Digital-Supported Problem-Based Learning in Islamic Education: Strengthening Students' Critical Thinking Skills at Al Abdi Bahlias Junior High School

Mega Dini Fitriani, Danny Abrianto, Charles Rangkuti

Abstract

This study aims to develop and examine the effectiveness of a digital-supported Problem-Based Learning (PBL) model in enhancing students' critical thinking skills in Islamic Education. This research employed a Research and Development (R&D) approach using the ADDIE model, which includes analysis, design, development, implementation, and evaluation stages. The participants of this study were secondary school students involved in Islamic Education learning. Data were collected through critical thinking tests, observation sheets, questionnaires, and interviews. The results show that the implementation of the digital-supported PBL model significantly improved students' critical thinking skills. The average score increased from 64.45 in the pre-test to 81.42 in the post-test, with a statistically significant difference ($p < 0.05$). In addition, students demonstrated positive responses toward the learning process, indicating increased engagement and participation. The findings suggest that integrating digital technology with PBL creates an effective and meaningful learning environment that supports the development of higher-order thinking skills. Therefore, this model can be used as an innovative approach in Islamic Education to meet the demands of 21st-century learning.

Keywords: *Problem-Based Learning, Digital Learning, Critical Thinking Skills, Islamic Education, 21st Century Learning.*

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Introduction

Education in the 21st century requires students to master higher-order thinking skills, particularly critical thinking, collaboration, communication, and creativity. Critical thinking is essential because it enables students to analyze information, evaluate arguments, solve problems, and make responsible decisions in academic and social contexts (Trilling & Fadel, 2009; Chris Joynes et al., 2019). In Islamic Education, critical thinking is also important to help students understand Islamic teachings not only as memorized knowledge, but as values that can be contextualized in real-life problems and contemporary social challenges.

However, Islamic Religious Education is still often implemented through conventional teacher-centered approaches that emphasize memorization, explanation, and passive reception of knowledge. Such approaches may limit students' opportunities to ask questions, investigate problems, construct arguments, and reflect on religious values critically. Previous studies indicate that learning models designed around active inquiry and problem solving are more effective in fostering students' critical thinking than conventional instruction (Facione, 2015; Ennis, 1991; Saragih & Abrianto, 2025).

Problem-Based Learning (PBL) is one of the instructional models that has been widely recognized as effective in developing students' critical thinking and problem-solving skills. PBL places real-world problems at the center of learning activities, encourages students to work collaboratively, investigate information, discuss possible solutions, and present arguments based on evidence (Savery, 2006; Wahyudi, 2025). Barrows explains that PBL promotes selfdirected learning and problem-solving processes, while Hmelo-Silver emphasizes that PBL supports students in constructing knowledge through meaningful inquiry and collaboration (Hmelo & Silver, 2004; Barrows, 1996). Recent systematic reviews and meta-analyses also show that PBL has a positive effect on students' critical thinking skills across different educational levels and subject areas (Anggraeni et al., 2023; Hafizah et al., 2024).

In the context of Islamic Education, PBL has strong potential because Islamic values can be discussed through contextual issues such as moral decision-making, social responsibility, tolerance, environmental ethics, and the application of religious teachings in daily life. Through this approach, students are encouraged to connect Islamic concepts with authentic problems, making learning more meaningful and reflective. Nevertheless, studies on the development of PBL models specifically for Islamic Religious Education remain relatively limited, especially those that integrate digital technology to support learning activities (Afandi et al., 2025; Rangkuti, 2016).

The integration of digital technology into PBL provides new opportunities to create more interactive, flexible, and student-centered learning environments. Digital platforms can support students in accessing learning resources, collaborating online, discussing cases, and presenting problem-solving outcomes. Research on digital-supported learning suggests that technology can strengthen engagement and support the development of 21st-century skills when it is pedagogically integrated rather than merely used as a technical tool (Mardiyah et al., 2026). Therefore, digital-supported PBL may become a relevant innovation for Islamic Education in responding to contemporary educational needs (Abrianto & Sitompul, 2014; Hamid & Rahman, 2026).

This situation also presents a challenge at Al Abdi Bahlias Junior High School. Based on initial observations, the teaching of Islamic Education still requires innovation in teaching strategies that can enhance pupils' active participation and critical thinking skills. Pupils tend to receive information passively and are not yet accustomed to linking learning materials to real-world issues in their immediate environment. Furthermore, the use of digital technology in learning has not yet been fully optimised as a medium to support problem-based learning activities.

Based on the above background, the novelty of this study lies in the development of a digital-supported Problem-Based Learning model in Islamic Education to strengthen students'

critical thinking skills. This study addresses the research problem of how digital-supported PBL can be designed and implemented effectively in Islamic Education learning. Therefore, the objective of this article is to develop and examine a digital-supported Problem-Based Learning model that can enhance students' critical thinking skills in the 21st-century Islamic Education context.

Literature Review

A. Critical Thinking Skills in Education

Critical thinking is widely recognized as a fundamental component of 21st-century skills and an essential outcome of modern education. It involves the ability to analyze arguments, evaluate evidence, make inferences, and solve problems systematically (Trilling & Fadel, 2009; Joynes et al., 2019). Facione defines critical thinking as a purposeful, self-regulatory judgment that results in interpretation, analysis, evaluation, and inference (Facione, 2015). Similarly, Ennis emphasizes that critical thinking includes reflective and reasonable thinking focused on deciding what to believe or do (Robert Ennis, 1991; Santosa et al., 2025).

In educational settings, critical thinking is associated with higher-order thinking skills as categorized in Bloom's taxonomy, particularly at the levels of analysis, evaluation, and creation [18]. Developing these skills requires instructional strategies that actively engage students in inquiry, discussion, and problem-solving activities rather than passive learning. Therefore, educators are encouraged to adopt student-centered learning approaches that promote active participation and intellectual engagement.

B. Problem-Based Learning (PBL)

Problem-Based Learning (PBL) is an instructional approach that uses real-world problems as the starting point for learning. According to Savery, PBL is characterized by student-centered learning, small group collaboration, and the role of the teacher as a facilitator rather than a knowledge transmitter (Savery, 2006). Barrows further explains that PBL aims to develop not only content knowledge but also problem-solving skills, self-directed learning, and critical thinking (Barrows, 1996).

Hmelo-Silver states that PBL supports meaningful learning by allowing students to construct knowledge through investigation and discussion (Hmelo & Silver, 2004). Research findings indicate that PBL has a significant positive effect on students' critical thinking skills, as it encourages learners to identify problems, analyze information, and propose evidence-based solutions (Anggraeni et al., 2023). Furthermore, meta-analytic studies confirm that PBL is more effective than traditional teaching methods in enhancing higher-order thinking skills across various disciplines (Hafizah et al., 2024).

C. Problem-Based Learning in Islamic Education

The application of PBL in Islamic Education provides opportunities to contextualize religious teachings through real-life issues. Islamic Education aims not only to transfer knowledge but also to develop moral reasoning, ethical awareness, and reflective thinking based on Islamic values. Therefore, integrating PBL into Islamic Education can support students in understanding and applying religious principles in practical situations (Harahap, 2022).

Previous studies suggest that contextual and student-centered learning approaches in Islamic Education can enhance students' engagement and understanding of religious concepts (Aryani et al., 2024). By using real-life problems related to social, ethical, and religious issues, PBL can encourage students to think critically about Islamic teachings and their relevance in modern society. However, empirical research on the systematic development of PBL models specifically tailored for Islamic Education is still limited.

D. Digital-Supported Learning in the 21st Century

The integration of digital technology in education has transformed teaching and learning processes, enabling more flexible, interactive, and collaborative environments. Digitalsupported learning involves the use of technology such as Learning Management Systems (LMS), online discussion platforms, and multimedia resources to enhance learning experiences.

According to recent studies, digital learning environments can support the development of critical thinking when they are combined with appropriate pedagogical models [10]. Technology allows students to access diverse information sources, collaborate with peers, and engage in interactive problem-solving activities. However, the effectiveness of digital learning depends on how well it is integrated into instructional design rather than merely used as a supplementary tool (Mayer, 2009).

E. Research Gap and Conceptual Framework

Although numerous studies have examined PBL and its impact on critical thinking, there is still a lack of research that integrates PBL with digital support specifically in the context of Islamic Education. Most existing studies focus on general education or specific disciplines such as science and medicine, while limited attention has been given to religious education contexts.

Therefore, this study addresses this gap by proposing a **digital-supported ProblemBased Learning model in Islamic Education**. The conceptual framework of this study assumes that the integration of PBL and digital technology can create a more interactive, contextual, and student-centered learning environment, which in turn enhances students' critical thinking skills.

Research Methodology

This study employed a Research and Development (R&D) approach to develop and evaluate a digital-supported Problem-Based Learning (PBL) model in Islamic Education aimed at enhancing students' critical thinking skills. The R&D method is appropriate for this study as it focuses on designing, developing, and validating educational products or instructional models (Gall et al., 2003). The development process in this research adapted the ADDIE model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation (Branch, 2009).

A. Research Design

The research design consisted of two main phases: (1) the development phase and (2) the implementation and evaluation phase. In the development phase, the digital-supported PBL model was designed based on theoretical frameworks of PBL, critical thinking, and digital learning. In the implementation phase, the model was tested in a classroom setting to examine its effectiveness in improving students' critical thinking skills.

B. Participants

The participants of this study were students from a secondary school (Madrasah/Senior High School) in Al Abdi Bahlias Simalungun Regency. A purposive sampling technique was used to select participants who were involved in Islamic Education learning. The sample consisted of one experimental group that received instruction using the digitalsupported PBL model. In some cases, a control group using conventional teaching methods may be included for comparison to strengthen the validity of the findings. C. Instruments

Data were collected using several instruments, including:

1. Critical Thinking Test, used to measure students' critical thinking skills before and after the implementation of the model. The test was developed based on critical thinking indicators such as analysis, evaluation, and inference (Facione, 2015);
2. Observation Sheet, used to assess students' engagement and participation during the learning process**;**

3. Questionnaire, used to collect students' responses toward the implementation of digitalsupported PBL**;**
4. Interview Guidelines, used to obtain in-depth information from teachers and students regarding the learning process.

All instruments were validated by experts to ensure content validity and reliability before being used in the study.

D. Procedure

The research procedure followed the ADDIE stages:

1. Analysis: Identification of problems in Islamic Education learning, particularly related to low critical thinking skills and the lack of innovative instructional models;
2. Design: Development of the digital-supported PBL framework, including learning scenarios, digital tools (e.g., LMS, online discussion platforms), and assessment strategies;
3. Development: Creation and validation of learning materials, lesson plans, and digital learning media;
4. Implementation: Application of the developed model in classroom learning activities;
5. Evaluation: Assessment of the effectiveness of the model based on students' critical thinking improvement and learning outcomes.

E. Data Analysis

The data were analyzed using both quantitative and qualitative techniques. Quantitative data from the critical thinking test were analyzed using descriptive statistics and inferential analysis, such as paired sample t-test or independent sample t-test, to determine the significance of students' improvement [24]. Meanwhile, qualitative data from observations and interviews were analyzed using thematic analysis to identify patterns related to students' engagement and learning experiences (Braun & Clarke, 2006).

F. Validity and Reliability

To ensure the validity of the findings, this study applied content validity through expert judgment and construct validity based on theoretical frameworks. Reliability testing was conducted using Cronbach's Alpha for the questionnaire and test instruments. Triangulation of data sources (tests, observations, and interviews) was also used to enhance the credibility of the research results (Denzin, 1978).

Results and Discussion A. Results

The results of this study demonstrate the effectiveness of the digital-supported ProblemBased Learning (PBL) model in enhancing students' critical thinking skills in Islamic Education.

The improvement in students' critical thinking skills can be observed from the comparison between pre-test and post-test scores across several indicators, as presented in Table 1.

Table 1. Students' Critical Thinking Scores Before and After Treatment

No	Indicator	Pre-Test Mean	Post-Test Mean	Gain Score	Category Improvement
1	Analysis	65.20	82.45	17.25	High
2	Evaluation	63.75	80.10	16.35	High
3	Inference	66.10	83.20	17.10	High
4	Explanation	64.30	81.55	17.25	High
5	Interpretation	62.90	79.80	16.90	High
	Average	64.45	81.42	16.97	High

As shown in Table 1, all indicators of critical thinking skills experienced a significant increase after the implementation of the digital-supported PBL model. The average score increased from 64.45 in the pre-test to 81.42 in the post-test, indicating a high level of improvement.

To further confirm the effectiveness of the model, statistical analysis was conducted using a paired sample t-test. The results are presented in Table 2.

Table 2. Paired Sample t-Test Results

Variable	Mean (PreTest)	Mean (PostTest)	t-value	Sig. (pvalue)	Interpretation
Critical Thinking Skills	64.45	81.42	9.876	0.000 (<0.05)	Significant Increase

The t-test results indicate that the difference between pre-test and post-test scores is statistically significant ($p < 0.05$), confirming that the digital-supported PBL model effectively improves students' critical thinking skills.

In addition, students' perceptions toward the implementation of the model were collected through questionnaires. The results are presented in Table 3.

Table 3. Students' Responses to Digital-Supported PBL

No	Statement	Agree (%)	Disagree (%)	Interpretation
1	Learning is more interesting	88%	12%	Very Positive
2	Helps understanding Islamic concepts	85%	15%	Positive
3	Improves critical thinking	90%	10%	Very Positive
4	Digital tools support learning	87%	13%	Positive
5	Encourages active participation	89%	11%	Very Positive

The results indicate that the majority of students responded positively to the digitalsupported PBL model, particularly in terms of engagement, understanding, and critical thinking development.

Visual Representation of Improvement

To clearly illustrate the improvement in students' critical thinking skills, the following diagram presents the comparison between pre-test and post-test average scores:

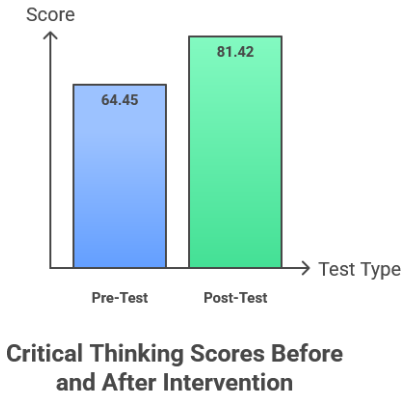

Figure 1. Critical Thinking Score

This diagram shows a clear upward trend, indicating a substantial improvement after the implementation of the model.

B. Discussion

The findings of this study confirm that the digital-supported Problem-Based Learning model is effective in enhancing students' critical thinking skills. The significant increase in test scores demonstrates that engaging students in problem-solving activities supported by digital tools can stimulate higher-order thinking processes, including analysis, evaluation, and inference (Facione, 2015).

The improvement across all critical thinking indicators suggests that the PBL approach provides a comprehensive learning experience. Students are not only required to understand concepts but also to apply, analyze, and evaluate them in real-world contexts. This is consistent with the theory proposed by Hmelo-Silver, which states that PBL promotes meaningful learning through inquiry and collaborative problem-solving (Hmelo & Silver, 2004).

Furthermore, the integration of digital technology plays a crucial role in enhancing the effectiveness of PBL. Digital tools enable students to access diverse learning resources, participate in discussions, and collaborate beyond the classroom. This supports Mayer's multimedia learning theory, which emphasizes that well-designed digital environments can enhance cognitive processing and learning outcomes (Mayer, 2009).

Another important finding is the high level of student engagement observed during the learning process. Students actively participated in discussions, asked questions, and contributed ideas. This indicates a shift from teacher-centered to student-centered learning, which is essential for developing critical thinking skills. These findings align with previous studies showing that active learning approaches are more effective than traditional methods in fostering higher-order thinking (Ennis, 1991).

Despite these positive results, several challenges were identified. These include the need for adequate technological infrastructure, teachers' readiness to implement innovative learning models, and students' adaptation to new learning environments. Therefore, successful implementation of digital-supported PBL requires proper training, institutional support, and careful instructional design.

Overall, this study contributes to the field of Islamic Education by providing empirical evidence that integrating PBL with digital support can significantly enhance students' critical thinking skills. This model can serve as an innovative pedagogical approach to meet the demands of 21st-century education.

Conclusion

This study concludes that the implementation of a digital-supported Problem-Based Learning (PBL) model in Islamic Education is effective in enhancing students' critical thinking skills. The findings show a significant improvement in students' critical thinking performance, as evidenced by the increase in post-test scores compared to pre-test results, as well as the statistically significant outcomes of the t-test analysis.

The improvement across all critical thinking indicators, including analysis, evaluation, inference, explanation, and interpretation, indicates that the integration of PBL with digital support provides a comprehensive learning environment that promotes higher-order thinking. Additionally, students demonstrated positive responses toward the learning process, highlighting increased engagement, motivation, and active participation.

Therefore, it can be concluded that digital-supported PBL is a relevant and effective instructional model for Islamic Education, particularly in addressing the challenges of 21stcentury learning and fostering students' critical thinking skills.

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