Al Qodiri: Jurnal Pendidikan, Sosial dan Keagamaan
Volume 24, Issue 2, 798-810.
e_ISSN: 2598-8735
https://al-qodiri.unikhams.ac.id/index.php/alqodiri/index

The Effect of Artificial Intelligence Integration and Computational Thinking on Students' Religious Problem-Solving Ability in Islamic Religious Education Learning

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Article Info

Article history:

Received: April, 30, 2026
Revised: June, 02, 2026
Accepted: July, 04, 2026

Keywords:

Artificial Intelligence;
Computational Thinking;
Islamic Religious Education;
Religious Problem Solving;
Senior High School Students.

Abstract

The rapid adoption of Artificial Intelligence (AI) has transformed educational practices worldwide, yet its pedagogical value in value-based learning remains insufficiently understood. Previous studies have largely examined AI and computational thinking in STEM, higher education, and general digital learning contexts, leaving Islamic Religious Education underexplored. This study investigates the effects of AI integration and computational thinking on students' religious problem-solving ability in Islamic Religious Education learning. Using a quantitative explanatory correlational survey design, data were collected from 150 grade XI senior high school and madrasah students selected through purposive sampling. A five-point Likert-scale questionnaire was used to measure AI integration, computational thinking, and religious problem-solving ability. The data were analyzed using descriptive statistics, validity and reliability testing, classical assumption tests, Pearson correlation, and multiple linear regression with IBM SPSS Statistics. The findings show that AI integration had a positive and significant effect on religious problem-solving ability. Computational thinking also had a positive and significant effect and emerged as the stronger predictor. Simultaneously, AI integration and computational thinking explained 57.5% of the variance in students' religious problem-solving ability. These findings indicate that the educational value of AI in Islamic Religious Education depends not only on technological access, but also on students' ability to process information systematically, ethically, and contextually. This study extends technology-enhanced learning and computational thinking literature by positioning computational thinking as a cognitive mechanism that transforms AI-supported information into value-based religious problem solving. Practically, the findings highlight the need for AI-supported Islamic Religious Education that integrates source verification, guided questioning, ethical reflection, and structured reasoning.

To cite this article: Khairrina. (2026). The Effect of Artificial Intelligence Integration and Computational Thinking on Students' Religious Problem-Solving Ability in Islamic Religious Education Learning. *Al Qodiri: Jurnal Pendidikan, Sosial dan Keagamaan, 24* (2), 798-810.

INTRODUCTION

Artificial Intelligence (AI) is no longer a peripheral innovation in education; it has become part of the learning ecology that shapes how students access information, construct explanations, receive feedback, and respond to academic problems. In many classrooms, AI is increasingly used to support inquiry, personalize learning, generate alternative explanations, and stimulate discussion. However, its educational value depends not only on technological availability but also on how learners use it to build understanding, evaluate information, and make responsible decisions. UNESCO emphasizes that generative AI in education should be governed through a human-centered approach, ensuring that technology strengthens human agency, teacher roles, and students'

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intellectual development rather than replacing them (Abu et al., 2026; Hsu & Lao, 2025; Nedungadi et al., 2024). This concern is highly relevant to Islamic Religious Education, where learning is not limited to cognitive mastery but also involves moral judgment, spiritual awareness, and ethical responsibility. Therefore, the integration of AI in Islamic Religious Education should be examined as a pedagogical and cognitive issue, not merely as the adoption of digital tools.

The urgency of this issue is reinforced by the growing need to strengthen students' higher-order thinking and problem-solving abilities in the digital era. The PISA 2022 creative thinking assessment shows that Indonesian students still face challenges in generating, evaluating, and improving ideas compared with international benchmarks (Esti et al., 2023; Hernández-Ramos & Araya, 2025). Although creative thinking and problem solving are not identical constructs, both require interpretation, reasoning, evaluation, and the ability to produce justified alternatives. These abilities are increasingly important because students encounter religious questions in digital spaces through online religious content, AI-generated explanations, social media debates, and moral dilemmas related to technology use. In such situations, students need to distinguish reliable religious information from unsupported claims, contextualize Islamic principles, and consider the ethical consequences of their decisions. Without adequate problem-solving ability, students may become passive consumers of digital religious information rather than reflective religious learners. Thus, Islamic Religious Education requires learning strategies that strengthen students' ability to analyze religious problems critically, ethically, and contextually.

Religious problem solving in Islamic Religious Education is more complex than the ability to answer doctrinal questions or memorize religious concepts. It requires students to identify the nature of a religious issue, understand its social and ethical context, relate it to Islamic principles, formulate possible responses, and evaluate the consequences of each solution. AI may support this process by providing explanations, examples, comparisons, and feedback, but it cannot automatically guarantee theological accuracy, contextual sensitivity, or ethical appropriateness. Recent studies indicate that AI can improve higher-order thinking and problem-solving abilities when it is used through guided, reflective, and pedagogically meaningful learning designs (Chang et al., 2025; Ilgun Dibek et al., 2025). At the same time, other studies warn that overreliance on AI dialogue systems may weaken students' critical thinking, analytical reasoning, and decision-making when learners treat AI-generated outputs as final answers rather than materials for evaluation (Zhai et al., 2024). This tension shows that AI integration cannot stand alone. It must be accompanied by a cognitive strategy that enables students to examine, organize, verify, and reinterpret AI-supported information before using it to solve religious problems.

Computational thinking offers a relevant cognitive strategy for addressing this challenge. It refers to a structured mode of thinking that includes decomposing complex problems, recognizing patterns, abstracting essential principles, designing solution steps, and evaluating outcomes. Although computational thinking has often been associated with programming, mathematics, and STEM education, recent studies increasingly position it as a transferable problem-solving competence across learning domains (Li & Oon, 2024; Ye et al., 2023). In Islamic Religious Education, computational thinking can help students break religious problems into key components, identify recurring moral patterns, distinguish essential Islamic values from secondary details, and construct accountable solutions. This is important because contemporary religious issues are rarely linear; they often involve the interaction of scriptural understanding, social context, ethical judgment, and digital information. In this sense, computational thinking may function as a bridge between information access and religious reasoning. It allows students not merely to obtain answers from AI but to process those answers through systematic, reflective, and value-based reasoning.

Previous studies have produced important insights into AI, computational thinking, and problem solving, but the literature remains fragmented. Studies on AI in education generally emphasize personalization, feedback, learning engagement, critical thinking, academic performance, and higher-order thinking (Kassenkhan et al., 2025; Papaneophytou & Nicolaou, 2025). However, much of this literature conceptualizes AI primarily as an instructional support tool rather than as part of a broader cognitive process that shapes students' reasoning. Meanwhile, studies on computational thinking have shown that it strengthens problem decomposition, systematic reasoning, and transferable problem-solving ability, especially in STEM, mathematics, programming, and digital learning contexts (Li et al., 2024; Palop et al., 2025; Pan et al., 2024; Wu et al., 2024; Zhang et al., 2024). Research on AI in Islamic education has begun to discuss ethical use, teacher roles, source validity, and the compatibility of technology with Islamic values (Ajizah et al., 2025; Djazilan et al., 2024). Nevertheless, these studies are still largely conceptual, qualitative, or focused on attitudes and perceptions. Few empirical studies have examined how AI integration and computational thinking jointly predict students' religious problem-solving ability in Islamic Religious Education.

This condition indicates several critical gaps that need to be addressed. First, the empirical gap lies in the limited quantitative evidence explaining whether AI integration and computational thinking significantly influence students' religious problem-solving ability. Second, the contextual gap appears in the dominance of STEM and higher education settings, while Islamic Religious Education as a value-based learning context remains underexplored. Third, the theoretical gap concerns the limited explanation of how AI-supported learning becomes cognitively meaningful for students in solving religious and ethical problems. Existing studies often treat AI and computational thinking as separate variables, whereas religious problem solving requires both access to information and a structured way to interpret it. This study argues that AI alone is insufficient because information access does not necessarily produce sound religious judgment. The novelty of this study lies in positioning computational thinking as a cognitive mechanism that transforms AI-supported information access into systematic, ethical, and contextual religious problem solving. This perspective shifts the discussion from whether AI is useful in education to how AI can become educationally meaningful when mediated by structured reasoning and value reflection.

Based on this background, this study aims to analyze the effect of Artificial Intelligence integration and computational thinking on students' religious problem-solving ability in Islamic Religious Education learning. Specifically, it examines the partial and simultaneous effects of AI integration and computational thinking on students' ability to understand, analyze, and solve religious problems ethically and contextually. Theoretically, this study contributes to technology-enhanced learning by extending the discussion of AI-supported learning into Islamic Religious Education, where technology must be aligned with moral, spiritual, and pedagogical considerations. It also contributes to computational thinking literature by demonstrating its relevance beyond STEM-oriented contexts and positioning it as a framework for value-based problem solving. Practically, this study provides insights for Islamic Religious Education teachers and schools in designing AI-supported learning that remains guided, reflective, and ethically responsible. Rather than positioning AI as a substitute for teachers or religious authority, this study frames AI as a learning support that must be accompanied by source verification, structured reasoning, and value-based reflection. Through this perspective, the study is expected to strengthen the discourse on responsible AI integration in religious education while preserving students' critical, ethical, and spiritual reasoning.

METHOD

Research Design

This study employed a quantitative approach with an explanatory correlational survey design. A quantitative design was used because the study aimed to test measurable relationships among variables through numerical data and statistical analysis (Barroga et al., 2023; Lim, 2025). The explanatory correlational survey design was considered appropriate because this study examined the extent to which Artificial Intelligence integration and computational thinking predict students' religious problem-solving ability in Islamic Religious Education learning. The study did not involve experimental treatment or manipulation of classroom conditions. Instead, it investigated students' responses based on their actual learning experiences. In this model, Artificial Intelligence integration and computational thinking were positioned as independent variables, while religious problem-solving ability was positioned as the dependent variable.

Research Context and Participants

The study was conducted in the context of Islamic Religious Education learning among grade XI senior high school and madrasah students. The population consisted of students who participated in Islamic Religious Education learning and had experience using digital devices or AI-based applications in learning activities. A total of 150 students were selected as respondents using purposive sampling. This sampling technique was used because the study required respondents who met specific criteria relevant to the research objectives. The inclusion criteria were: active grade XI students, participation in Islamic Religious Education classes, experience using digital or AI-based learning tools, willingness to participate voluntarily, and completion of the questionnaire. Incomplete or inconsistent responses were excluded from the final analysis.

Research Instrument

Data were collected using a structured questionnaire with a five-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree. Likert-type instruments are commonly used to measure attitudes, perceptions, and self-reported learning experiences in educational research (Akbulut et al., 2023; Andretta & Worrell, 2022). The questionnaire consisted of three constructs: Artificial Intelligence Integration, Computational Thinking, and Religious Problem-Solving Ability. Artificial Intelligence Integration measured students' use of AI to search for religious information, understand Islamic Religious Education materials, analyze religious cases, support discussion, and engage in ethical reflection. Computational Thinking measured students' ability to decompose problems, recognize patterns, abstract core values, formulate solution steps, and evaluate solutions. Religious Problem-Solving Ability measured students' ability to understand religious problems, identify root causes, connect problems with Islamic principles, formulate alternative solutions, and evaluate solutions ethically and contextually.

Table 1. Operational Variables and Measurement Indicators

Variable	Code	Operational Definition	Main Indicators	Number of Items
Artificial Intelligence Integration	X1	The use of AI in Islamic Religious Education learning to support information searching, material understanding, case analysis, discussion, and ethical reflection.	Searching for religious information; understanding materials; analyzing cases; supporting discussion; using AI ethically.	15
Computational Thinking	X2	Students' systematic thinking ability in solving problems through decomposition, pattern recognition, abstraction, solution formulation, and evaluation.	Problem decomposition; pattern recognition; value abstraction; formulation of solution steps; solution evaluation.	15
Religious Problem-Solving Ability	Y	Students' ability to understand, analyze, and solve religious problems based on Islamic principles in an ethical and contextual manner.	Understanding problems; identifying root causes; connecting with Islamic principles; formulating alternative solutions; evaluating solutions.	15

Table 1 shows the operational structure of the research instrument. Each variable was represented by five indicators, and each indicator was measured using three questionnaire items. This structure was used to ensure that the instrument covered the conceptual domain of each construct in a balanced manner.

Validity and Reliability

Instrument validity was examined through content validity and empirical validity. Content validity was used to ensure that each item was conceptually aligned with the variable indicators and suitable for the context of Islamic Religious Education learning. Empirical validity was tested using item-total correlation. An item was considered valid when the calculated correlation coefficient was higher than the r-table value. The validity test showed that all items had r-count values above the r-table value of 0.160, indicating that all items were valid.

Reliability was examined using Cronbach's alpha. Cronbach's alpha is widely used to evaluate the internal consistency of Likert-type scales (Haghshenas et al., 2023; Zhang et al., 2026). A reliability coefficient of 0.70 or higher is generally considered acceptable in social science research (Akbağ et al., 2025; Aldemir Atmaca et al., 2025). The reliability test showed that Artificial Intelligence Integration had a Cronbach's alpha value of 0.884, Computational Thinking had 0.891, and Religious Problem-Solving Ability had 0.907. These results indicate that all constructs had strong internal consistency and were appropriate for further statistical analysis.

Data Collection Procedure

The data collection process was conducted in several stages. First, the questionnaire was prepared based on the operational indicators of each variable. Second, the questionnaire items were reviewed and refined to improve clarity, relevance, and consistency with the research constructs. Third, the questionnaire was distributed to grade XI students who met the inclusion criteria. Before completing the questionnaire, respondents were informed about the purpose of the study, the voluntary nature of participation, the confidentiality of their responses, and the academic use of the data. Fourth, the collected responses were screened to identify incomplete answers and response inconsistencies. Only complete and usable responses from 150 students were included in the final dataset.

Data Analysis

Data were analyzed using IBM SPSS Statistics. The analysis began with descriptive statistics, including minimum score, maximum score, mean, and standard deviation. Descriptive statistics were used to describe the general tendency of each variable. Instrument quality was then examined through validity and reliability tests. Before hypothesis testing, classical assumption tests were conducted to ensure that the regression model met the required statistical assumptions. These tests included normality, multicollinearity, and heteroscedasticity testing. The use of assumption testing is important in regression analysis because violations of these assumptions may affect the accuracy and interpretation of the model (Lenz et al., 2026; Osemeke et al., 2024; Roustaei, 2024).

Normality was examined using the Kolmogorov–Smirnov test on unstandardized residuals. Multicollinearity was assessed using Tolerance and Variance Inflation Factor values. A Tolerance value above 0.10 and a VIF value below 10 indicated that multicollinearity was not problematic. Heteroscedasticity was examined using the Glejser test and supported by residual scatterplot inspection. After the assumptions were met, Pearson correlation analysis was used to examine the direction and strength of the relationships among variables. Multiple linear regression was then used to test the partial and simultaneous effects of Artificial Intelligence integration and computational thinking on religious problem-solving ability.

The regression model was formulated as follows:

$$Y = a + b1X1 + b2X2 + e$$

where Y represents religious problem-solving ability, X1 represents Artificial Intelligence integration, X2 represents computational thinking, a represents the constant, b1 and b2 represent regression coefficients, and e represents the error term. The t-test was used to determine the partial effect of each independent variable, while the F-test was used to determine their simultaneous effect. The coefficient of determination was used to identify the proportion of variance in religious problem-solving ability explained by the independent variables. Statistical significance was determined at $p < 0.05$.

Table 2. Data Analysis Procedure

Analysis Stage	Statistical Technique	Decision Criteria
Descriptive analysis	Mean, standard deviation, minimum, maximum	Used to describe the tendency of each variable
Item validity	Item-total correlation	r-count > r-table
Reliability	Cronbach’s alpha	$\alpha \geq 0.70$
Normality	Kolmogorov–Smirnov test	$p > 0.05$
Multicollinearity	Tolerance and VIF	Tolerance > 0.10; VIF < 10
Heteroscedasticity	Glejser test and scatterplot	$p > 0.05$ and random residual pattern
Correlation analysis	Pearson correlation	Direction and strength of relationship
Hypothesis testing	Multiple linear regression, t-test, F-test, R^2	$p < 0.05$

Table 2 summarizes the statistical procedures used in this study. The sequence of analysis was designed to ensure that the instrument was adequate, the data met regression assumptions, and the hypotheses were tested using appropriate statistical criteria.

Research Ethics

This study followed ethical principles in educational research. Respondents were informed about the purpose of the study, voluntary participation, confidentiality of responses, and their right not to participate. The questionnaire did not require respondents to disclose personal identities, and all responses were treated anonymously. The data were used only for academic purposes. The study also maintained academic integrity by reporting the procedures, instrument testing, and statistical analysis transparently.

RESULTS AND DISCUSSION

Results

This section presents the empirical findings obtained from the analysis of data collected from 150 grade XI students who participated in Islamic Religious Education learning. The results are organized systematically to address the research objectives and hypotheses. The presentation begins with the respondents' characteristics, followed by descriptive statistics of the research variables, instrument quality assessment, classical assumption testing, correlation analysis, and multiple linear regression analysis. The section concludes with the results of hypothesis testing, which provide empirical evidence regarding the effects of Artificial Intelligence integration and computational thinking on students' religious problem-solving ability. All findings are reported based on the statistical analysis without interpretation, which is presented in the subsequent Discussion section.

Respondent Profile

A total of 150 grade XI students participated in this study. The respondent profile included gender, class program, AI use intensity, and experience using AI in Islamic Religious Education learning.

Table 3. Respondent Characteristics

Characteristic	Category	Frequency	Percentage
Gender	Male	68	45.3%
	Female	82	54.7%
Class Program	XI Science	56	37.3%
	XI Social Sciences	61	40.7%
	XI Religious/Language	33	22.0%
AI Use Intensity	Low	31	20.7%
	Moderate	76	50.7%
	High	43	28.6%
Experience using AI for Islamic Religious Education learning	Yes	121	80.7%
	No	29	19.3%

Table 3 shows that the respondents were relatively balanced by gender, with female students representing 54.7% of the sample and male students representing 45.3%. Most respondents came from social sciences and science programs. In relation to AI use, 50.7% of students reported moderate use, while 80.7% had experience using AI to support Islamic Religious Education learning. This profile indicates that most respondents had relevant exposure to AI-based learning tools.

Descriptive Statistics

Descriptive analysis was conducted to identify the general tendency of each research variable. The results are presented in Table 4.

Table 4. Descriptive Statistics of Research Variables

Variable	N	Minimum	Maximum	Mean	Standard Deviation	Category
Artificial Intelligence Integration (X1)	150	2.40	4.93	3.82	0.51	High
Computational Thinking (X2)	150	2.33	4.87	3.74	0.49	High
Religious Problem-Solving Ability (Y)	150	2.47	4.95	3.88	0.46	High

Table 4 indicates that all research variables were in the high category. Religious Problem-Solving Ability had the highest mean score, followed by Artificial Intelligence Integration and Computational Thinking. The standard deviation values were below 1.00, indicating that students' responses were relatively homogeneous.

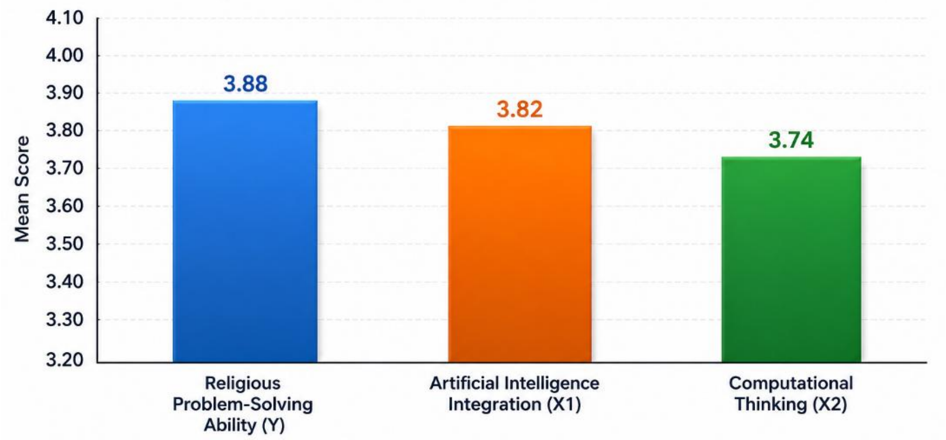

Figure 1. Mean Scores of Research Variables

Figure 1 illustrates that students reported the highest mean score in Religious Problem-Solving Ability. This result suggests that students perceived themselves as capable of understanding, analyzing, and evaluating religious problems in Islamic Religious Education learning.

Instrument Validity and Reliability

The instrument was tested before hypothesis analysis. Validity was examined using item-total correlation, while reliability was examined using Cronbach's alpha. The results are summarized in Table 5.

Table 5. Instrument Validity and Reliability

Variable	Number of Items	Range of r-count	r-table	Cronbach's Alpha	Description
Artificial Intelligence Integration (X1)	15	0.421–0.782	0.160	0.884	Valid and reliable
Computational Thinking (X2)	15	0.438–0.801	0.160	0.891	Valid and reliable
Religious Problem-Solving Ability (Y)	15	0.452–0.824	0.160	0.907	Valid and reliable

Table 5 shows that all r-count values exceeded the r-table value of 0.160. The Cronbach's alpha values for all variables were also above 0.70. These results indicate that the questionnaire items were valid and internally consistent.

Assumption Testing

Before multiple linear regression analysis, normality, multicollinearity, and heteroscedasticity tests were conducted. The results are presented in Table 6.

Table 6. Classical Assumption Test Results

Assumption Test	Indicator	Result	Decision
Normality	Kolmogorov–Smirnov Sig.	0.200	Normal
Multicollinearity: AI Integration	Tolerance / VIF	0.684 / 1.462	No multicollinearity
Multicollinearity: Computational Thinking	Tolerance / VIF	0.684 / 1.462	No multicollinearity
Heteroscedasticity: AI Integration	Glejser Sig.	0.318	No heteroscedasticity
Heteroscedasticity: Computational Thinking	Glejser Sig.	0.426	No heteroscedasticity

Table 6 indicates that the regression model met the required assumptions. The residuals were normally distributed, multicollinearity was not detected, and the Glejser test showed no heteroscedasticity. Therefore, the data were appropriate for multiple linear regression analysis.

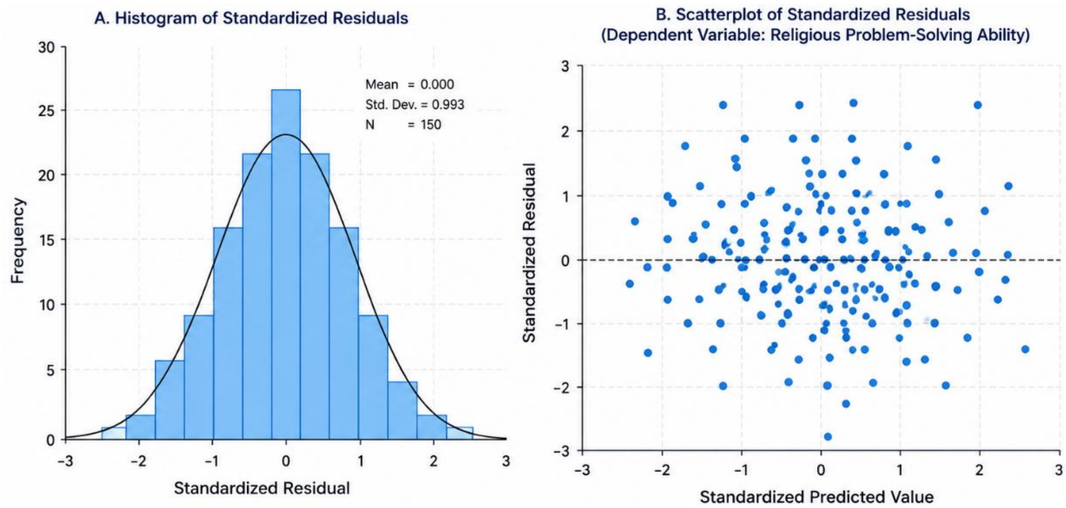

Figure 2. Residual Distribution and Scatterplot

Figure 2 shows that the residual distribution and scatterplot supported the results of the assumption tests. The residuals did not show a systematic pattern, indicating that the regression model was statistically appropriate for hypothesis testing.

Correlation among Variables

Pearson correlation analysis was conducted to examine the direction and strength of the relationships among the research variables.

Table 7. Correlation Matrix

Variable	AI Integration (X1)	Computational Thinking (X2)	Religious Problem-Solving Ability (Y)
AI Integration (X1)	1	0.562**	0.641**
Computational Thinking (X2)	0.562**	1	0.689**
Religious Problem-Solving Ability (Y)	0.641**	0.689**	1

Table 7 shows that all variables were positively correlated. AI Integration was positively correlated with Religious Problem-Solving Ability, while Computational Thinking showed the strongest correlation with Religious Problem-Solving Ability. These results indicate that students with higher AI integration and stronger computational thinking tended to report better religious problem-solving ability.

Multiple Linear Regression

Multiple linear regression was used to examine the partial and simultaneous effects of Artificial Intelligence Integration and Computational Thinking on Religious Problem-Solving Ability.

Table 8. Model Summary and ANOVA

Model Indicator	Value
R	0.758
R Square	0.575
Adjusted R Square	0.569
Std. Error of the Estimate	0.302
F	99.421
Sig.	0.000

Table 8 shows that the regression model was significant. The R Square value of 0.575 indicates that Artificial Intelligence Integration and Computational Thinking explained 57.5% of the variance in students' Religious Problem-Solving Ability. The F value of 99.421 with a significance value of 0.000 confirms that both independent variables simultaneously had a significant effect on Religious Problem-Solving Ability.

Table 9. Regression Coefficients

Predictor	B	Std. Error	Beta	t	Sig.	Decision
Constant	0.812	0.214	—	3.794	0.000	Significant
Artificial Intelligence Integration (X1)	0.352	0.058	0.391	6.069	0.000	Significant
Computational Thinking (X2)	0.461	0.061	0.489	7.557	0.000	Significant

Table 9 shows that Artificial Intelligence Integration had a positive and significant effect on Religious Problem-Solving Ability. Computational Thinking also had a positive and significant effect. The standardized beta coefficient of Computational Thinking was higher than that of Artificial Intelligence Integration, indicating that Computational Thinking was the stronger predictor in the model.

The regression equation is:

$$Y = 0.812 + 0.352X1 + 0.461X2$$

This equation indicates that increases in Artificial Intelligence Integration and Computational Thinking are associated with increases in Religious Problem-Solving Ability.

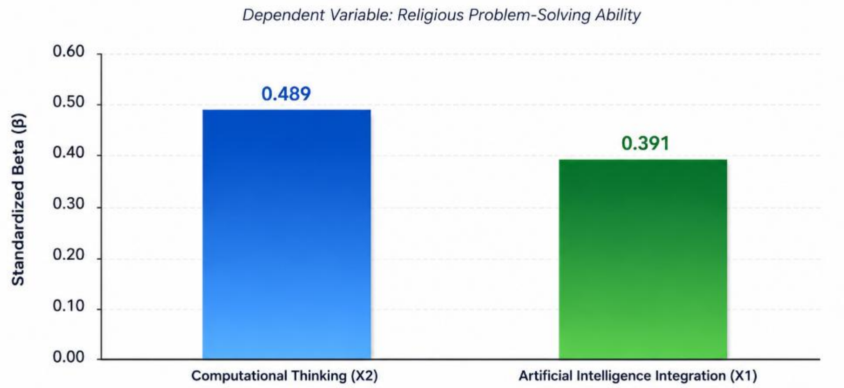

Figure 3. Comparison of Standardized Beta Coefficients

Figure 3 highlights the relative strength of the predictors. Computational Thinking contributed more strongly to Religious Problem-Solving Ability than Artificial Intelligence Integration, suggesting that structured thinking plays a central role in transforming AI-supported learning into religious problem-solving competence.

Hypothesis Testing Summary

The results of hypothesis testing are summarized in Table 10.

Table 10. Hypothesis Testing Summary

Hypothesis	Statement	Statistical Evidence	Result
H1	Artificial Intelligence Integration has a positive and significant effect on Religious Problem-Solving Ability.	B = 0.352; t = 6.069; p = 0.000	Accepted
H2	Computational Thinking has a positive and significant effect on Religious Problem-Solving Ability.	B = 0.461; t = 7.557; p = 0.000	Accepted
H3	Artificial Intelligence Integration and Computational Thinking simultaneously have a positive and significant effect on Religious Problem-Solving Ability.	F = 99.421; p = 0.000; R^2 = 0.575	Accepted

Table 10 confirms that all proposed hypotheses were accepted. The findings show that both Artificial Intelligence Integration and Computational Thinking were significant predictors of students' Religious Problem-Solving Ability. Simultaneously, the two variables explained more than half of the variance in Religious Problem-Solving Ability, indicating that technological learning support and structured thinking ability are important components in Islamic Religious Education learning.

Discussion

The findings show that Artificial Intelligence integration has a positive and significant effect on students' religious problem-solving ability in Islamic Religious Education learning. This result indicates that AI can support students in accessing explanations, comparing perspectives, developing questions, and obtaining initial feedback when they engage with religious issues. From the perspective of technology-enhanced learning, AI becomes educationally meaningful when it is embedded in guided learning activities rather than used as an automatic answer provider. This finding is consistent with recent studies showing that AI-based learning can strengthen higher-order thinking, critical inquiry, and problem-solving processes when supported by appropriate pedagogical direction (Chang et al., 2025; Ilgun Dibek et al., 2025; Kassenkhan et al., 2025). However, in Islamic Religious Education, the role of AI must be interpreted carefully because religious learning requires source verification, ethical judgment, and contextual understanding. Therefore, AI integration should not be understood as a replacement for teachers or religious authority, but as a learning support that helps students explore and reflect on religious problems more systematically.

The second finding confirms that computational thinking has a positive and significant effect on students' religious problem-solving ability. This means that students who are able to decompose problems, recognize patterns, abstract essential values, formulate solution steps, and evaluate outcomes tend to demonstrate stronger ability in solving religious problems. Theoretically, this finding expands the application of computational thinking beyond STEM, mathematics, and programming contexts. It shows that computational thinking can also operate as a transferable cognitive framework for value-based learning. This result is in line with previous studies showing that computational thinking supports systematic reasoning, cognitive transfer, and problem-solving performance across educational settings (Li & Oon, 2024; Ye et al., 2023). In the context of Islamic Religious Education, computational thinking helps students move from fragmented religious information toward structured ethical reasoning. Thus, religious problem solving requires not only knowledge of Islamic principles, but also a disciplined thinking process that enables students to apply those principles to real and contemporary issues.

A particularly important finding is that computational thinking emerged as the stronger predictor than Artificial Intelligence integration. This pattern suggests that students' religious problem-solving ability is shaped more strongly by how they process information than by their access to AI-supported information itself. AI may provide learning resources, alternative explanations, and discussion stimuli, but computational thinking determines whether students can organize, verify, and evaluate that information. This interpretation is consistent with concerns that excessive reliance on AI dialogue systems may weaken students' cognitive abilities when they accept AI-generated responses without critical examination (Zhai et al., 2024). Therefore, the role of computational thinking in this study is not merely as an additional independent variable, but as a cognitive mechanism that helps transform AI-supported information into ethical and contextual religious solutions. This is one of the main conceptual contributions of the study. It shifts the discussion from whether AI improves learning toward how students' structured reasoning determines the educational value of AI in religious learning.

The simultaneous effect of Artificial Intelligence integration and computational thinking further indicates that students' religious problem-solving ability is shaped by the combination of technological support and cognitive structure. The model explains 57.5% of the variance in religious problem-solving ability, which suggests that both variables are important predictors in the context of Islamic Religious Education learning. This finding supports the view that technology-enhanced learning becomes more effective when combined with active knowledge construction and structured reasoning. Compared with studies that examine AI mainly in relation to engagement, academic performance, or general higher-order thinking, this study places AI within a religious education context where knowledge must be interpreted ethically and spiritually (Papaneophytou & Nicolaou, 2025; Kassenkhan et al., 2025). At the same time, compared with computational thinking studies that remain dominant in STEM-related fields, this study demonstrates its relevance for religious and moral problem solving (Li & Oon, 2024; Ye et al., 2023). Therefore, this study fills an empirical and contextual gap by integrating AI, computational thinking, and religious problem-solving ability into one quantitative model.

Nevertheless, the findings should be understood within the boundaries of the research design. The use of a correlational survey allows the study to explain predictive relationships, but it does not establish causal effects in the same way as experimental research. The use of questionnaire data also means that the findings are based on students' self-reported perceptions, which may contain response bias. Even so, these limitations do not reduce the theoretical relevance of the study; rather, they clarify the scope of interpretation. The study contributes to the literature by positioning computational thinking as a bridge between AI-supported learning and religious problem-solving ability. Practically, the findings suggest that Islamic Religious Education teachers should design AI-supported case-based learning that includes source verification, guided questioning, ethical reflection, and structured problem-solving tasks. Future research should test this model using experimental or mixed-method designs and include additional variables such as AI literacy, religiosity, critical thinking, self-regulated learning, and teacher guidance.

CONCLUSION

This study examined the effect of Artificial Intelligence integration and computational thinking on students' religious problem-solving ability in Islamic Religious Education learning. The findings show that both Artificial Intelligence integration and computational thinking have positive and significant effects on students' religious problem-solving ability, both partially and simultaneously. These results indicate that AI-supported learning can help students access information, compare perspectives, and develop initial understanding, while computational thinking enables them to organize, verify, and evaluate that information more systematically. Among the two predictors, computational thinking emerged as the stronger factor, suggesting that students' ability to process information critically is more decisive than access to AI itself. Therefore, the educational value of AI in Islamic Religious Education depends not only on the availability of technology, but also on students' structured reasoning and ethical reflection.

Theoretically, this study contributes to the literature by extending the discussion of AI-supported learning and computational thinking into the context of Islamic Religious Education. It shows that computational thinking can function as a cognitive mechanism that transforms AI-supported information into ethical, contextual, and value-based religious problem solving. Practically, the findings suggest that Islamic Religious Education teachers should design AI-supported case-based learning that includes source verification, guided questioning, moral reflection, and structured problem-solving activities. This study is limited by its correlational survey design, reliance on self-reported questionnaire data, and sample coverage of grade XI senior high school and madrasah students. Future research should examine this model through experimental or mixed-method designs, involve broader educational contexts, and consider additional variables such as AI literacy, religiosity, critical thinking, self-regulated learning, and teacher guidance.

AUTHOR CONTRIBUTIONS STATEMENT

Khairrina Conceptualization, methodology, formal analysis, investigation, data curation, writing original draft, writing review and editing, visualization, and project administration. The author has read and approved the final version of the manuscript and agrees to be accountable for all aspects of the work.

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