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The Effectiveness of Jigsaw Model Based on Flipped Classroom to Improve Students' Critical Thinking Ability in Islamic Religious Education Learning

Makhrus Ali[1]✉, Sutarto[2], R Nurhayati[3], Hasyim Mahmud Wantu[4], Miftachul Amri[5], Tomi Apra Santosa[6]
Sekolah Tinggi Agama Islam Ibnu Rusyid Kotabumi, Indonesia(1); Sekolah Tinggi Agama Islam Nida El-Adabi, Indonesia(2); Universitas Islam Negeri Raden Intan Lampung, Indonesia(3); Institut Agama Islam Negeri Sultan Amai Gorontalo, Indonesia(4); Universitas Negeri Surabaya, Indonesia(5); Akademi Teknik Adikarya, Indonesia(6)
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Abstract
This study aims to determine the influence of the flipped classroom-based Jigsaw model on students' critical thinking skills in PAI learning. This type of research is quantitative research with the use of meta-analysis. The inclusion criteria in this study are research published in 2021-2024; Research must be relevant; research must be experimental or quasi-experimental methods; research must be indexed by SINTA, Scopus or Web of Science; Research must be carried out on Islamic Religious Education learning and research data must be complete to calculate the effect size value. Data analysis is to calculate the effect size value with the help of a JSAP application. The results of the study concluded that the flipped classroom-based jigsaw model positively influenced the thinking ability of students in PAI learners with a score (rRE= 1.026; z= 7.086 and p < 0.001). This finding provides important information for applying the flipped classroom-based jigsaw learning model to encourage the critical thinking skills of school students.

Keywords: *Flipped Classroom; Jigswa Model; Effect Size; PAI; Critical Thinking*

✉ Corresponding author: Makhrus Ali
Email Address: makhrus.ali@gmail.com (Lampung, Indonesia)
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Introduction

Critical thinking skills are essential in Islamic religious education because they teach students not only to receive information passively but also to analyze, evaluate, and question the various concepts learned (Rijal et al., 2021; Diniyyah et al., 2022). In Islam, critical thinking is reflected in the teachings of the Qur'an, which encourages people to think deeply about Allah's creation, the laws of nature, and aspects of social and spiritual life. By thinking critically, students can relate religious teachings to real-life contexts, solve moral problems, and make decisions based on Islamic principles (Saputra et al., 2019). This is especially important in the modern era full of complex challenges, where students must be able to sort information wisely and live a life with solid religious values. In addition, the ability to think critically also helps students understand religious texts more deeply. Islamic religious education teaches memorization or dogmatic knowledge and encourages a more contextual

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understanding of the teachings (Rohman, 2022; Osman et al., 2020). By thinking critically, students can study various interpretations of texts, investigate sources of Islamic law, and engage in discussions that enrich their religious insights. The development of these skills also supports the formation of strong morals and character, as students are trained to consider different viewpoints and make fair judgments based on the teachings of Islam (Altinyelken, 2021; Nurtamam et al., 2023).

Islamic Religious Education (PAI) learning often faces challenges in developing critical thinking skills in students. One of the most prominent problems is the teaching method which is still dominated by conventional approaches such as lectures and memorization (Fajrul Munir, 2020). This approach makes students passive recipients of information, without being trained to critically analyze or evaluate the learned teachings. As a result, students are less familiar with activities that demand higher-order thinking skills, such as critical reflection, problem-solving, and applying religious teachings in daily life. This is an obstacle in producing a generation that is able to understand and practice Islamic teachings with a deep and contextual understanding (Ma`arif et al., 2022; Simanjuntak, 2024). Another problem in PAI learning is the lack of use of interactive and collaborative learning strategies. Students tend to learn individually, so opportunities to discuss, share perspectives, and collaborate with classmates are often limited. This condition not only hinders the development of critical thinking skills but also lowers the level of student involvement in learning (Rohman, 2022). In fact, social interaction in group discussions is very important to build a broader understanding of religious teachings, including examining various diverse perspectives in the interpretation of religious texts. The lack of learning methods that encourage active involvement and cooperation between students makes the learning process monotonous and unchallenging (Farooqi & Naeem, 202; Fajri et al., 2023; Chimmalee & Anupan, 2023; Wahjusaputri & Fitrianingsih, 2024). The lack of technology integration in PAI learning is also a significant problem. In today's digital age, technology can play an important role in providing access to richer and more varied learning resources, including videos, simulations, and interactive apps that can make it easier to understand religious concepts (Idris et al., 2018). However, many schools have not utilized technology optimally in PAI learning. Students rely more often on traditional textbooks, which are sometimes not interesting enough or relevant to the context of their daily lives. As a result, students' motivation to learn in PAI subjects is often low, and learning becomes less effective in fostering 21st-century skills, such as critical thinking, creativity, and problem-solving skills (Mahfudz & Sukarno, 2023). Therefore, it is necessary to have a model that can develop students' critical thinking skills, namely the Jigsaw learning model.

Jigsaw learning is a cooperative learning model designed to improve student collaboration and interaction. In this model, students are divided into small groups, where each group member is responsible for learning and mastering one piece of material (Affandi et al., 2022; Usman et al., 2022). After understanding the material, they must explain and teach it to the rest of the group. In this way, each student is not only required to master a certain section but also to rely on each other to understand the entire material. This encourages active engagement, cooperation, and the development of communication skills and social responsibility, as each student has an important role in the group learning process. In addition, the jigsaw learning model is effective in improving deep understanding and critical thinking skills in students (Maison et al., 2021; Basyah et al., 2018; Fajri et al., 2023). By giving students the opportunity to become "experts" in one aspect of the material and then convey it to their peers, they are trained to analyze, summarize, and convey information clearly. This process also helps reinforce the understanding of concepts, as students must understand the material well before explaining it to others. Jigsaw learning creates an interactive and fun learning atmosphere, where students feel motivated to actively participate and help each other in achieving shared learning goals (Lelean & Edwards, 2020).

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Furthermore, the jigsaw learning model can be collaborated with the flipped classroom. Flipped Classroom is Flipped classroom is a learning model that reverses the traditional concept, where material delivery activities are carried out outside the classroom and time in the classroom is used for discussion, problem solving, and more interactive activities (Lelean & Edwards, 2020; Park et al., 2021). In a flipped classroom, students usually learn the material through videos, articles, or online learning materials before class starts (ÖZ & Kala, 2023). This allows students to access and understand the material independently according to their learning pace. When students come to class, they already have a basic understanding, so that time in class can focus more on deepening concepts, group discussions, and applying material in more practical and collaborative situations. Thus, students are more active and involved in the learning process (Chimmalee & Anupan, 2023). The flipped classroom model also provides great benefits in terms of developing critical thinking and problem-solving skills (Simatupang et al., 2023). Because students have already acquired the material beforehand, class time is more focused on developing a higher level of understanding, such as analyzing, evaluating, and creating solutions based on what has been learned (Farooqi & Naeem, 2023; Net & Aqmarina, 2024). Teachers act as facilitators who guide students in solving problems and providing direct feedback. In addition, flipped classrooms encourage more personalized learning, as students can redo material that they have not understood without feeling overwhelmed by limited class time. This model is effective in maximizing the interaction between teachers and students so that learning becomes more meaningful and deep (Chimmalee & Anupan, 2023).

Research by Akçayır and Akçayır (2018) revealed that flipped classrooms are able to increase student engagement and help them better prepare for classroom discussions, while jigsaw models provide opportunities for students to work together and develop critical thinking skills through their respective responsibilities in the group. The results of the study showed that when students were given an active role, they were better able to understand concepts independently and develop critical thinking skills through interaction with peers. Research by Sukardi (2020) on PAI learning found that students who learned using the flipped classroom and jigsaw models significantly increased their ability to analyze and evaluate religious texts. In addition, they are more motivated to learn and more easily apply religious concepts in their daily lives. This research supports the idea that the combination of these two learning models is able to create a dynamic learning atmosphere where students are encouraged to think critically and reflectively about the religious teachings they are learning. Furthermore, research by Wang and Liu (2019) revealed that the flipped classroom model, which requires students to prepare materials before class, creates a more interactive learning atmosphere and increases student engagement. Students who have studied the material independently show higher confidence when participating in class discussions, which contributes to improved thinking skills. The research gap is that many researchers regarding the jigsaw learning model have not found an effect size jigsaw model based on flipped classrooms in PAI learning. Therefore, it is necessary to conduct a meta-analysis to determine the effectiveness of the flipped classroom-based Jigsaw model on students' critical thinking skills in PAI learning by analyzing previous studies.

Methodology

This study is quantitative research with a meta-analysis approach. Meta-analysis is a study that collects and analyzes previous research quantitatively to reach a conclusion (Öztop, 2023; Zulyusri et al., 2023; Tamur et al., 2020). This meta-analysis determines the influence of the flipped classroom-based Jigsaw model on students' critical thinking skills in PAI learning. Menurut (Borenstein et al., 2007; Zulkifli et al., 2022) meta-analysis research procedures, i.e. determining the research inclusion criteria, collecting data and coding, and analyzing the data statistically, which can be seen in Figure 1.

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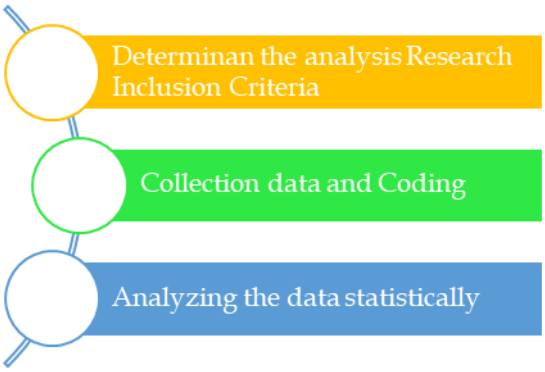

Figure 1: Procedure Meta-analysis

Eligibility Criteria

In the process of searching for data through Google Scholar, ScienceDirect, Wiley, ERIC, ProQuest and IEEE databases, the research must meet several inclusion criteria, namely the research published in 2021-2024, the research must be relevant, the research must be an experimental or quasi-experimental method, the research must be indexed by SINTA, Scopus or Web of Science, the research is carried out on Islamic Religious Education learning, and the research data must be complete to calculate the effect size value. From the data search, 22 studies were obtained that met the inclusion criteria published in 2021-2024, as shown in Table 2.

Data Collection

To obtain valid research data related to ethno-physics-based problem-based learning models to improve students' thinking skills in PAI students collected from Google Scholar, ScienceDirect, Wiley, ERIC, ProQuest and IEEE databases. Keywords for data search consist of: "Jigsaw Learning Model"; Flipped Classroom-based Jigsaw Model"; "Flipped Classroom", "The Influence of Flipped Classroom-Based Jigsaw Model on Critical Thinking of PAI Students"; "Thinking ability in PAI students".

Statistic Analysis

The data analysis in this study calculated the effect size value of each analyzed study. The value of the effect measure in this study is to calculate the effect of the flipped classroom-based jigsaw learning model on critical thinking skills in PAI students. According to (Borenstein dkk., 2007) The stages of data analysis in the meta-analysis can be seen in (Figure 2.). Furthermore, the criteria for the value of the effect measure in the study can be seen in Table 1.

Table 1. Category Effect Size Value

Effect Size	Category
0.0≤ES≤ 0.2	Low
0.2≤ES≤ 0.8	Medium
ES≥ 0.8	High

Sources: (Borenstein et al., 2007; Bachtiar et al., 2023; Tamur et al., 2020)

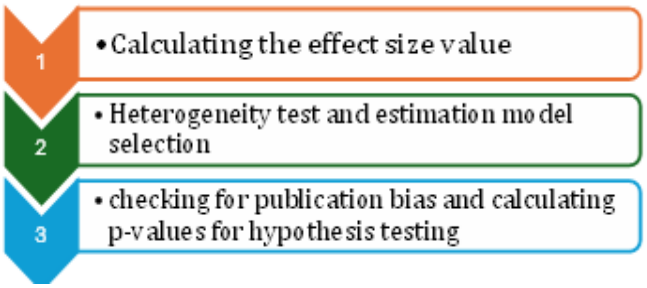

Figure 2. Data Analysis Procedure

DOI: 10.31004/obsesi.v8i5.1069

Result and Discussion

Based on the results of the data search through the database, 24 studies/articles met the inclusion criteria. The size of the effect and the standard of error can be seen in Table 2.

Table 2. Effect Size and Standard Error of Each Study

Journal Code	Years	Effect Size	Standard Error
R1	2024	0.88	0.23
R2	2024	1.82	0.34
R3	2024	0.52	0.48
R4	2022	1.07	0.30
R5	2022	0.72	0.26
R6	2022	2.51	0.51
R7	2022	1.52	0.41
R8	2023	0.93	0.38
R9	2024	0.87	0.30
R10	2023	1.06	0.39
R11	2023	1.25	0.32
R12	2023	1.19	0.30
R13	2023	1.72	0.43
R14	2023	0.91	0.37
R15	2024	0.57	0.20
R16	2024	0.61	0.26
R17	2022	0.42	0.17
R18	2022	0.69	0.22
R19	2022	1.92	0.45
R20	2023	1.03	0.30
R21	2023	-0.71	0.27
R22	2024	2.83	0.62

Based on Table 2, the effect size values of the 22 studies ranged from 0.42 to 2.83. According to Borenstein dkk., (2007) Of the 22 effect sizes analyzed, one study (4.5%) had a low effect size criterion, 6 studies (27.28%) had a medium effect size criterion and 15 studies (68.18%) had a high effect size criterion. Furthermore, 22 studies were analyzed to determine an estimation model to calculate the average effect size. The analysis of the fixed and random effect model estimation model can be seen in Table 3.

Table 3. Fixed and Random Effect Model

	Q	Df	p
Omnibus Coeficient	69.821	1	< 0,001
Residual Heterogeneity	119.007	23	< 0,001

Based on Table 3, a Q value of 119,007 was obtained higher than the value of 69,821 with a coefficient interval of 95% and a p value of 0.001 <. The findings can be concluded that the values of the 22 effect measures analyzed are heterogeneously distributed. Therefore, the model used to calculate the average effect size is a random effect model. Next, check the bias of the publication through funnel plot analysis and Rosenthal fail-safe N test (FSN) (Tamur dkk., 2020; Badawi dkk., 2022; Ichsan dkk., 2023b; Borenstein dkk., 2007; Fazel et al., 2012). The results of checking the publication bias with the funnel plot can be seen in Figure 2.

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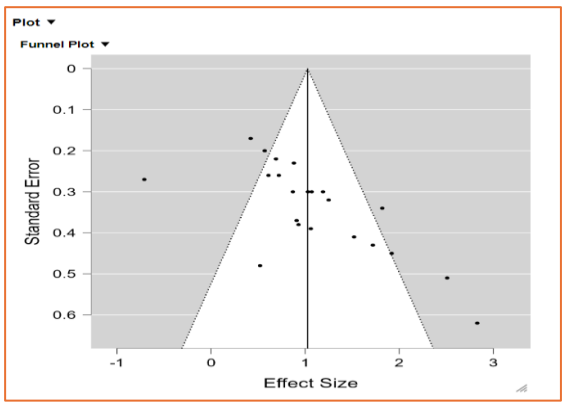

Figure 2. Funnel Flot Random Effect Model

Based on Figure 2, the funnel plot analysis is not yet known whether it is symmetrical or asymmetrical, so it is necessary to conduct a Rosenthal Fail Safe N (FSN) test. The results of the Rosenthal Fail Safe N calculation can be seen in Table 4.

Tabel 4. Fail safe N

Drawer Analysis			
	Fail Safe N	Target Significance	Observed Significance
Rosenthal	1691	0.050	< 0,001

Based on Table 4, the Fail-Safe N value of 1691 is greater than the value of 5k + 10 = 5(24) + 10 = 120, so it can be concluded that the analysis of the 22 effect measures in this data is not biased by the publication and can be scientifically accounted for. Next, calculate the p-value to test the hypothesis through a random effects model. The results of the analysis of the summary effect model with the random effect model can be seen in Table 5.

Tabel 5. Summary Effect Size

Coefficients						
	Hedge's	Standard Error	z	p	Confidence Interval 95%	
					Lower	Upper
Intercept	1.026	0.145	7.086	< 0,01	0.742	1.310

Based on Table 5, the analysis results with the random effect model obtained a lower limit value of 0.742, an upper limit of 1.310 and an average effect size value of 1.026. The category of effect size in this study is included in the high category. Furthermore, the results of the Z test to determine the significance were obtained at 7,086 and a p-value < 0.01, so it can be concluded that the flipped classroom-based jigsaw model positively influences students' critical thinking skills in PAI teaching.

Discussion

The flipped classroom-based jigsaw model has proven to effectively improve students' critical thinking skills in Islamic religious education. In this model, students are allowed to learn material outside of the classroom through various learning resources, such as videos, articles, or interactive teaching materials. In this way, students are required to memorize information and analyze and understand the concepts taught (Lelean & Edwards, 2020). Previous research has shown that when students learn in this way, they become better

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prepared to actively participate in class discussions, which is a key component in developing critical thinking skills (Fajrul Munir, 2020; Farooqi & Naeem, 2023).

After students learn the material independently, they are divided into small groups using a jigsaw model. In this group, each member is responsible for understanding a particular part of the material and then explaining it to the other group members. This approach encourages students to collaborate and learn from each other, which directly contributes to the improvement of their critical thinking skills (Rohman, 2022). Interaction in groups allows students to question and evaluate the information they receive and develop the ability to make logical, evidence-based arguments. In addition, the flipped classroom-based jigsaw model allows teachers to act as facilitators who provide guidance and direct feedback during class sessions. In this way, students can receive more personalized and relevant input to their learning process (Park et al., 2021). Teachers can detect areas where students struggle and provide the necessary support to address the issue. Research shows that this approach increases students' motivation and encourages them to think more critically about the material being studied (Suryawan et al., 2023; Gürsan et al., 2023; Simanjuntak, 2024).

Implementing this learning model in the context of Islamic religious education is also relevant because students are often faced with complex religious texts. With the *jigsaw-based* flipped classroom model, students are allowed to analyze and discuss these texts in groups, thereby increasing their understanding of religious teachings (Hakim & Zulkifli, 2021). Engaging in discussions helps students to understand the context and meaning behind the teachings, as well as strengthen their understanding of religious principles that can be applied in everyday life (Osman et al., 2020). Furthermore, the success of this model in improving critical thinking skills can be seen from the results of evaluation and feedback provided by students. Many students report that they feel more confident in analyzing and discussing religious material after participating in learning with this model (Saputra et al., 2019). They also stated that learning became more engaging and interactive, motivating them to learn. Formative assessments carried out during the learning process also showed a significant improvement in students' ability to analyze and evaluate the material taught. The combination of the flipped classroom-based jigsaw model not only improves students' critical thinking skills but also equips them with social skills that are important in religious learning (Diniyyah et al., 2022; Fajrul Munir, 2020). Students learn to work together, respect the opinions of others, and develop a critical attitude towards the information they receive. Thus, applying these two models in Islamic religious education significantly contributes to the development of student's critical thinking skills and character, which is crucial in forming a generation that is sensitive and responsive to the challenges of the times.

Conclusion

From the results of this study, it can be concluded that the flipped classroom-based jigsaw model positively influences the thinking ability of students in PAI learners with a value (rRE= 1,026; z= 7,086 and $p < 0.001$). This finding provides important information in applying the flipped classroom-based jigsaw learning model in encouraging the critical thinking skills of school students. In addition, this research needs to be further researched in the future. With this model, students are allowed to learn the material independently before class, so they are better prepared to engage in discussions and collaboration in class. Interactions that occur in small groups encourage students to exchange knowledge, question each other's understanding, and develop better argumentation. The results show that students not only gain a deeper understanding of religious teachings, but also the critical thinking skills needed to apply these concepts in the context of daily life. The application of the Flipped Classroom-based Jigsaw model in Islamic Religious Education learning can be an effective strategy to develop students' critical thinking skills, which are important skills in this modern era. Teachers can integrate this approach into the curriculum to create a more interactive and collaborative learning environment. With students preparing material independently outside

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of the classroom, time in class can be maximized for in-depth discussion and problem-solving, ultimately strengthening their critical analysis skills. In addition, this model can also be applied to other subjects, especially those that require an understanding of complex concepts and high-level thinking skills.

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