



Enhancing Student Learning Outcomes Through a Deep Learning-Based Flipped Classroom: A Quasi-Experimental Study in Madrasah

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DOI: <http://doi.org/10.61987/communautaire.v5i2.3105>

Article History:

Received: 28 July 2026

Revised: 16 September 2026

Accepted: 11 October 2026

Keywords:

Flipped Classroom, Deep Learning, Learning Outcomes, Fiqh

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Abstract:

This study analyzes the impact of implementing a deep learning-based flipped classroom model on Fiqh madrasah students' learning outcomes in madrasah examinations, focusing on developing contextual and meaningful learning. The study uses a quantitative approach with a quasi-experimental pretest-posttest control group design. The research subjects consisted of 70 students divided into a group using the deep learning-based flipped classroom model and a group receiving conventional instruction. Data were collected through learning outcome tests, observation, and documentation. Data analysis used descriptive statistics, the N-Gain test, and the independent-samples t-test, after confirming normality and homogeneity assumptions. The results indicate a significant difference in learning outcomes between the deep learning-based flipped classroom group and the conventional group, with a significance value of 0.031 (<0.05). The experimental group achieved a mean posttest score of 87.65 with an N-Gain of 0.64, whereas the conventional group obtained a mean of 82.67 with an N-Gain of 0.54. The study's implications suggest that the deep learning-based flipped classroom model serves as an alternative instructional strategy for Fiqh that can enhance student engagement, strengthen conceptual understanding, and support the implementation of innovative learning practices in madrasah.

INTRODUCTION

Education plays a crucial role in developing high-quality human resources capable of navigating social and technological changes as well as the demands of 21st-century life (Arifani & Zhou, 2026; Susilo et al., 2025; Syadidunniam et al., 2026). The educational process aims not only to build knowledge but also to cultivate critical thinking, creativity, collaboration, and independence in students (Arsyad, 2026; Dewi et al., 2026; Fitri et al., 2026; Hamidah & Maspupah, 2026). A shift in learning paradigms requires a transition from teacher-centered instruction to approaches that allow students to actively construct their own understanding. This matters because the quality of learning directly affects the younger generation's readiness to face the challenges of modern society. Goswami (2024) and Saheli (2025) explain that 21st-century learning requires innovative strategies that boost student engagement; consequently, developing active learning models has become a critical priority for the educational community.

A persistent issue in educational settings is low student engagement, largely because conventional teaching methods dominate. Instructional patterns that prioritize

teacher-led delivery tend to relegate students to passive recipients of information, limiting their opportunities to explore, discuss, and develop higher-order thinking skills. This situation extends to religious education—including Fiqh (Islamic jurisprudence) classes in madrasah—which often focuses more on rote memorization of concepts and legal rules than on understanding their underlying meanings and real-world applications. (Yusuf et al., 2025)notes that students' diverse characteristics make it challenging to create effective, needs-based instruction. These issues highlight the need for learning innovations that address student needs in a more contextual way.

Observations of madrasah education indicate that students require more interactive approaches to gain a deeper understanding of Fiqh material. Fiqh instruction involves more than just the ability to recall Islamic legal rulings; it requires the capacity to comprehend scriptural evidence, analyze issues, and connect concepts to various real-life situations. However, because teaching practices remain dominated by lectures, student opportunities to engage in analysis and problem-solving are restricted. This situation limits students' opportunities to construct their understanding independently. Therefore, instructional practices need to be developed that boost active student participation while helping teachers create more meaningful learning experiences through innovative approaches aligned with current educational trends.

Previous research indicates that the flipped classroom model can enhance learning quality by transforming the roles of both teachers and students. This model enables students to study introductory material independently—using videos, digital modules, or other resources—before face-to-face sessions. As a result, classroom time shifts to more meaningful activities such as discussion, problem-solving, and reflection (Faiz et al., 2024; Lasut & Neman, 2025; Radhiyah, 2025). A meta-analysis by Kartikowati et al. (2025) and Surur et al. (2026) demonstrates that implementing the flipped classroom model positively impacts student learning outcomes. However, much of the existing research focuses on the flipped classroom's general effectiveness. It has yet to extensively examine how the model can be combined with deep learning approaches, particularly within the context of Fiqh (Islamic jurisprudence) instruction in madrasah.

The deep learning approach offers an opportunity to strengthen the implementation of the flipped classroom model by emphasizing conceptual understanding, the interconnectedness of knowledge, critical thinking skills, and the application of knowledge in real-life contexts. Siregar et al. (2025) explain that a deep approach to learning is characterized by a learner's effort to grasp a concept's meaning rather than merely memorizing information. Furthermore, Adeoye et al. (2024) and Eswaran (2024) assert that modern education needs to foster critical thinking, creativity, collaboration, and the ability to apply knowledge. Nevertheless, there remains room for further development regarding the integration of the flipped classroom and deep learning, particularly within the context of Fiqh (Islamic jurisprudence) instruction in madrasah (Islamic schools). Consequently, this community service initiative contributes by offering an innovative instructional approach that combines technology, collaborative activities, and the reinforcement of students' conceptual understanding.

Given these issues, there is a need for an instructional solution capable of enhancing the quality of Fiqh learning through a more active and meaningful approach. The central question addressed by this community service activity is how the implementation of a deep-learning-based flipped classroom model can help increase student engagement and improve learning outcomes in Fiqh subjects at madrasah. The

activity aims to introduce and implement an innovative teaching strategy that integrates independent pre-class study with analysis, discussion, and reflection activities during the lesson. The scope of the activity encompasses strengthening teachers' competencies in applying innovative learning models and enriching students' learning experiences—making them more active and critical, and enabling them to understand Fiqh material in a contextual manner that meets the needs of the educational community.

RESEARCH METHODS

This community service initiative employs a participatory approach (Parsons et al., 2025; Wilkinson & Wilkinson, 2024) utilizing a community-based learning strategy, specifically through the implementation of a deep-learning-based flipped classroom model in Fiqh (Islamic jurisprudence) instruction. The initiative selected a participatory approach because it positions participants not merely as objects of the activity, but as active partners in problem identification, implementation, reflection, and evaluation of the learning process. Through this approach, teachers and students collaborate to create a learning process that is more meaningful and aligned with the educational needs of the madrasah (Islamic school). According to Syamsiyah et al. (2025), the participatory approach emphasizes community involvement at every stage of the activity, ensuring that the resulting solutions are contextual and sustainable. Furthermore, an experiential learning approach can enhance student engagement in the learning process.

The service activity was conducted at MAN 1 Pandeglang, involving 34 students from class XI IPS IV (Social Sciences stream) as the group implementing the deep-learning-based flipped classroom model, and 36 students from class XI IPA IV (Natural Sciences stream) as the comparison group receiving conventional instruction. The location was selected based on a needs assessment indicating that Fiqh instruction faced challenges regarding low active student engagement in discussions, case analysis, and the development of conceptual understanding. The madrasah was chosen as the partner institution due to the nature of its religious education, which requires innovative teaching strategies to enable students to grasp the material more deeply and contextually. Classes were selected based on academic ability parity and students' readiness to participate in technology-based learning and collaborative activities.

Data collection techniques for this initiative included participatory observation, interviews, documentation, and learning outcome tests. Participatory observation was used to gather information on student engagement during implementation of the deep-learning-based flipped classroom model, covering discussion activities, problem-analysis skills, and interactions throughout the lesson. The researchers interviewed teachers and students to understand their experiences, feedback, and the challenges encountered during the community service activity. Documentation—including instructional materials, activity records, and student work—supplemented the data. Additionally, learning achievement tests were administered before and after the activity to assess changes in students' understanding of Fiqh (Islamic jurisprudence) topics, specifically *Jinayat* (crimes), *Qisas* (retribution), *Diyat* (blood money), and *Kifarat* (expiation). The researchers employed a variety of data collection techniques to provide a comprehensive overview of the activity.

The data obtained during the activity were analyzed using both quantitative and qualitative approaches. Quantitative data from learning achievement tests were analyzed using descriptive statistics to observe improvements in student understanding before

and after implementing the learning model. We assessed improvements in learning outcomes by calculating N-Gain scores. In contrast, differences in outcomes between the experimental and comparison groups were analyzed using appropriate statistical tests after confirming data normality and homogeneity. Qualitative data from observations, interviews, and documentation were analyzed through data reduction, data display, and conclusion drawing. This analysis aimed to evaluate the activity's implementation effectiveness, student responses, and the success of the learning model in enhancing the quality of Fiqh instruction. The analysis process followed the interactive data analysis framework proposed by Miles, Huberman, and Saldaña (Mihās, 2022; Saldaña, 2024; Salmona & Kaczynski, 2024)

RESULTS AND DISCUSSION

Results

Implementation of a Deep Learning-Based Flipped Classroom

In this community service initiative, the deep learning-based flipped classroom model is an instructional strategy that combines independent pre-class study with active learning activities during face-to-face sessions to foster deeper conceptual understanding. The model is implemented in three stages: before class, during class, and after class. In the "before class" stage, students study introductory material via instructional videos and digital resources distributed through WhatsApp. The "during class" stage focuses on case analysis, group discussions, presentations, and reflection on Fiqh (Islamic jurisprudence) issues relevant to daily life. Meanwhile, the "after class" stage focuses on reinforcing concepts, providing feedback, and evaluating student understanding. This model shifts learning from the mere reception of information to an active process of knowledge construction.

Interviews with the Fiqh teacher revealed that implementing the flipped classroom model transformed classroom interaction patterns. The teacher noted that before this model, most class time was spent explaining the material, limiting opportunities for students to discuss topics or express their opinions. With the flipped classroom approach, students arrive with prior knowledge from digital materials, allowing the lesson to focus on conceptual discussion, problem analysis, and clarifying misunderstood topics. The teacher also observed a shift in their role from the primary source of information to a facilitator guiding the learning process. These findings indicate that the model fosters a more dialogic relationship between teacher and students.

Interviews with students indicated that the flipped classroom model helped them understand Fiqh material in a more flexible and structured manner. One student mentioned that receiving videos and reading materials beforehand allowed them to study the content in advance, boosting their confidence during class discussions. Another student explained that group-based case analysis made the Fiqh material easier to grasp because it linked the subject matter to real-life situations rather than relying solely on the rote memorization of legal rules. Based on this statement, the researcher interprets that implementing this model allows students to prepare before the lesson and enhances their engagement in knowledge construction. This demonstrates a shift toward learning that is more centered on student activity.

Observational data collected during the activities reveal changes in student learning behavior following the implementation of a deep learning-based flipped classroom model. During group discussions, students appeared more active in expressing

opinions, asking questions, and responding to their peers' arguments. Activities involving the analysis of Fiqh (Islamic jurisprudence) cases also indicated that students were beginning to connect Islamic legal concepts with various relevant real-life situations. The researcher found that teacher explanations no longer dominated face-to-face sessions; instead, sessions became an interactive process of exploring ideas and solving problems. These findings demonstrate that integrating deep learning into the flipped classroom model effectively strengthens students' critical thinking skills, collaboration, and conceptual understanding.

Based on the comprehensive interview and observation data, a pattern emerged: successful implementation of a deep-learning-based flipped classroom depends on changes to learning activities before, during, and after instruction. The independent preparation phase, utilizing digital materials, establishes the students' initial readiness, while interactive classroom activities reinforce understanding through discussion, argumentation, and problem-solving. Meanwhile, the post-lesson reflection phase strengthens the connection between the concepts learned and their real-life applications. This pattern demonstrates that the model focuses not merely on content delivery but also on fostering an active, reflective, and contextual learning process. Consequently, the deep-learning-based flipped classroom serves as a relevant approach for enhancing the quality of Fiqh instruction in madrasah.

These findings confirm that implementing a deep-learning-based flipped classroom creates a more meaningful learning experience for students. The data reveal a shift from conventional patterns toward a learning process that affords students greater opportunities to explore material, engage in discussion, and independently construct their understanding. Teachers act as facilitators who guide the learning process, while students take on the role of primary actors in learning activities. Overall, the results of this initiative indicate that integrating educational technology with a deep learning approach offers a strategic alternative for developing Fiqh instruction that is more active, critical, and aligned with contemporary educational needs.

Changes in Student Learning Outcomes

Changes in learning outcomes were measured to determine differences in student achievement before and after implementing a deep learning-based flipped classroom model. The researchers evaluated learning outcomes by administering pre-tests and post-tests to both the group implementing the learning model and the comparison group. Test instruments were used to assess students' cognitive abilities regarding Fiqh (Islamic jurisprudence) material, covering conceptual understanding, legal analysis, and the ability to relate the material to contextual issues. Measurement results indicate that both groups improved following instruction; however, the magnitude of improvement differed between groups. Table 1 below presents are measurement data.

Table 1. Learning Outcomes Improvement by Learning Model						
Group	Number of Students	Mean Pretest	Mean Posttest	Mean Improvement	N-Gain Score	Category
Deep Learning-Based Flipped Classroom	34	66.00	87.65	21.65	0.64	Moderate
Conventional Learning	36	62.22	82.67	20.45	0.54	Moderate

Based on Table 2, the results of the independent samples t-test analysis show a t-value of -2.200 with degrees of freedom (df) of 68 and a significance value of 0.031. Because the significance value is smaller than the specified error level ($\alpha = 0.05$), the null hypothesis (H_0) is rejected, and the alternative hypothesis (H_1) is accepted. These findings indicate that there are significant differences in learning outcomes between students who take part in deep learning-based flipped classroom learning and students who take part in conventional learning. This difference is evident in the average posttest achievement: the deep learning-based flipped classroom group scored 87.65, while the conventional group scored 82.67. Thus, applying this learning model positively contributes to students' Fiqh learning outcomes.

Theoretically, the differences in learning outcomes can be explained by the main characteristics of the flipped classroom model, which changes the traditional learning structure. In this model, students obtain initial information independently through digital learning resources before face-to-face learning so that class time can be used for higher-level cognitive activities such as discussion, case analysis, problem solving, and reflection. Integrating a deep learning approach further strengthens this process because it encourages students to understand relationships between concepts, build arguments, and connect Fiqh material to real-life contexts. This finding aligns with Marton and Säljö's (1976) concept of deep learning: learning oriented toward understanding meaning produces stronger mastery of concepts than learning oriented only toward reproducing information.

The results of this research also strengthen previous findings regarding the effectiveness of implementing the flipped classroom in improving student learning outcomes. The flipped classroom positively influenced various learning indicators by increasing student engagement and the quality of interaction during the learning process. However, this research contributes by applying this model to Fiqh learning in madrasas and integrating a deep learning approach. Unlike the flipped classroom, which moves learning material outside the classroom, this research emphasizes optimizing face-to-face activities to build students' conceptual understanding, analytical skills, and reflection on Islamic legal values.

Although the test results show a significant influence, the improvement in learning outcomes, based on the Normalized Gain (N-Gain) value of 0.64 for the deep learning-based flipped classroom group, remains in the medium category. These findings show that this learning model has good potential. Still, its effectiveness can be further developed through longer-term application, improved digital learning resources, and more varied classroom activities. Therefore, the results suggest that a deep learning-based flipped classroom can be an alternative strategy for learning Fiqh, creating a more active, reflective, and meaningful learning experience, especially in the context of madrasah education.

The Effect of Deep Learning-Based Flipped Classroom on Learning Outcomes

Before testing the hypothesis, we analyzed the learning outcome data using statistical assumption tests to ensure the feasibility of parametric analysis. Shapiro–Wilk normality tests showed that all data are normally distributed. The significance value of the pretest in the control group was 0.080, the posttest in the control group was 0.066, the pretest in the deep learning-based flipped classroom group was 0.142, and the posttest was 0.886. All significance values are above the critical limit of 0.05, so no

deviations were found from the normality assumption. Furthermore, the homogeneity test using Levene's test yielded a significance value of 0.137 (>0.05), indicating that the variances of the two groups are relatively homogeneous. Based on these results, the analysis of differences in learning outcomes continued with an independent-samples t-test.

Table 2. Independent Samples t-Test Results of Fiqh Learning Outcomes

Variable	Group	Mean Posttest	t	df	Sig. (2-tailed)	Significant Decision
Fiqh learning outcomes	Deep Learning-based Flipped Classroom	87.65	-2.200	68	0.031	Significant Decision
Fiqh learning outcomes	Conventional	82.67	t			Significant Decision

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Discussion

The research results show that implementing a deep learning-based flipped classroom positively influences students' Fiqh learning outcomes. This finding aligns with a meta-analysis that found the flipped classroom model improved students' academic achievement compared with conventional learning (Eltahir & Alsalhi, 2025; Gong et al., 2024; Somaa, 2024). These findings suggest that changing the learning structure by providing initial material before class and optimizing face-to-face activities can increase learning engagement. However, this research contributes by integrating deep learning principles into Fiqh learning. In contrast, some previous studies have mainly studied the effectiveness of the flipped classroom in general subjects. Thus, this research expands the study of the flipped classroom in the context of religious education.

The improvement in learning outcomes in the group that implemented the deep learning-based flipped classroom can be explained by changes in students' roles in the learning process. In the conventional model, students tend to receive information directly from the teacher. In contrast, in the flipped classroom approach, they can study the material independently before class activities begin. These findings support Surur et al. (2026) and Zona et al. (2025) view that flipped learning allows face-to-face time to be used for more meaningful activities such as discussion, problem solving, and providing feedback. This research also strengthens the findings of Agyeman & Aphane (2024) and Mushtaq & Iqbal (2024), who stated that the success of the flipped classroom lies in combining independent learning with active classroom interaction. This research differs by strengthening in-depth understanding in learning Fiqh.

Integrating a deep learning approach is a key factor that differentiates this research from the application of flipped classrooms in general. The results showed that students not only gained greater mastery of the material but also had the opportunity to analyze Fiqh issues through discussions and case studies. These findings are in accordance with the concept of Hamidah & Maspupah (2026) and Sholeh et al. (2025), who explain that a deep learning approach encourages students to understand meaning, connect concepts, and build overall understanding. In addition, Zainuddin & Asmoni (2026) explain that deep learning focuses on students' ability to create knowledge through collaboration, creativity, communication, and problem solving. Therefore, this research provides a theoretical contribution by showing that deep learning principles can strengthen the effectiveness of the flipped classroom model in learning based on values and religious concepts.

From a theoretical perspective, this study contributes to research on active learning that integrates technology, learner autonomy, and knowledge construction. The findings support constructivist theory, which posits that learners build understanding through experience, social interaction, and reflection. This was evident when learners used digital materials as an initial source of knowledge and then deepened their understanding through collaborative classroom activities. These results align with the principle of "constructive alignment" proposed by Astuti et al. (2025) and Sundari et al.

(2025), which emphasizes coherence among learning objectives, learning activities, and assessment. The study's contribution lies in providing empirical evidence that a structured instructional design can foster both cognitive competence and higher-order thinking skills in Fiqh (Islamic jurisprudence) education.

In practical terms, these findings offer implications for teachers, madrasah (Islamic schools), and instructional designers regarding the creation of learning strategies that are more responsive to the needs of 21st-century learners. Teachers can utilize a deep-learning-based flipped classroom model as an alternative to reduce reliance on traditional lectures and to enhance student engagement through discussion, analysis, and reflection. For madrasah, adopting this model can help strengthen a learning culture that productively leverages digital technology. The findings also indicate that the model's success depends not only on using digital media but also on the quality of classroom learning activities. Consequently, teachers must be prepared to design materials, facilitate discussions, and provide guidance to ensure the learning process proceeds optimally.

Although this study yielded positive results, certain aspects warrant attention in future research. The moderate improvement in learning outcomes suggests that the deep-learning-based flipped classroom model has room for further development—specifically through longer implementation periods, a wider variety of learning resources, and greater emphasis on reflective activities. These findings differ from other studies reporting higher gains, likely because of differences in learner characteristics, subject matter, and the model's implementation duration. Thus, this study not only reinforces the evidence regarding the benefits of the flipped classroom but also highlights the importance of adapting the model to specific learning contexts. Overall, this study contributes to enriching Fiqh learning strategies that are active, contextual, and oriented towards deep understanding.

CONCLUSION

This study shows that implementing a deep learning-based flipped classroom improves students' learning outcomes in Fiqh (Islamic jurisprudence) and fosters a more active, reflective, and meaningful learning environment. Integrating independent study via digital resources with in-class activities—such as discussions, case analyses, and reflection—enhances student engagement in constructing conceptual understanding. These findings suggest that this model serves as a viable alternative instructional strategy for madrasah in meeting the demands of 21st-century education, particularly regarding the development of critical thinking skills and the practical application of knowledge. Consequently, teachers and educational institutions should further implement this model by strengthening pedagogical competence, providing digital learning resources, and planning contextual learning activities. Future research should examine the application of the deep learning-based flipped classroom across a wider range of educational levels, subjects, and student demographics, using longer implementation periods to understand the model's effectiveness and sustainability.

ACKNOWLEDGMENT

The authors thank Sekolah Tinggi Agama Islam Syekh Manshur Pandeglang, Indonesia, for the support and facilities provided during this research. The authors also thank all participants and contributors who supported the successful completion of this study.

CONFLICTS OF INTEREST

No conflict of interest.

USE OF ARTIFICIAL INTELLIGENCE (AI)-ASSISTED TECHNOLOGY

The authors acknowledge using Claude (Anthropic) as an AI-assisted tool while preparing this manuscript. Claude supported language refinement, proofreading, and improved manuscript clarity. The authors remain fully responsible for the article's accuracy, originality, interpretation, and final content.

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