify learning needs, the ongoing learning process, and the characteristics of students prior to the development of the Interactive E-Module based on Project Based Learning (PjBL). Based on classroom observations in class VIII.8, it was found that the learning process was still dominated by lecture-based teaching methods with textbooks as the main learning resource. The learning process was teacher-centered, resulting in low student engagement. Students tended to be passive and were less involved in collaborative and project-based learning activities.

The results of interviews with the teacher revealed that although the school has provided technology-based learning facilities such as projectors (infocus), their utilization in the learning process has not been optimal. These facilities were rarely used consistently in classroom instruction, resulting in a still conventional learning process. In addition, the teacher stated that the lack of interactive teaching materials based on Project Based Learning (PjBL) was one of the main obstacles in creating active and meaningful learning.

The analysis of student characteristics showed that students had varied academic abilities but demonstrated potential for collaborative group work. This indicates that students are ready to be developed through project-based learning that emphasizes collaboration, creativity, and active participation in the learning process. Based on these findings, it can be concluded that there is a need to develop an Interactive E-Module based on Project Based Learning (PjBL) to enhance student engagement in Islamic Religious Education and Character Education learning.

Table 5. Learning Needs Analysis Results

Aspect	Findings
Teaching model	Predominantly lecture-based (conventional)
Learning media	Textbooks and worksheets
School facilities	Projector available but not optimally utilized
Technology use	Not optimally integrated into learning
Student engagement	Low
Student activity	Less active in discussions and project-based learning
Teacher constraints	Lack of PjBL-based teaching materials
Student characteristics	Diverse and able to work in groups
Learning need	Interactive E-Module based on Project Based Learning (PjBL)

The results in Table 1 indicate that the learning process is still dominated by conventional, teacher-centered instruction with low student engagement. Although learning facilities such as

projectors are available at the school, their use in instructional activities is not yet optimal.

In addition, the lack of digital and Project Based Learning (PjBL)-based teaching materials is one of the factors contributing to the low level of active student participation in learning. Therefore, innovation in the form of interactive learning media is needed to improve the quality of learning. Based on the results of the analysis stage, the next stage in this study is the design stage, which involves the initial design of the Interactive E-Module based on Project Based Learning (PjBL).

2. Results of the Design Stage

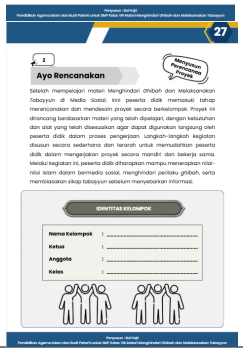
The design stage in this study aimed to develop the initial design of an Interactive E-Module based on Project Based Learning (PjBL) on the topic *Avoiding Ghibah and Implementing Tabayyun in Social Media*. This stage involved formulating learning objectives, selecting learning strategies, and designing project-based learning activities.

The learning content focused on Islamic Religious Education and Character Education values related to ethical behavior in social media, particularly avoiding ghibah (backbiting) and applying the concept of tabayyun (verifying information before sharing). This topic was selected due to its relevance to students' daily digital interactions in the social media era.

The learning strategy applied was Project Based Learning (PjBL), which emphasizes active student involvement in producing a project-based learning outcome. In this study, students were guided to create a digital poster promoting the avoidance of ghibah and the practice of tabayyun, which was then published on social media as an educational digital campaign.

Based on this design, the learning steps in the E-Module were structured into the following PjBL stages:

Table 6. PjBL Learning Steps in the E-Module

Stage	Figure	Description
Let's Explore		Students learn the concept of ghibah and tabayyun through texts, images, and instructional videos
Let's Plan		Students design ideas and concepts for a digital poster campaign

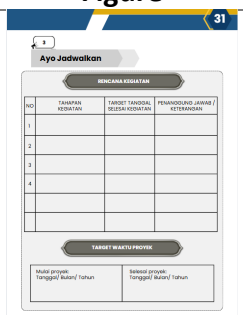
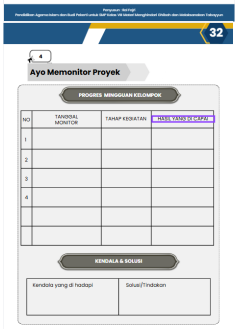
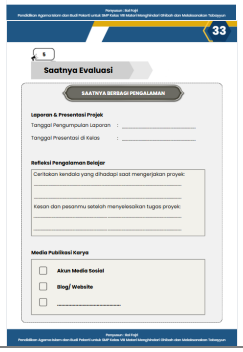
Stage	Figure	Description
Let's Schedule		Students organize a timeline for project implementation in groups
Let's Monitor the Project		Students carry out the poster creation process and monitor project progress
Time to Evaluate		Students present their final project and conduct reflection and evaluation

Table 4 shows that the learning steps in the Interactive E-Module are structured based on the syntax of Project Based Learning (PjBL). Each stage is designed to provide a systematic learning experience, starting from understanding the material to producing a real product in the form of a digital poster.

The "Let's Explore" stage provides students with initial understanding through interactive learning materials such as text, images, and videos. In the "Let's Plan" stage, students begin to develop creative ideas for their digital poster based on the concepts they have learned.

The "Let's Schedule" stage requires students to organize a timeline for project completion to ensure structured learning activities. The "Let's Monitor the Project" stage focuses on the implementation of the poster creation process in groups with teacher guidance. Finally, the "Time to Evaluate" stage involves presenting the project results and reflecting on both the process and outcomes.

Based on the results of the design stage, the next stage in this research is the development stage, which involves the production of the E-Module and expert validation.

3. Development Stage

The development stage in this study aimed to produce an interactive E-Module based on Project-Based Learning (PjBL) that is suitable for use in Islamic Religious Education and Character Education learning. At this stage, the product developed from the design phase was transformed into a prototype E-Module, which was then validated by experts.

The validation process was carried out by five experts consisting of one learning model expert, one media expert, two material experts, and one language expert. Each expert evaluated the product using validation questionnaires based on predetermined assessment aspects in accordance with their respective fields of expertise. The results of this validation were used to determine the feasibility level of the E-Module and to serve as a basis for revision before implementation in the learning process.

The validation instruments in this study were designed to assess the feasibility of the interactive E-Module based on Project-Based Learning (PjBL) from four main aspects, namely learning model, content/material, media, and language. Each aspect contained specific indicators developed in accordance with the characteristics of the E-Module and the learning objectives. In general, these instruments were used to measure the quality of the product before it was implemented in classroom learning.

Table 7. Learning Model Validation Instrument

No	Assessed Aspect
1	Suitability of the learning model
2	Project-Based Learning syntax
3	Role of teacher and students
4	Feasibility of model implementation in the E-Module

The learning model validation was conducted by **one expert in instructional design**. The assessment focused on the suitability of the Project-Based Learning (PjBL) model implementation within the E-Module, including learning syntax, teacher and student roles, and the feasibility of applying the model in Islamic Religious Education learning.

Table 8. Material Validation Instrument

No	Assessed Aspect
1	Alignment with curriculum and learning objectives
2	Clarity and comprehensibility of content
3	Accuracy and validity of material
4	Completeness of content
5	Structure and coherence of material
6	Suitability with students' characteristics
7	Support for PjBL implementation
8	Alignment with PjBL steps
9	Project activities
10	Exercises and evaluation

Material validation was conducted by **two subject matter experts**. The assessment focused on the quality of the learning content, including curriculum alignment, accuracy, completeness, and coherence of the material. In addition, its relevance to students' characteristics and support for Project-Based Learning (PjBL) implementation were also evaluated.

Table 9. Media Validation Instrument

No	Assessed Aspect
1	E-Module characteristics
2	Quality elements of the E-Module
3	E-Module components

Media validation was conducted by **one media expert**. The assessment covered the characteristics of the E-Module as a digital learning media, including format quality, visual attractiveness, organization, and completeness of learning components such as introduction, content, exercises, and closing section.

Table 10. Language Validation Instrument

No	Assessed Aspect
1	Readability
2	Language suitability for students
3	Clarity and coherence of sentences
4	Language attractiveness
5	Consistency of language and terminology

Language validation was conducted by **one language expert**. The evaluation focused on readability, appropriateness of language level for junior high school students, clarity of sentence structure, attractiveness of language use, and consistency of terminology used in the E-Module.

Table 11. Results of E-Module Validation

No	Aspect	Percentage (%)	Validity Level
1	Model	95%	Very Valid
2	Media	90%	Very Valid
3	Material	95%	Very Valid
4	Language	95%	Very Valid
Total		**93.75%**	**Very Valid**

Based on Table 11, the validation results of the interactive E-Module based on Project-Based Learning (PjBL) indicate that all assessed aspects are categorized as **very valid**.

The learning model aspect obtained a percentage of 95%, indicating that the implementation of the Project-Based Learning (PjBL) syntax in the E-Module is appropriate and feasible for use in learning activities. The media aspect obtained a percentage of 90%, showing that the E-Module has good quality as a digital learning medium in terms of design and presentation. Furthermore, the material aspect obtained a percentage of 95%, indicating that the content is accurate, relevant, and aligned with the curriculum as well as students' learning needs. The language aspect also obtained a percentage of 95%, indicating that the language used is appropriate for students' developmental level and easy to understand. Overall, the average validation score reached 93.75%, categorized as very valid, meaning that the E-Module is feasible to be used without major revision and can proceed to the next stage.

Although the validation results showed a very valid category and the E-Module was declared feasible for use without major revision, several minor improvements were suggested by the experts. The suggestions mainly concerned typographical errors and minor wording or sentence structure corrections found in several parts of the E-Module. These suggestions appeared across the model, media, material, and language aspects. After revisions were made according to the experts' feedback, the E-Module became more refined, clearer, and more appropriate for instructional use. However, these revisions did not change the overall structure or core content of the E-Module, meaning that the product remained feasible without fundamental revision. Thus, it can be concluded that the interactive E-Module based on Project-Based Learning (PjBL) is valid, feasible, and ready to be implemented in the learning process.

After completing the development and validation stage, and after minor revisions were applied based on expert suggestions, the E-Module was declared feasible for implementation. Therefore, the next stage of this research is the implementation stage, in which the E-Module is applied in classroom learning to examine its practicality and effectiveness.

4. Implementation Stage

The implementation stage in this study aims to apply the previously validated interactive E-Module based on Project-Based Learning (PjBL) into the actual classroom learning process. In

addition, this stage is also used to determine the practicality level of the E-Module and the implementation of learning activities in the classroom.

The implementation was conducted in class VIII.8 of SMP Negeri 25 Padang over three meetings using the topic *"Avoiding Gossip (Ghibah) and Practicing Tabayyun on Social Media."* At this stage, the E-Module was used as the main learning resource in Project-Based Learning (PjBL)-based instruction.

Students were guided to carry out a project in the form of creating digital posters containing messages encouraging the avoidance of gossip and the practice of tabayyun on social media. The posters were then published on social media as an educational campaign. During the learning process, the teacher acted as a facilitator who guided students in accordance with the PjBL syntax embedded in the E-Module.

The practicality of the E-Module from the teacher's perspective was measured using a questionnaire administered to one teacher as the E-Module user in the learning process. This instrument aimed to assess the ease of use, content appropriateness, and effectiveness of integrating the E-Module into Islamic Religious Education and Character Education learning.

Table 12. Aspects of E-Module Practicality Assessment by Teacher

No	Assessment Aspect
1	Implementation and access of the E-Module in learning
2	Content and pedagogical support
3	Independent learning and Project-Based Learning support
4	Language and readability

Based on Table 12, the teacher practicality assessment focuses on the ease of E-Module implementation, the relevance of content to learning, and its support for Project-Based Learning (PjBL).

The practicality of the E-Module from the students' perspective was measured using a questionnaire administered to 17 students as the research sample. This instrument was used to determine the ease of use, attractiveness, and support of the E-Module for independent and project-based learning processes.

Table 13. Aspects of E-Module Practicality Assessment by Students

No	Assessment Aspect
1	Implementation and access of the E-Module
2	Learning content support
3	Ease of use and language readability

Based on Table 13, this instrument shows that the E-Module was designed to be easy to use, engaging, and supportive of active and project-based learning.

In addition to practicality, learning implementation was also observed using an observation sheet conducted by one observer over three meetings. This observation aimed to examine the implementation of each stage of Project-Based Learning (PjBL) integrated into the E-Module.

Table 14. Learning Implementation Observation Sheet

No	Aspect	Indicators
I	Opening activities	greeting, prayer, apperception, motivation, learning objectives
II	Core activities	Ayo Mencari Tahu, Ayo Rencanakan, Ayo Jadwalkan, Ayo Memonitor Proyek, Evaluating Results
III	Closing activities	evaluation, quiz/practice questions, closing prayer

Based on Table 14, the observation sheet was used to assess the implementation of all PjBL syntax stages in the E-Module, from introduction to closing activities. The results of the study

showed that the implementation of the interactive E-Module based on Project-Based Learning (PjBL) was carried out very effectively. Teacher practicality reached 96%, categorized as very practical, indicating that the E-Module was easy to use and could be integrated into classroom learning without significant obstacles. Meanwhile, student practicality reached 95.35%, also categorized as very practical, indicating that the E-Module was easy to understand, engaging, and helpful in supporting students' participation in project-based learning.

In addition, the observation of learning implementation showed that all stages of Project-Based Learning (PjBL) were implemented properly according to the E-Module design. The average implementation score reached 96%, categorized as highly implemented, indicating that the learning process was systematically conducted from opening activities, core activities, to closing activities.

Table 15. Practicality and Implementation Results of the E-Module

No	Aspect	Percentage (%)	Category
1	Teacher Practicality	96%	**Very Practical**
2	Student Practicality	95.35%	**Very Practical**
3	Learning Implementation	96%	**Highly Implemented**

Based on Table 15, the results indicate that the implementation of the interactive E-Module based on Project-Based Learning (PjBL) was highly successful. The high practicality scores indicate that the E-Module is easy to use for both teachers and students in the learning process. It also supports more active, collaborative, and structured learning through the implementation of the PjBL model. Furthermore, the observation results confirm that all learning stages were systematically implemented, from introduction to core activities and closing. This indicates that the E-Module is not only feasible but also effective in supporting classroom learning activities.

Based on these implementation results, it can be concluded that the interactive E-Module based on Project-Based Learning (PjBL) has a very high level of practicality and can be effectively applied in classroom learning. Therefore, the next stage of this study is the effectiveness evaluation, which is analyzed using the Paired Sample T-Test and N-Gain score to determine the improvement of students' learning outcomes after using the E-Module.

5. Evaluation Stage

The evaluation stage in this study was conducted to assess the quality and effectiveness of the developed Interactive E-Module based on Project-Based Learning (PjBL). This stage involved a comprehensive analysis of all data obtained throughout the research process, starting from the analysis, design, development, and implementation stages. The purpose of this evaluation was to ensure that the developed E-Module was in line with learning objectives and students' learning needs.

Evaluation in this study not only focused on the final product assessment but also examined the extent to which the E-Module supported an effective learning process. Therefore, the evaluation was carried out based on three main aspects, namely validity, practicality, and effectiveness. Validity was used to determine the feasibility of the product in terms of content, presentation, and language. Practicality was used to examine the ease of use of the E-Module and users' responses during the learning process. Meanwhile, effectiveness was used to determine the extent to which the E-Module improved students' learning outcomes.

Through this evaluation stage, a comprehensive description of the quality of the developed E-Module was obtained. The evaluation results served as the basis for determining whether the Interactive E-Module based on Project-Based Learning (PjBL) was feasible to be used as an

effective, practical, and student-centered learning medium at the junior high school level.

Further explanation of each evaluation aspect is presented as follows:

a. Validity Evaluation

Validity evaluation was conducted to determine the feasibility level of the developed E-Module in terms of model, media, content, and language aspects. This assessment was carried out by expert validators who have competencies in their respective fields. The validity results showed that the developed E-Module obtained an average score of 93.75%, categorized as very valid. This indicates that the E-Module has met the feasibility criteria in terms of content accuracy, presentation structure, visual design, and language use, making it appropriate for use in the learning process.

However, several minor revisions were suggested by the validators, such as correcting typographical errors, improving consistency in terminology usage, enhancing layout arrangement for better clarity, and adding supporting visual elements and instructional videos to improve students' understanding. These suggestions were used as a basis for improving and refining the E-Module.

b. Practicality Evaluation

Practicality evaluation was conducted to determine the ease of use of the Interactive E-Module based on Project-Based Learning (PjBL) in the learning process. Practicality data were obtained from teacher and student response questionnaires after using the E-Module, supported by classroom observation results. The analysis of teacher responses showed that the E-Module obtained a practicality score of 96%, categorized as very practical. This indicates that the E-Module facilitates teachers in delivering materials, managing learning activities, and guiding students through Project-Based Learning (PjBL) steps.

Furthermore, student responses showed an average practicality score of 95.35%, also categorized as very practical. This indicates that the E-Module is easy to use, visually attractive, and provides clear learning instructions that support students in independent and project-based learning. In addition, classroom observation results showed an average implementation score of 96%, categorized as highly implemented. This indicates that the learning process using the PjBL-based E-Module was carried out effectively according to the designed learning syntax and successfully increased student engagement and participation.

Therefore, based on teacher responses, student responses, and implementation observations, it can be concluded that the developed Interactive E-Module based on Project-Based Learning (PjBL) has a very high level of practicality and is suitable for classroom use.

c. Effectiveness Evaluation

Effectiveness evaluation was conducted to determine the extent to which students' learning outcomes improved after using the Interactive E-Module based on Project-Based Learning (PjBL). In addition, effectiveness was also observed through students' engagement during the learning process. During the learning implementation, all students actively participated in the project activities designed in the E-Module. Students were involved in planning, implementing, and presenting project results according to the PjBL stages. This indicates that the learning process provided opportunities for students to engage actively and meaningfully.

The project assessment in this study focused on learning implementation rather than

detailed product evaluation. Therefore, effectiveness was primarily measured through pretest and posttest analysis. The effectiveness test was conducted using the Paired Sample T-Test to determine differences in learning outcomes before and after using the E-Module. In addition, the N-Gain Score was calculated to measure the level of improvement in students' learning outcomes.

The results showed a significant difference between pretest and posttest scores. This was confirmed by the Paired Sample T-Test result with a significance value of less than 0.05, indicating a statistically significant difference. Furthermore, the N-Gain score obtained an average of 79.44%, categorized as effective, indicating a good level of improvement in students' learning outcomes. Thus, it can be concluded that the developed Interactive E-Module based on Project-Based Learning (PjBL) is effective in improving students' learning outcomes and encouraging active participation in the learning process.

Based on the overall evaluation results, the developed Interactive E-Module based on Project-Based Learning (PjBL) has met the quality criteria of a good instructional product. This is evidenced by the validity level categorized as very valid (93.75%), practicality categorized as very practical (teacher 96% and students 95.35%), and effectiveness categorized as effective (N-Gain 79.44%).

Therefore, the developed E-Module is feasible to be used as a learning media in Islamic Education and Character Education (PAI and Budi Pekerti) at SMP Negeri 25 Padang.

DISCUSSION | مناقشة

The results of this study indicate that the development of an Interactive E-Module based on Project-Based Learning (PjBL) contributes positively to improving the overall quality of learning by creating a more active, structured, and student-centered learning process (Padwa & Erdi, 2021). The high level of validity confirms that the E-Module meets the criteria of a good instructional material in terms of content, presentation, and language (Prastowo, 2011). In terms of practicality, the E-Module is considered easy to use by both teachers and students due to its clear structure and systematic guidance, which supports independent and collaborative learning (Janah & Sunanto, 2025; Suryani & Saparuddin, 2022).

However, a more detailed analysis shows that the media aspect obtained the lowest score compared to other aspects, although it was still categorized as very valid. This may be influenced by technical limitations such as device compatibility, screen size constraints, and variations in students' digital literacy. In addition, not all students have equal access to personal devices, which can affect the optimal use of digital learning media. These findings highlight that the effectiveness of digital-based learning tools is not only determined by design quality but also by the technological readiness of users and the learning environment.

Furthermore, the implementation of the PjBL-based E-Module revealed several practical challenges. The duration required to complete project-based activities tends to be longer compared to conventional learning, which may create time management issues within limited classroom schedules. Teachers also need sufficient pedagogical and technological competence to facilitate PjBL effectively in a digital environment. This finding contrasts with some previous studies that report optimal implementation of PjBL without significant constraints, indicating that contextual factors such as school infrastructure and teacher readiness play a crucial role.

Despite these challenges, the use of the PjBL-based E-Module enhances students' engagement and conceptual understanding through direct experience and meaningful project

activities (Aksanti, 2023). The integration of structured PjBL stages within the E-Module supports students in actively constructing knowledge and developing critical thinking skills (Amaliya & Kubro, 2025; Manalu & Marjo, 2025).

From a practical perspective, this study provides several implications. First, the integration of the E-Module into school learning management systems (LMS) can support more flexible and accessible learning. Second, teacher training programs are needed to improve competencies in facilitating digital PjBL-based learning. Third, schools need to consider infrastructure readiness, including device availability and internet access, to ensure optimal implementation.

Overall, the Interactive E-Module based on Project-Based Learning (PjBL) is a feasible, practical, and effective learning innovation. However, its successful implementation depends on the alignment between instructional design, technological readiness, and pedagogical support within the school context.

CONCLUSSION | خاتمة

The interactive e-module based on Project-Based Learning (PjBL) developed in this study demonstrates a high level of validity, as evidenced by expert validation results across the aspects of model, media, content, and language. The e-module is also considered highly practical, as reflected in the positive responses from both teachers and students regarding its ease of use and its ability to support learning activities. Furthermore, the e-module has proven to be effective in improving student engagement and learning outcomes, as indicated by the significant differences between pretest and posttest results, supported by an N-Gain score categorized as effective.

These findings indicate that the structured integration of Project-Based Learning (PjBL) syntax into a digital e-module can promote active, student-centered learning and support meaningful project-based learning activities. Future research is recommended to conduct longitudinal studies to examine the long-term impact of the e-module on students' digital character development, to develop automated assessment features within the e-module, and to test its implementation in schools with diverse socio-economic backgrounds.

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